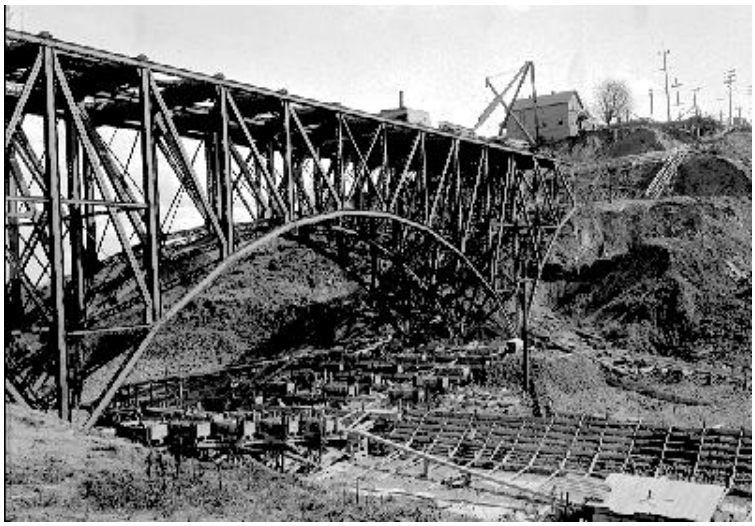
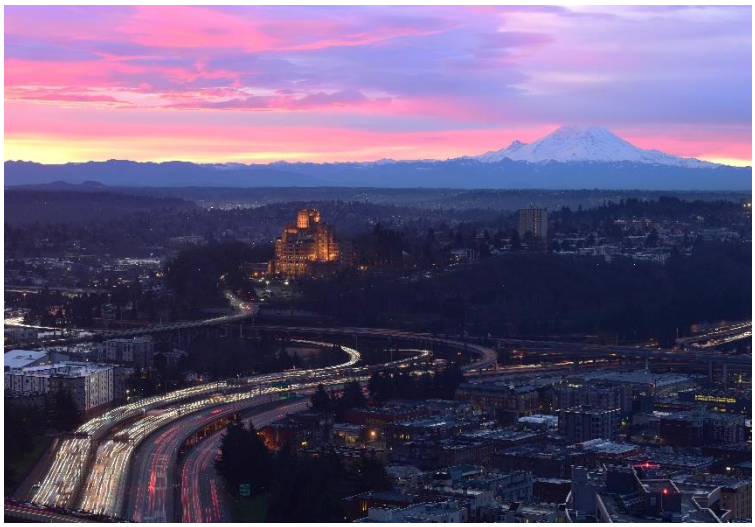
ASSET STATUS & CONDITION REPORT

ASSET & PERFORMANCE MANAGEMENT





Seattle Department of Transportation

2020

700 Fifth Avenue, Suite 3800 | PO Box 34996 | Seattle, WA 98124-4996 | 206-684-ROAD (7623) | seattle.gov/transportation

Seattle Department of Transportation

Dear Seattle,

I am pleased to share the SDOT 2020 Transportation Asset Status and Condition Report* with you.

In my short time in Seattle, I have seen first-hand how vibrant this growing community is. As more people move to the city, there is higher demand on our transportation infrastructure. As stewards of the public right-of-way, we have an obligation to invest in, maintain, and preserve our transportation assets - like bridges, roads, stairways, sidewalks, and much more. It is through our commitment to stewardship that we strive to prioritize our investments so that they return the greatest transportation benefits back to our community.

Prior to my arrival at SDOT, our teams spent countless hours on this report as part of a comprehensive asset management plan. I am proud of our asset management work, because it is focused on making the right investment in the right asset, at the right time, within available resources, to ensure our infrastructure stands the test of time.

Across the country, funding for asset maintenance has not kept up with aging infrastructure and growing asset inventories. Seattle is no exception. Importantly, this report comes as the department is developing a new plan to fund our future transportation system – one that is responsive to our needs and what we have heard from you during conversations about the new Seattle Transportation Plan. We have heard voices agreeing with the need for comprehensive asset management alongside a desire to build new infrastructure that will take us safely, sustainably, wherever we need to go.

Today presents a unique opportunity. With the publication of this report and the development of a future funding plan, we can find a way – together, as One Seattle – to sustainably fund necessary maintenance activities, proactive preservation strategies, and critical infrastructure replacements. In doing so, we can ensure that we are taking care of our assets for current and future generations and at the lowest practicable cost.

Thank you.
Greg Spotts
SDOT Director

**Note: In general, SDOT has developed Asset Status and Condition Reports every five years, with some exceptions. This report contains data from 2020 that has been shared publicly in other materials to inform transportation investments. It is being published in its entirety in February 2023. Our latest report, conducted in 2015, can be found on our website by accessing the following link: 2015 SDOT Transportation Asset Status and Condition Report. We anticipate that our next Asset Status and Condition Report will be published in 2026.*

2020 SDOT Transportation Asset Status & Condition Report

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1 - EXECUTIVE SUMMARY

The Seattle Department of Transportation (SDOT) is pleased to provide the 2020 Transportation Asset Status & Condition Report as a continuation of its commitment to transportation asset management (TAM). TAM focuses on improving business processes that support resource allocation decisions so that we can manage our transportation infrastructure assets in a cost-effective and efficient manner. The goal of TAM is to make strategic decisions based upon quality asset data and information. This approach achieves the best performance results for the preservation, improvement, and operation of our assets given limited and constrained resources.

Seattle is one of the fastest growing large cities in the United States and the demands on our transportation system have increased dramatically in recent years. This growth highlights the need to address one of our more significant challenges, balancing the amount of future spending to fund the construction of new assets (or increase existing transportation services) with an asset management-based approach that emphasizes the maintenance and preservation of our existing assets. The region has historically experienced peaks of new infrastructure construction during building booms and many of these assets constructed in the 20th century are reaching the end of their useful lives. Throughout the life of our assets, we can extend and optimize service lives by making smaller strategic investments through proactive maintenance, preservation, and rehabilitation activities. This approach is one example of how we work within the constraints of the City's limited financial resources to maintain or improve infrastructure conditions while increasing transportation sustainability and equity for both current and future generations.

Over 96%, or $27.6 billion, of our overall asset replacement value ($28.6 billion) is distributed among seven high value assets as shown in Table 1.1 found at the end of this summary. These assets are areaway street walls, bridges, retaining walls, traffic signal assemblies, arterial pavements, non-arterial pavements, and sidewalks. Table 1.1 also provides an itemized breakdown of the high value assets' replacement costs, quantities, conditions, current values, and data qualities. The remaining assets are shown in Table 1.2 which has been expanded to include all 48 assets that we are responsible for maintaining and preserving, grouping them into the following 11 different asset classes:

- Bicycle & Pedestrian System
- Bridges & Other Roadway Structures
- Channelization
- Intelligent Transportation System
- Parking Payment Devices
- Pavement System
- Real Property
- Signs
- Traffic & Safety Structures & Devices
- Transit
- Urban Forest

There are several "asset type" changes in the 2020 Status & Condition Report edition. Bicycle facilities, railroad crossings, and radio towers are new assets in this report. In addition, the transit asset class has been modified to reflect the certification of our first Transit Asset Management Plan (2018). Finally, Bluetooth readers were removed since we now receive this data as a service.

To facilitate the efficient and effective management of each asset, we have designated either an individual as the asset owner / expert, asset maintainer, and asset data maintainer or a group that provides asset maintenance or development through capital projects. Team members resolve issues in a collaborative manner, managing an asset through the planning, design, construction, and maintenance life cycle stages. This report outlines our

governance and program management structure to keep our assets in the best condition possible given our finite resources. We have established a steering committee that includes Asset & Performance Management team members, Division Directors, and the SDOT Executive Leadership Team to act as the governing body to implement, grow, and support asset management within the department.

We formally update this report every three to five years and consider it a living document designed to guide our implementation and improvement of asset management practices. Since 2015, the replacement value of our assets has increased $8.6 billion, with the largest increase ($4.2 billion) coming from the bicycle and pedestrian asset class, followed by the bridges and structures asset class ($3.5 billion). In addition to including new asset types and updated quantities built by public and private construction projects, we increased our data quality by performing asset condition assessments and adjusting the asset values due to inflation and construction cost increases. The amount of investment needed to maintain and preserve our assets continues to increase faster than our financial resources.

The chart to the bottom right of Table 1.1 compares the total replacement cost percentages of the three highest value asset classes to all other asset class values. These asset types traditionally also have longer service lives, represent higher risk, and involve preventative maintenance and preservation strategies to optimize their lifecycles. The chart to the bottom left of Table 1.1 shows the change in data confidence since the 2015 report in terms of asset value. The biggest jump in the high data confidence category is primarily due to increased asset information on the sidewalk system, which also explains the higher replacement valuation for this asset type. Aside from the updated asset information, the region has also experienced significant inflation and construction cost increases causing the valuations to increase.

Knowing what assets we have is a keystone for being able to effectively "take care of what we have." This report provides information regarding our current asset inventory, including a description and condition of those assets which we own, operate, inspect, and/or maintain. This report serves as a critical communication document that:

- ✓ Provides technical information about our assets that will serve as a useful reference for communicating consistent asset information to the public, for assisting department staff when making decisions, and for effectively and efficiently managing our limited resources;
- ✓ Discusses the enterprise system tools we employ in our asset and work management efforts along with data quality and confidence within those systems;
- ✓ Serves as a gap analysis to identify steps for us to take to increase our asset management maturity; and
- ✓ Supports budgeting and capital funding decisions by gathering asset funding requirements. We will use our insights to develop a better understanding of the preservation needs and programmatic funding levels necessary to meet desired service levels. This knowledge will be used to guide discussions centered on the implementation of asset preservation strategies that inform future years' budgets and transportation capital project investments.

Section 2 of this report provides an overview of our core mission and values along with an introduction to our key asset management objectives, policies, funding resources, performance management and governance approach, coupled with definitions on the technical terms used throughout this report. Our 11 asset classes are covered in Sections 3 through 13. Each section opens with a table and a summary that identifies the assets

within each asset class. After the asset class summary, each asset is given its own subsection that includes a brief description, inventory count, data confidence level, replacement value, useful life, and anticipated annual growth. Depending on the complexity, quantity, and available asset information each subsection may include a description of our maintenance approach, anticipated life cycle costs, and an estimate of the asset's long-term financial needs.

Section 14 provides a summary of the report's key takeaways and outlines several improvement strategies along with an implementation timeline in alignment with current expectations and guidance. As resources allow, we will prioritize these improvements to enhance our strategic decision-making by integrating them into our current business processes. The most notable of these actionable improvements are:

- ✓ Promote proactive asset management by documenting maintenance costs and identifying opportunities for optimizing asset maintenance strategies to reduce risk and lifecycle costs while extending service life. Research creating standard operating procedures for cost accounting to track maintenance activities against individual assets.

- ✓ Identify and plan for maintenance funds to support new and existing assets. A critical, primary gap is adequately funding maintenance and preservation activities. We can make progress to close this gap through the development of standard estimates correlated with project scope which can be used to secure new funding for asset maintenance. This will ensure that assets achieve their desired service life and prevent newly created assets from adding to our asset maintenance backlog.

- ✓ Improve asset data maintenance and increase interdivisional coordination while modernizing project related asset onboarding. By creating a centralized, adequately staffed asset data management group we can increase the efficiency of onboarding, retiring, and modifying assets in our Infor and GIS databases while improving our ability to manage and coordinate our technology improvements with our partners in the Seattle Information Technology Department.

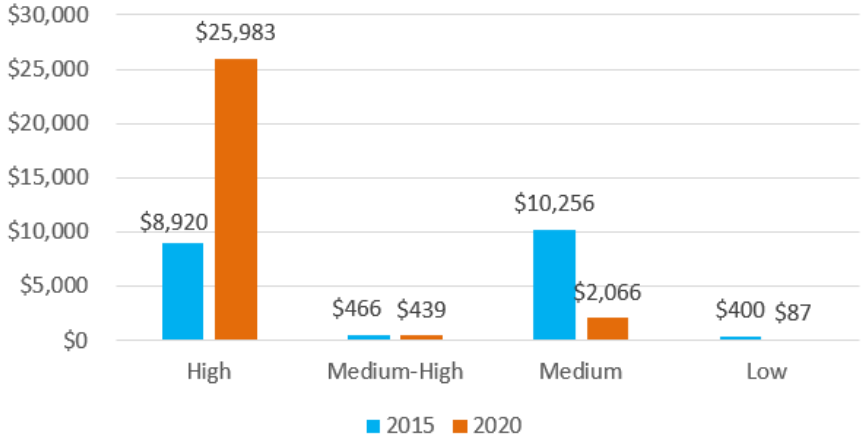
Our vision for Seattle is a thriving, equitable community powered by dependable transportation. In part, this means we optimize asset maintenance strategies, at the lowest practicable cost, for current and future generations. This report serves as a transparent and publicly available reference guide for our stakeholders to review the current inventories, descriptions, and condition of our managed assets. We will use this report to strengthen our TAM commitment and enhance stakeholder awareness and communication.

Report Disclaimer: *Financial figures used in this document are in 2020 dollars unless otherwise noted. Financial and budget data were obtained from the City of Seattle's Summit Peoplesoft and Infor databases. Asset data was obtained from Infor, BridgeWorks, and StreetSaver and is current as of July 2020. The funding requirements discussed in this report are estimates based on each asset's available financial information. This report does not include a rigorous reconciliation to budget and financial information primarily because current financial systems, with few exceptions, do not track budgets or costs by each individual asset. This report strives to provide asset information and condition data. Any recommendations provided herein are intended to increase SDOT's asset maturity levels and should not be misconstrued as policy recommendations.*

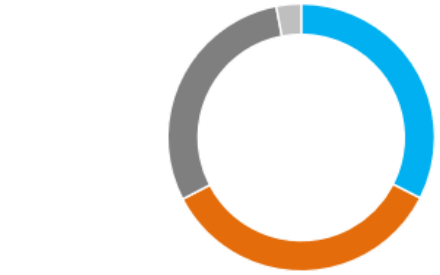
Table 1.1: SDOT TRANSPORTATION INFRASTRUCTURE HIGH VALUE ASSETS = $27.6 BILLION

Asset Class/Asset	Inventory Status	Replacement Value ($M)	Current Value ($M)	Data Confidence	Condition: Excellent	Good	Fair	Poor	Very Poor	Unk.
BIKE & PEDESTRIAN SYSTEM		**$9,404.4**								
Sidewalks	2,288 miles	$9,404.4	$5,629	High	11.0%	41.1%	37.7%	6.6%	2.8%	0.8%
BRIDGES & STRUCTURES		**$8,699.1**								
Areaway Street Walls	236	$194.4	$120	Medium		43.6%	33.1%	3.8%		19.5%
Bridges[1]	122	$7,143.5	$3,580	High		26.2%	57.4%	16.4%		0.0%
Retaining Walls	606	$1,361.2	$855	Medium		30.2%	34.2%	2.6%		33.0%
INTELLIGENT TRANSPORTATION SYSTEM		**$293.5**								
Traffic Signal Assemblies	1,118	$293.5	$132	Med-High	6.2%	19.9%	34.1%	24.4%	15.4%	0.0%
PAVEMENT SYSTEM		**$9,166.5**								
Arterial	1,548 lane miles	$5,008.3	$2,576	High	13.4%	28.4%	23.1%	16.0%	19.1%	0.0%
Non-arterial	2,396 lane miles	$4,158.2	$2,288	High	20.0%	27.9%	20.5%	12.9%	18.7%	0.0%

Data Confidence Comparison 2015 - 2020
(in millions)



Total Replacement Cost



Pavement System	$9,166M	32%
Bike/Ped System	$9,684M	34%
Bridges & Structures	$8,710M	30%
All Other Assets	$1,015M	4%

Table 1.2: SDOT TRANSPORTATION INFRASTRUCTURE ASSETS = $28.58 BILLION

Asset Class/Asset	Inventory Status	Replacement Value ($M)	Current Value ($M)	Data Confidence	Condition: Good	Fair	Poor	Unk.
BIKE & PEDESTRIAN SYSTEM		**$9,684.0**						
Bicycle Facilities	141.5 miles	$71.8		Medium				
Bicycle Racks	3,953	$2.4	$1.8	Med-High	86.2%	1.0%	0.4%	12.3%
Kiosk	150 (e)	$1.3	$0.7	Low				100%
Marked Crosswalks	5,649	$3.7	$2.5	Med-High	72.4%	11.7%	13.8%	2.1%
Sidewalks	34,425 blocks	$9,404.4	$5.6	High	**	**	**	**
Stairways	497	$73.3	$51.7	High	70.1%	28.6%	1.3%	
Street Furnishings	1,039	$3.0	$1.5	Medium				100%
Trails	47 lane miles	$124.1	$62.0	Medium				100%
BRIDGES & STRUCTURES		**$8,710.4**						
Air Raid Siren Tower	1	$0.5	$0.3	High		100%		N/A
Areaway Street Walls	236	$194.4	$119.6	Medium	**	**	**	**
Bridges	122	$7,143.5	$3,580.4	High	**	**	**	**
Bridge Hydrant Vaults	18	$5.2	$4.1	Medium	17.1%	53.1%	29.8%	
Elevator	2	$3.0	$2.4	High	100%			
Retaining Walls	606	$1,361.2	$855.1	Medium	**	**	**	**
Tunnel	1	$2.6	$1.3	High		100%		
CHANNELIZATION		**>$10.0**						
Pavement Markings		>$10.0		Medium				100%
INTELLIGENT TRANSPORTATION SYSTEM		**$418.0**						
Beacons	550	$19.2	$10.9	Medium	23.5%	4.7%	.7%	71.1%
Cameras	293	$4.1	$3.3	Medium	99%		.3%	.7%
Communications Network	150 miles (e)	$82.1	$41.1	Low				100%
Counters	211	$7.7	$3.8	Medium				100%
Dynamic Message Signs	66	$6.7	$5.4	Med-High	100%			
Network Hubs	14	$1.1	$0.5	Medium				100%
Radar Speed Signs	51	$1.3	$0.8	Medium	43.1%			56.9%
Radio Towers	38	$1.2	$0.3	High	13.2%		86.8%	
Transportation Ops. Ctr	1	$1.1	$0.9	High	100%			
Traffic Signal Assemblies	1,118	$293.5	$132.0	Med-High	**	**	**	0%
PARKING PAYMENT DEVICES		**$11.3**						
Pay Stations	1,512	$11.3	$9.1	High	100%			
PAVEMENT SYSTEM		**$9,166.5**						
Arterial	1,548 lane miles	$5,008.3	$2,576.3	High	**	**	**	
Non-arterial	2,396 lane miles	$4,158.2	$2,287.8	High	**	**	**	0%
REAL PROPERTY		**$47.7**						
Buildings & Yards	14	$47.7	$24.9	Med-High	35.7%	35.7%	28.6%	
Parcels	55	N/A		Med-High				N/A
Shoreline Street Ends	141 (e)	N/A		Med-High				N/A
SIGNS		**$73.4**						
Sign Assemblies	194,009	$73.4		Medium	46.6%	<.01%	<.01%	53.4%
TRAFFIC SAFETY STRUCTURES & DEVICES		**$101.8**						
Chicanes	22	$.66		Medium				100%
Crash Cushions	41	$.89	$0.7	Medium	78%	4.9%	0%	17.1%
Guardrails	85,859 LF, 925 ea	$9.4	$5.9	Medium	42.7%	36.6%	0.4%	20.2%
Median Islands	500 (e)	$62.5	$38.9	Med-High	17.4%	6.6%	2.2	43.4%
Railroad Crossings	336	Unknown		Med-High	29.5%	31.5%	24.1%	14.9%
Speed Cushions	567	$2.8	$2.3	Medium	95.6%		14.3%	4.4%
Speed Dots	3	$.02		Medium				100%
Speed Humps	372	$2.0	$1.5	Medium	73.1%			26.9%
Traffic Circles	1,073	$23.5	$18.5	Med-High	95.2.%	3.7%	0.2%	0.8%
TRANSIT		**$178.5**						
Historic Transit Shelters & Stations	3	$41.6	$33.3	High	100%			
Streetcar System	2 Lines	$133.4	$106.9	High	100%			
Transit Loading Platforms	35	$3.5	$2.0	High	97.1%	2.9%	0%	
URBAN FOREST		**$173.9**						
Irrigation	156	Unknown		Med-Low				100%
Landscape Complexes	7,020,000 SF	$109.3		Medium	25%	0%	75%	N/A
Trees	38,000 (e)	$64.6		Medium	75%	17%	5%	3%

2 - INTRODUCTION

PURPOSE AND SCOPE OF THIS REPORT

This is the fourth edition of the Seattle Department of Transportation's (SDOT) Asset Status and Condition Report. The Asset and Performance Management (A&PM) program published the Status & Condition report in 2007, 2010, and 2015.

As with previous versions, this report focuses on the physical infrastructure assets located in the public transportation right-of-way (ROW) that are owned, inspected, operated, and/or maintained by SDOT and directly affect the ability of people and goods to move around the city in an equitable, safe, timely, and efficient manner.

Regulated assets, which are physical assets and improvements that exist in the street ROW and are not owned by SDOT, but over which SDOT has a jurisdictional interest, are not studied to a significant degree in this report. Such improvements are typically added by utilities, other governmental organizations, and private parties. Both private and public projects in the ROW are permitted by the Department's Street Use Division. A partial list of these assets includes non-SDOT owned areaways, landscaped areas (e.g., planting strips adjacent to roadways), privately installed and owned trees, and unopened ROW.

Intended Uses of this Report

We plan to use this report to provide information regarding our current asset inventory, including descriptions, conditions, replacement values, current values, and data quality of SDOT owned, operated, and/or maintained assets. Beyond acting as a transparent reference guide on our assets, this report also intends to:

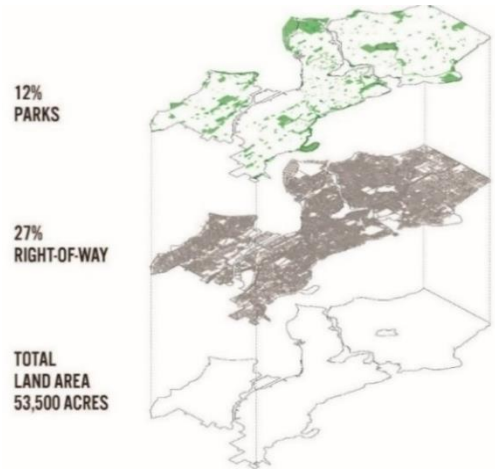
- ✓ Provide technical information about our assets that will serve as a useful reference for communicating consistent asset information to the public, for department staff when making decisions, and for strategic utilization of our limited resources;
- ✓ Discuss the enterprise system tools that we employ in our asset and work management efforts along with data quality and confidence within those systems;
- ✓ Serve as a gap analysis to improve and monitor our asset management maturity progression; and
- ✓ Support budgeting and capital funding decisions by gathering asset funding requirements. As our asset management maturity increases, we will better understand the preservation needs of our assets and the related funding requirements to meet desired preservation strategies. This information can guide future year budgets and transportation capital project development.

How this Document was Prepared

SDOT's Asset & Performance Management program prepared this report. We primarily obtained asset data through our Infor for Public Service (previously Hansen) version 11.1 (herein after referenced as Infor) central data repository and confirmed data elements and quality with our asset owners. Financial data was pulled from the City's Financial Management System (PeopleSoft 9.2) with the assistance of our Finance Group and historical unit cost data was obtained from asset owners/managers.

TRANSPORTATION OVERVIEW

The City of Seattle covers 142.5 square miles – 83.8 square miles consisting of land and 58.7 square miles of water. Seattle's urban transportation system consists of a street network with paved roads, a sidewalk system, a bicycle network, bridges and other roadway structures, a traffic control network, paths and trails, street signs, traffic safety structures and devices, parking devices, a streetcar system, and an urban forest. These infrastructure assets exist within the public ROW. Streets and sidewalks in the ROW make up 27% of the city surface area [1].



The City has invested in transportation infrastructure since its founding in 1851. In addition, each year private entities construct new assets in the ROW and turn them over to SDOT when construction is completed. Since 1980, we have maintained a detailed record of costs to build and perform major rehabilitation on infrastructure assets and to align with for Governmental Accounting Standards Board, Statement 34, (GASB-34) reporting (see Appendix C). Our investments total $2.82 billion (2020 dollars) in transportation infrastructure from 1980 to 2019.

Seattle Growth and Development

The Washington State Office of Financial Management (OFM) estimates Seattle's population to be approximately 761,100[2] as of April 2020, a growth of nearly 25% from 2010 to 2020. This is a significantly faster rate of growth than had been projected in the City's 2035 Comprehensive Plan adopted in 2016. The 2035 Comprehensive Plan anticipated the addition of at least 70,000 households during the 20-year planning period from 2016-2035, which would place Seattle's population at nearly 800,000 in the year 2035. If the pre-pandemic population growth trend somehow manages to continue through the economic recovery, the city would easily surpass that number much sooner.

Washington State Employment Security Department (ESD) estimates that there were about 620,000 jobs in Seattle in 2019, 157,736 more than in 2010. The ESD estimates that 115,000 jobs will be added each year from 2016-2035. This means that by 2035, there will be an estimated 700,000 jobs in Seattle. The COVID-19 pandemic caused a spike in unemployment and disrupted the short run trajectory of job growth, but forecasters note a return to pre-pandemic levels within a few years is possible. If this occurs, there may be 700,000 jobs in Seattle before 2035.


Landscaped Trail in an Industrial Area

A growth in the population and job numbers will most likely cause a significant increase in demand and stress on the City's transportation infrastructure. For example, increased density brought by growth has led to more frequent and heavier buses,

[1] Adapted from *the Move Seattle Levy report:* seattle.gov/Documents/Departments/SDOT/About/DocumentLibrary/Levy/MoveSeatte-FinalDraft-2-25-Online.pdf

[2] seattlecitygis.maps.arcgis.com/apps/opsdashboard/index.html#/846486cdbad44b5f8349dfc8ffa1dac5

delivery trucks, and other vehicles which may contribute to pavement deterioration. The City strives to accommodate growth through greater population densities and improved transportation choices. Prior to the COVID-19 health crisis more than 75% of all trips within Seattle were not work-related; instead, these trips were for shopping, errands, and entertainment. SDOT anticipates that future growth may negatively impact infrastructure conditions and operations and may require accelerated maintenance, replacement, and construction of new assets, and/or implementation of non-asset solutions in the right-of-way.

In addition to the pressure of a growing population, the City of Seattle is faced with other challenges such as climate change, earthquake and flooding hazards, deteriorating asset conditions, funding uncertainty, housing displacement, and a transportation system built on a legacy of racial bias and social injustice. SDOT is resolved to increase the quality of life through the implementation of strategic and effective asset management strategies that increase overall asset condition, manage our maintenance backlog, and ensure that the transportation system is vibrant, strong, and resilient for future generations of Seattleites.

SDOT ASSET & PERFORMANCE MANAGEMENT PROGRAM

Asset Management Framework & MAP-21

The Federal Highway Administration (FHWA) describes Asset Management (AM) as a business process and decision-making framework that covers an extended time horizon and draws from economics and engineering, while considering a broad range of assets. The AM approach incorporates an economic assessment of trade-offs among alternative investment options and uses this information to help make cost-effective investment decisions.

MISSION, VISION, CORE VALUES, & GOALS

SDOT Mission: *To deliver a transportation system that provides safe and affordable access to places and opportunities.*

SDOT Vision: *Seattle is a thriving, equitable community powered by dependable transportation.*

AM Mission: To inform transportation resource allocation decisions through expert credible and responsive asset management

- Achieve *Sustainability* over the lifecycle of the transportation infrastructure
- Practice *Accountability* to the citizens of the city of Seattle in its stewardship of the transportation infrastructure
- Resource allocations will reflect *Transparency* so that decisions are easily communicated and understandable

Transportation Asset Management (TAM) is a strategic approach to managing transportation infrastructure assets. It focuses on business processes for resource allocation and utilization with the objective of better decision-making based upon quality information about assets and well-defined objectives expressed as levels of service. This approach achieves the best performance results for the preservation, improvement, and operation of infrastructure assets given the resources available. The International Organization for Standardization (ISO)[3] outlines a standard for management of physical assets and features the key principles of asset management as a way of doing business. The internationally applied standard identifies common asset practices across broad organizations and cultures.

[3] Further information on the ISO 55000 standard is available at: iso.org/obp/ui/#iso:std:iso:55000:ed-1:v2:en

In 2012, Congress passed MAP-21 (Moving Ahead for Progress in the 21st Century) provisions which envisioned major surface transportation, safety, congestion, and freight improvements while providing long-term funding certainty for surface transportation. Then in 2015, Congress enacted the FAST Act (Fixing America's Surface Transportation Act) which continues the MAP-21 reforms. Building on the foundation of MAP-21, the FAST Act[4] is administered by the FHWA with the goals of improving mobility, creating jobs, supporting economic growth, accelerating project delivery, and promoting innovation. Transportation agencies that adopt asset management models for managing their assets, including data-supported asset management plans, will have more success in obtaining funding.

Initially, MAP-21 focused on pavement, bridge, and transit asset management plans. Once agencies reach maturity in reporting these assets, future federal legislation may require pavement markings, culverts, guardrail, signs, traffic signals, lighting, and intelligent transportation systems (ITS) infrastructure asset management plans. With assistance from King County Metro, we certified our first Transit Asset Management Plan (TAMP) in 2018, which covers a four-year horizon period (2019 to 2023.) Furthermore, we provided all required information to support the Washington State Department of Transportation's (WSDOT) bridge and pavement asset management plans and are in full compliance with MAP-21 requirements.

SDOT Asset Management Guiding Goals and Vision

At SDOT, we have adopted asset management to enable us to meet the challenges of preserving Seattle's transportation infrastructure and to aid in the implementation of the Department's mission and vision.

We have elected to implement the asset management business model through a multi-year program of continuous improvement in infrastructure policies and practices. More information about our asset management principles is available in Appendix A.

The AM program's approach is to develop basic building blocks, create collaborative "early wins" where possible in the organization, and lay the foundation for a sustainable program as outlined in Figure 2.1, below. We continue to compile asset inventory data (status and condition), develop level of service standards, implement a risk management approach, and manage asset-based performance measures. Development of standardized life cycle cost analysis, risk-based decision models, and development of a Transportation Asset Management Plan are underway. We are in the process of increasing the capability of our Infor enterprise data management system, both in terms of a "build-out" of the system's capabilities, and our ability to analyze available data.

[4] For more information on transportation Asset Management, the FAST Act, and MAP-21 see fhwa.dot.gov/map21/ and fhwa.dot.gov/fastact/summary.cfm .

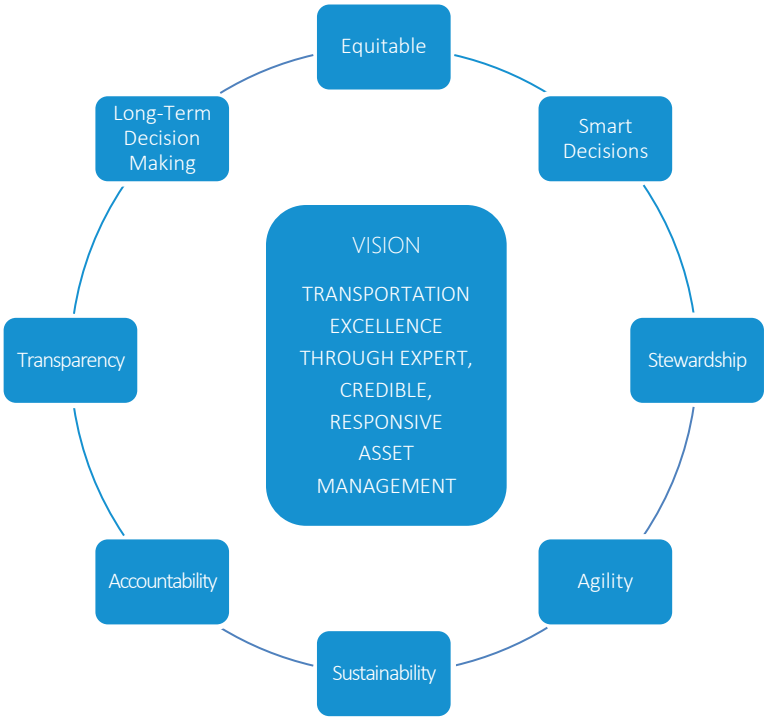


Figure 2.1: SDOT Asset Management Guiding Goals & Vision

Measuring Performance and Tracking Progress

The City established an externally facing performance measures website in 2015: https://performance.seattle.gov/. Performance measures track our progress toward both maintaining our success rates as well as improving our service delivery for the benefit of all Seattle residents. We have aligned business activities with our vision and core values to help us monitor and evaluate organizational performance against our strategic goals. This methodology combines work planning, performance metrics, and other indicators to create a comprehensive view of organizational performance and actionable insights. It enables us to communicate a unified story on our accomplishments and future improvement initiatives.

To better communicate how we are tracking our progress, measuring our success, and staying true to our mission, we developed and released our Moving the Needle Performance Report in late 2017. An improved, interactive update of the report is available at seattle.gov/transportation/movingtheneedle. It is a comprehensive detailing of many of our ongoing performance metrics and provides straightforward, easy to understand graphics that depict the City's progress and aspirations for the future. Figure 2.2 on the next page is a depiction of the report organization, which includes data stories providing deep dives into particularly rich areas of data-centric performance.

We actively collect data to support more than 50 performance measures throughout the organization. Many of these performance measures are shared with the public through interactive websites including the Move Seattle Levy and Capital Projects dashboards. We use this data to inform strategic decisions and maximize the potential of available resources to serve Seattle's residents. Our approach is holistic, with a long-term focus, and we are committed to being responsible stewards of public funds while meeting the City's transportation needs.

Our objectives are defined as measurable achievements which inform us as to whether we are meeting our higher-level goals. Performance metrics in turn are based on specific observable characteristics or changes that allow the organization to gauge our progress, course correct, and share our story.

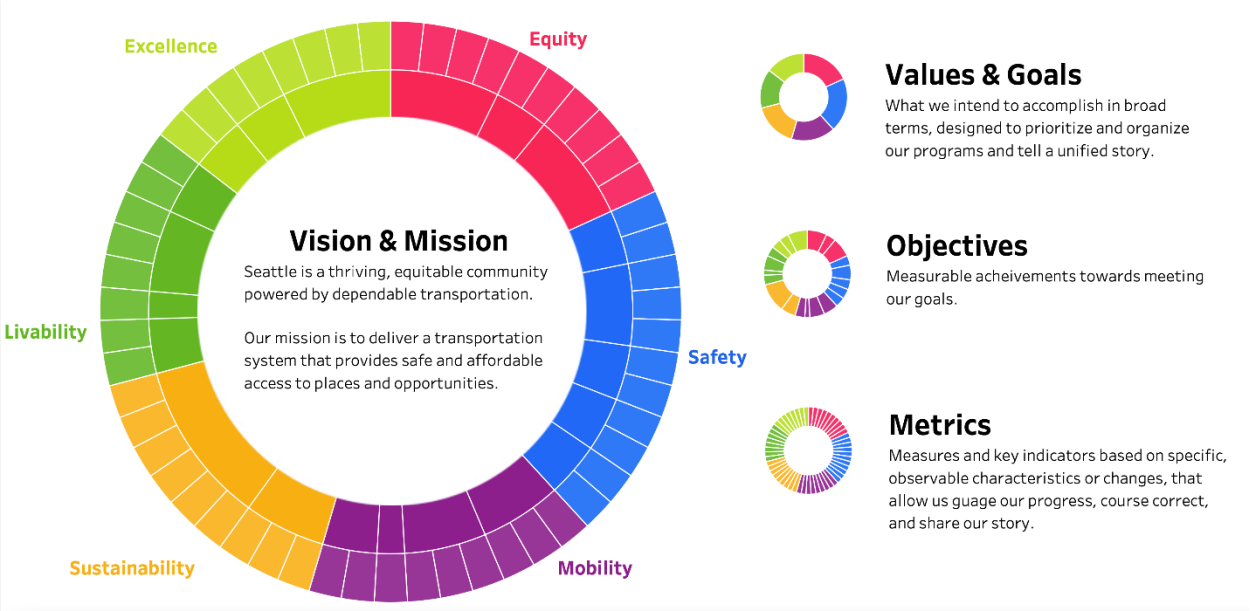


Figure 2.2: SDOT's Vision, Mission, Goals, Objectives, and Metrics

SDOT Core Values and Goals:

Equity - We believe transportation must meet the needs of communities of color and those of all incomes, abilities, and ages. Our goal is to partner with communities to build a racially equitable and socially just transportation system.

Safety - We believe everyone should be able to move safely throughout the City. Our goal is to create safe transportation environments and eliminate serious and fatal crashes in Seattle.

Mobility - We believe transportation choices are critical to accessing opportunities. Our goal is to build, operate, and maintain an accessible transportation system that reliably connects people, places, and goods.

Sustainability - We believe environmental health should be improved for future generations through sustainable transportation. Our goal is to address the climate crisis through a sustainable, resilient transportation system.

Livability - We believe transportation is essential to supporting daily life. Our goal is to manage our streets and sidewalks in a way that enriches public life and improves community health.

Asset Management Governance

To support the Asset & Performance Management program, we have established a governance and program management structure. The governing body is the Asset & Performance Management Steering Committee. The committee consists of A&PM program staff, Division Directors, and the Executive Sponsor. Program implementation is carried out through a joint effort among A&PM program staff, asset owners, data maintainers, and Seattle IT department representatives (when system improvements are involved). Figure 2.3 on the next page illustrates the data touchpoints of the different bodies and how the data flows through a data-centric continuous improvement cycle.

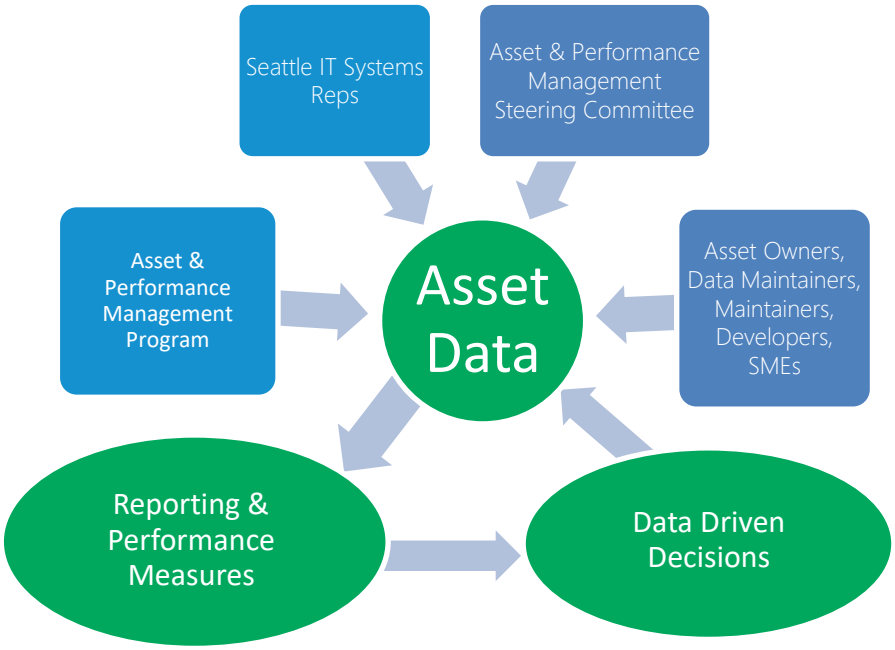


Figure 2.3: TAM Continuous Improvement & Governance

Asset Management Roles & Responsibilities

There are a variety of different roles that must be filled to ensure the proper governance of our assets. Many of the roles, such as asset owner/manager, asset data maintainer, asset maintainer, asset developer, and asset expert, are decentralized across the department. The implementation of asset management across the department is led by the Asset & Performance Management (A&PM) Program team.

Asset & Performance Management Team

The A&PM Program staff play an important role providing oversight and advisory responsibilities while leading initiatives to improve asset management outcomes, provide business process development, oversee asset management-related IT system improvement projects, facilitate issue resolution and culture change related to asset and performance management, and provide data visualization and reporting tools. The asset owner and developer may form ad hoc working teams from time to time to carry out projects, reports, and business improvements which supports implementing AM as a continuous business improvement strategy.

Assigned team members collaborate to resolve issues that arise to manage an asset through its life cycle – from planning, designing, and building, to operating, maintaining, and replacing. Team members often include technology subject matter experts and system developers from Seattle IT. The program's success depends greatly on the cooperation of the team assigned to the various roles below for each Level 1 asset. The roles below are defined in our asset hierarchy and/or project charters.

Asset Owner/Manager

Asset owners/managers are departmental subject matter experts from a variety of disciplines including engineering, planning, landscape architecture, maintenance, information technology, operations, and finance who prioritize and implement program initiatives. The owners/managers are the primary source of knowledge and information about the asset – its condition, performance, capabilities, capital investment needs (preservation, rehabilitation, and replacement), and the maintenance and operation strategies of the asset.

Asset owners/managers:

- Coordinate resource and asset management strategies
- Respond to questions about the asset and plan
- Resolve identified issues
- Inform maintenance strategies and activities
- Support annual monitoring of each asset's inventory, value, condition, and needs
- If possible, project the condition of the asset based on various funding scenarios

Asset Data Maintainer

Our data maintenance approach is decentralized and relies on various Asset Data Maintainers across the department to improve transportation asset onboarding and data maintenance practices to support up-to-date asset inventories. Asset Data Maintainers:

- Incorporate asset data from as-built plans and work orders (including backlogged as-built plans)
- Inventory reconciliation projects into Infor, GIS systems, BridgeWorks, and StreetSaver

Asset Maintainer

- Maintains and/or operates the assets using proactive and reactive strategies
- Collaborates with the asset owner and data maintainers on maintenance strategies, setting performance measures, and work order and accomplishment tracking

Asset Developer

- Collaborates with the asset owner and maintainers
- Identifies needs for new additions to the asset inventory or the non-asset solution
- Develops the capital project(s) for assets betterments
- Serves as permit coordinator and regulator for assets built by private developers or utilities that will become SDOT owned and/or managed assets

Asset Expert

Provides specific expertise, such as design knowledge, preliminary engineering, life cycle costing, or specialized knowledge to assist the asset management team.

Asset Data Structure

Asset Data Standards and Uses

Our Asset & Performance Management program has established standards for asset data to help ensure that information is consistent across all assets. Standard data includes asset status, condition information, ownership, maintenance responsibility, and location information. In addition to standard data, we maintain attribute information including material, color, size, category, and warranty information for some assets primarily in the Infor central repository.

We aggregate (category) and disaggregate (sub-element) asset data to support different needs inside and outside of our organization to measure condition, forecast reinvestment needs, support federal funding requests, and determine inspection and preventive maintenance schedules. The Transit Asset Management Pilot

Program Guidance document FTA-2011-004-TPM defines four functional perspectives from different types of requirements to employ asset inventory data:

- Accounting: Depreciable value and inventory of assets to comply with regulatory standards, such as GASB 34. This is typically too high-level to support asset management.
- Maintenance: Asset maintenance, installation, or removal records, which can vary based on maintenance needs and component granularity.
- Capital planning: Major multi-year capital budgets for programmatic asset renewal, replacement, and investment.
- Risk management: The asset inventory information helps identify potential risks to public safety and reliability.

Enterprise Data Management System and Systems Integration

We use Infor for managing asset and inspections data to retain most asset-related information in a central data repository. We also use it for work management to standardize recording and tracking of our crew work in addition to select planned work by private and capital projects. Work orders are recorded against either a specific asset, or a type of asset, paving the way for creating an accumulated lifecycle maintenance history of each asset which asset owners can use to create replacement programs or preventive maintenance programs. By combining historical work management data and long-term operational forecasting, our plan is to establish asset-based funding needs for these programs.

Infor software allows us to integrate data and information on assets, work orders (and asset costing), inspections, equipment, and collisions in a single data system. Users can view a block/segment or intersection along with the assets, inspections, open or recent work orders, and collision history along that block. Asset stewards can record observations in inspection tools about their assets and then update the condition rating based on these results. Tracking observed changes in condition over time provides additional inputs into data-driven asset decisions. The central data repository has enforced standardization in data management while improving the quality of transportation system service delivery. As we continue to mature, we will take steps to minimize the duplication of data entry and increase efficiency by continuing to advance our external system interfaces. One proposed improvement includes integrating Infor with the City of Seattle's financial and human resources databases to better track actual asset-based costing from our work orders system.

Apart from Infor, we maintain primary paving data in our StreetSaver Pavement Management System (which links to Infor) to meet the specific demands of pavement analysis. Likewise, we maintain bridge data in a bridge-specific database (BridgeWorks). Our partners in the Department of Finance & Administrative Services (FAS) maintain buildings and parcels in their Real Property Asset Management System (RPAMS).

As of August 2020, we maintain the following asset inventories in the Infor Asset Management database:

Air Raid Siren Tower	Irrigation Systems	Sign Assemblies
Areaways*	Kiosks	Speed Cushions
Beacons	Landscaped Complexes	Speed Dots
Bicycle Racks	Marked Crosswalks	Speed Humps
Bridges*	Median Islands	Stairways*
Bridge Hydrant Vaults	Network Hubs	Street Furnishings
Buildings*	Pavement*	Traffic Circles
Camera Assemblies	Pay Station Locations	Traffic Signal Assemblies
Chicane	Radar Speed Signs	Transit Island Platforms
Crash Cushions	Railroad Crossings	Trails
Counters	Retaining Walls*	Trees
Dynamic Message Signs	Shoreline Street Ends	Tunnel*
Guardrails	Sidewalks	

* These assets have additional data maintained in other data systems.

We utilize ESRI GIS systems to visually integrate and display information on different base maps, providing system users with a more complete picture of any location in the city. Our spatial information regarding the location of our assets in ESRI ArcGIS is available for viewing and analysis in Infor's MapDrawer viewer and ESRI products. Reports are available through our business interface reporting applications. The database platform is in Oracle 12c. In 2018, we added a GIS feature class of major and minor separated protected bicycle lanes, neighborhood greenways, sharrows, and trails to its external interactive asset maps. We are currently developing an asset inventory in Infor that connects to the asset feature class along segments, so that maintenance can be planned and tracked by section. A public web map of our assets is available from SDOT's Interactive Web Maps page at seattle.gov/transportation/permits-and-services/interactive-maps. For long-term planning purposes as well as operational planning, we perform analysis of GIS map asset representations and utilize both Tableau and ESRI dashboards to provide integrated, real-time reporting of asset locations, status, and condition.

Open Data Initiative

In 2016, the City established an open data initiative. The Open Data Program makes the data generated by the City of Seattle openly available to the public for the purpose of increasing the quality of life for our residents; increasing transparency, accountability, and comparability; promoting economic development and research; and improving internal performance management. Our transportation asset data is available on the GIS GeoData portal: data-seattlecitygis.opendata.arcgis.com/

Future Opportunities

We had planned to add a mobile component to our systems in 2017, allowing access to work orders, and asset inspection information by crews working remotely. Unfortunately, the module was not compatible with the configured system which required us to pivot and to utilize laptops in the field to access Infor. In the future, we will be evaluating customer request tracking, allowing customer interactions to be tracked from initiation through investigation, assessment of impact on infrastructure, work performed, and notification back to the customer. Currently, the City of Seattle uses mobile and web applications that do not communicate with Infor and requires a reliance on personnel resources to create work orders.

REVENUE, FINANCIALS, & LIFECYCLE PLANNING

SDOT Funding

SDOT's adopted budget for 2020 was $738.9 million[5], passed by the City Council in November 2019. Like all City departments, however, we had to make budget cuts in 2020 to adjust to the pandemic-induced drop in local and state revenues.

While our funding is complicated and consists of 62 funding sources, more than half of our reduced 2020 revenue was provided by the City's Transportation Fund ($411M). This fund is a compilation of multiple revenue sources including grants and partnerships, reimbursables, Street Use fees, commercial parking tax, and the state gas tax. The second largest funding source, the Move Seattle Levy, provided $133 million in funding. The third and fourth largest funding sources, respectively, are the Seattle Transportation Benefit District (STBD I) Fund ($77M) and the General Fund ($35M). Other notable sources of funding include the REET (Real Estate Excise Tax) II Capital Fund ($18M), Bonds ($15M), Waterfront Funds ($14M), Seattle Streetcar Operations ($14M), and the School Safety Traffic and Pedestrian Improvement Funds or SSTPI ($10M). Figure 2.4 below shows how the funding is broken out into these categories after the budget adjustments.

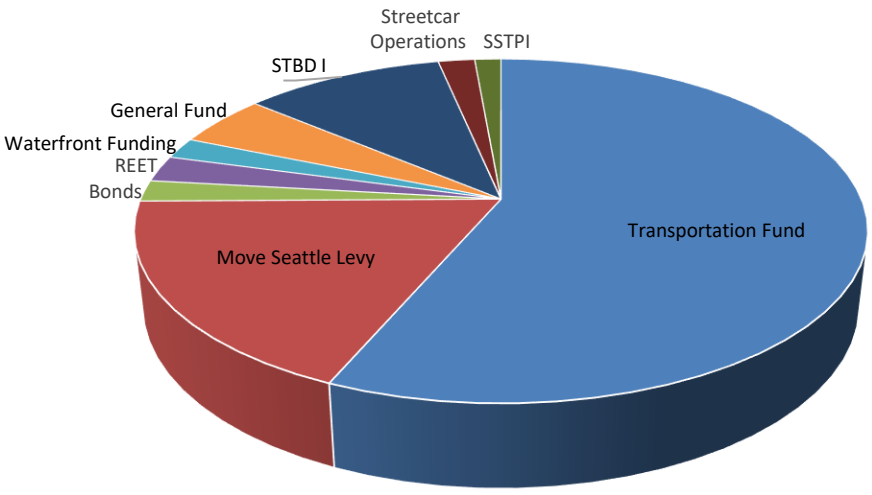


Figure 2.4: 2020 Adopted Budget with Adjustments

As with the sources of revenue the uses of our funding are also widely varied. The largest single expenditure category in 2020 is Mobility Capital ($198.2M), which covers transit improvements, corridor and intersection upgrades, sidewalk and pedestrian facility enhancements, and other mobility-related improvements. Mobility Operations, which ended up receiving $120.4 million, is responsible for funding transit operations, commuter mobility projects, parking and curb space improvements, and operation and maintenance of traffic signals, signs, and street markings. The third largest category of spending involves Major Maintenance/Replacement ($105.8M), which is largely responsible for maintaining the City's existing roads, bridges, sidewalks, and urban forest. Other large spending categories include the Central Waterfront ($139.6M), General Expense ($54.6M),

[5] http://openbudget.seattle.gov/#!/year/default

and Right-Of-Way Management ($39.2M). Our complex system of revenue sources and uses categories is illustrated in Figure 2.5 which is based on the 2020 Adopted Budget information.

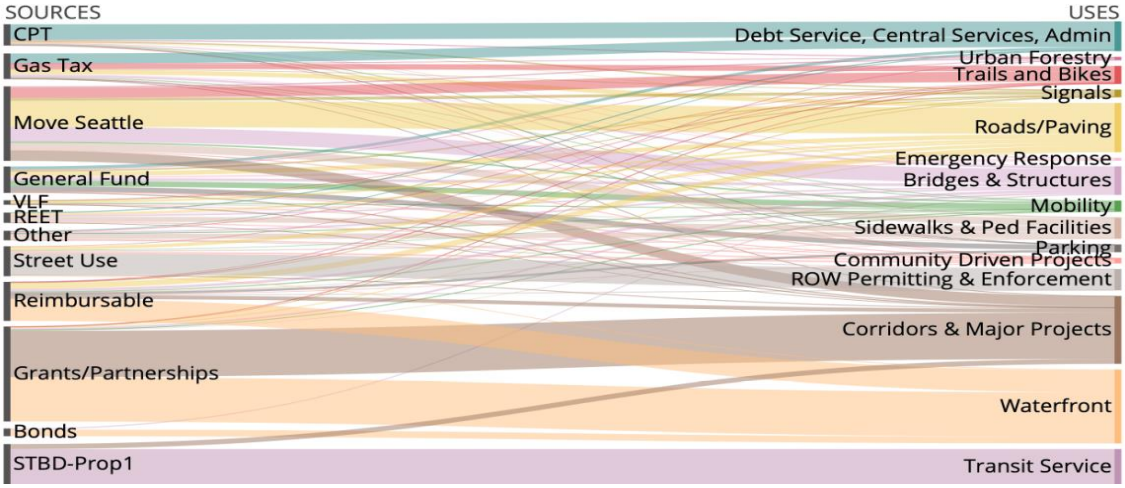


Figure 2.5: SDOT's Revenue Sources and Uses

We anticipate associated revenue impacts and budget reallocations due to COVID-19 and the West Seattle Bridge closure to present significant financial challenges for us for the foreseeable future. At the time of this writing, actual revenues for 2020 and estimated revenues for2021 and 2022 have been negatively impacted compared to pre-pandemic forecasts with a direct implication for asset maintenance and associated service delivery.

Capital & Maintenance Funding History

At SDOT, we strive to balance infrastructure expansion, preservation, and maintenance by aligning our maintenance practices and service delivery with our fiscal budget realities. To understand our recent capital and maintenance investments it is important to know our organizational history. The Seattle Transportation Department (previously SeaTran) was formed in November 1996 as part of the reorganization and eventual dissolution of the Seattle Engineering Department (SED). The organization was renamed the Seattle Department of Transportation (SDOT) in 2004. From its inception in 1996 until 2006, SDOT experienced a 66% loss in dedicated transportation funding. This decrease in funding was attributed to multiple statewide tax-revenue-limiting initiatives, the aforementioned reorganization of the City departments, and a mild recession that occurred in the early 2000s.

From 1996 until 2006, the Mayor and City Council supplemented SDOT's transportation budget using other funding sources, including the General Fund. However, because of competing Citywide priorities this level of funding was not sufficient to meet many basic maintenance and operational needs.

In 2006, the nine-year BTG Levy was conceived as a response to 35 years of deferred maintenance aggravated by years of shrinking dedicated transportation revenues. The BTG Levy specifically stipulated that no less than 67% of levy revenues be spent on maintenance programs. The voting public approved the Levy, and 2007 marked the first year of the $365M funding package, a combination of a voter–approved transportation levy and a Mayor/Council-approved parking tax and employee hour tax. Later, the City abandoned an employee hour tax as part of the BTG Levy.

From 2007 thru 2015, SDOT programmed more than $40 million annually from BTG revenue sources and achieved its annual goals for maintenance or new construction in a variety of asset categories. Specifically for

maintenance, cumulative spending over the nine years reached 73% of total levy by the end of 2015. Through the BTG, SDOT was also able to further leverage grant funding for infrastructure replacement. BTG provided dedicated transportation revenues to the Department. This funding enabled SDOT to establish better asset maintenance, replacement, and preservation programs.

In 2015, as the BTG Levy was nearing its end, Seattle voters passed the 9-year $930 million Levy to Move Seattle (also known as the Move Seattle Levy or MSL). This Levy provides dedicated transportation funding from 2016 to 2024 for maintenance and repair; safety; and congestion relief. Funded by property taxes, the MSL proceeds also leverage additional local, state, federal, and other agency investments as part of the overall MSL program. Compared to BTG, only 45% of the Move Seattle Levy is intended for maintenance of existing assets. A third of the levy was conceived to provide congestion relief through new capital projects and 22% is intended for safe routes. Both latter categories included new asset types and additional assets that require increased or different maintenance needs. However, due to the increase in construction costs, inflation, and unfunded mandates the allocation for maintenance does not provide SDOT with sufficient funding to sustain the prior progress from BTG in reducing the maintenance backlog.

Around the same time that the MSL was being proposed to replace the expiring BTG levy, the Seattle voters also approved Proposition 1, the Seattle Transportation Benefit District (STBD), in 2014 to fund the purchase of increased Metro service and additional transit programs for Seattle residents. This voter-approved funding measure includes a $60 vehicle license fee and 0.1% sales tax increase to generate about $50 million annually to improve transit availability and access for 6 years (2014-2020). In July 2020, Council Bill 119833 endorsed a Seattle Transportation Benefit District (STBD) proposal to replace the expiring 2014 measure. The new proposal included a 0.15% sales tax (i.e., the equivalent of 15 cents on a $100 purchase) anticipated to generate roughly $39 million annually over six years to fund transit service, capital projects, and transit access programs like ORCA Opportunity. Collection of the new sales tax started in April 2021.

Figure 2.6 below shows SDOT's overall expenditures for 2000-2019 and the shift in asset allocation following the BTG Levy, STBD I, and Move Seattle Levy funding packages. Refer to the 2007 Status and Condition Report for dedicated transportation revenue allocations for years 1995 through 1999.

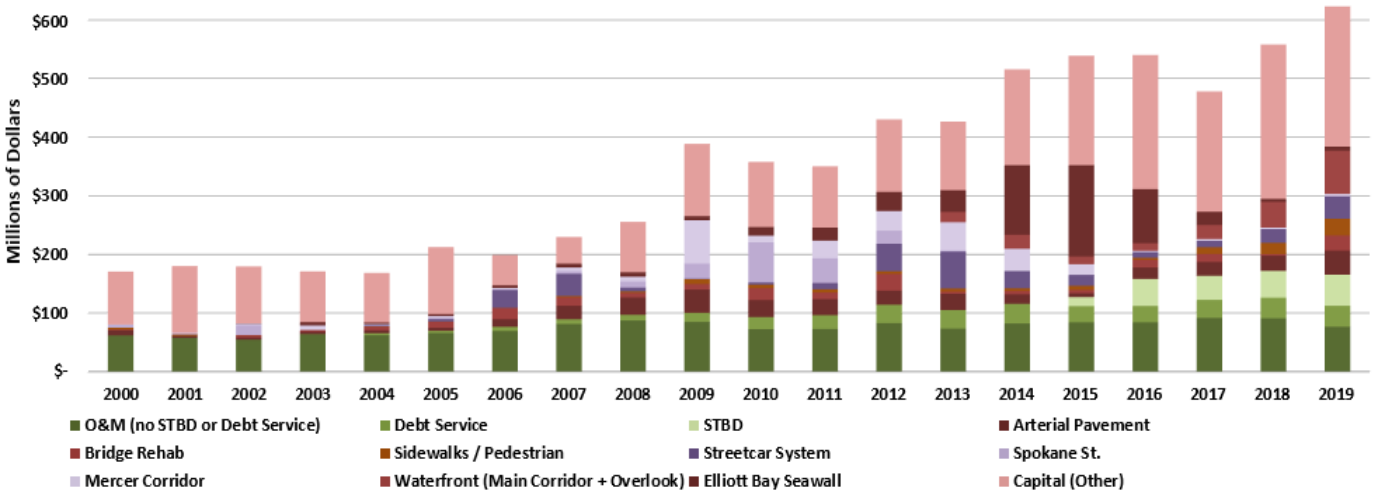


Figure 2.6: 2000-2019 SDOT Overall Expenditures (infl. adj. to 2020 Dollars)

The key takeaway from Figure 2.6 is how our maintenance budget has remained relatively stable throughout the years while our capital spending has increased significantly. In recent years, our capital spend plans have

included asset types like landscaping, pavement markings, and intelligent transportation systems requiring significant, and previously unfunded, investment in maintenance and operations support. Further compounding the maintenance needs are the public and private ROW capital investments that significantly increase our asset inventory and new types of SDOT assets, which are often designed without fully realizing the long-term impacts on operations and maintenance (O&M).

Keeping up with the sheer number of assets from public and private capital projects continues to impact our ability to properly onboard these assets in our asset management database. Our asset data maintenance teams are decentralized and staff turnover, along with insufficient staffing to perform the work, results in inconsistent processes across the department for onboarding and updating or retiring assets. As a result, assets are "discovered" when service requests are received. These new asset types compete with existing assets for maintenance and operational resources, making them both vulnerable to deteriorating before the end of their useful lives. One way to remedy this challenge is by including maintenance planning when scoping a project; that way we can more easily identify the impacts to our annual operations and maintenance budgets to care for these new types of assets. Furthermore, we anticipate a centralized asset onboarding group, along with technological improvements for managing large quantities of assets from plan sets, would improve our ability to efficiently maintain our asset data.

This report provides an estimated long-term operational cost forecast for each asset class, and where feasible, major Level 1 assets. Forecasting provided in this report employs a 20-year (2020-2039) financially unconstrained approach (asset-based need rather than available funding) to identify future projected peaks and valleys of infrastructure funding needed for maintenance and renewal as well as new capacity.

STATUS & CONDITION OF SDOT INFRASTRUCTURE ASSETS

Asset Hierarchy & Condition

The transportation infrastructure we own includes hundreds of distinct physical component types. Our asset inventory (refer to Table 1.1 and Table 1.2 found at the end of Section 1) identifies 48 different "level 1" assets. A level 1 asset represents the level to which we manage an asset. We assign asset ownership for each level 1 asset by category. As previously discussed, SDOT staff members who serve as asset owners are the primary sources of information and knowledge about capital investment needs, preservation, maintenance, and operation of the asset. However, we recognize that asset-based decision-making requires a team of engineers, financial advisors, operations staff, data maintainers, and executives.

Level 1 assets that share a common purpose or function are grouped into asset classes. The status and condition of the level 1 assets are presented in the hierarchy in alphabetical order by asset class. A condition rating has been specified for each of the level 1 assets where known. This condition rating is a consistent measure used for all of our assets. An "Unknown" (UNK) asset condition rating means the condition of the asset is not available. We generally rate assets as UNK if the time between periodic inspections is long, or the asset is managed on a customer-request basis and no requests have been received for the asset that necessitated an on-site inspection. Assets such as crosswalk markings and pavement markings, are not typically assessed for condition but are on a continuous refurbishment/replacement cycle rather than run to failure. See Appendix C for a listing of assessment cycles and maintenance approach by asset type.

While we use a consistent condition rating for our assets, the evaluation criteria against which our assets are rated are different for each asset. Some assets, like pavement, traffic signals, sidewalks, and bridges, require a

more robust range of condition assessment ratings that generally range from 0 to 100. Most assets are rated on a three-point scale of good, fair, and poor. The Asset Condition Ratings table in Figure 2.7 shows the five-point scale generally used to allocate condition ratings across different asset types for federal agency reporting for MAP-21 required asset management plans.

Condition	Rating	Description
5	Excellent	No visible defects, near new condition.
4	Good	Some slightly defective or deteriorated components
3	Fair	Moderately defective or deteriorated components
2	Poor	Defective or deteriorated components in need of replacement.
1	Very Poor	Seriously damaged components in need of immediate repair
	Unknown	Asset condition is unknown and may pose a significant risk

Figure 2.7 Asset Condition Ratings

We, like other urban transportation agencies, face the challenge of an increasing volume of asset deterioration. Historic lack of funding to sustain our assets in good condition is a primary driver of asset aging and deterioration, as is increasing population density, climate change, and Seattle's complex topography. For some assets, deferred maintenance creates a danger of rapidly accelerating replacement costs once the asset deterioration reaches a certain "tipping point."

Figure 2.8 below shows the conceptual rate of deterioration of different asset types. Pavement and bridges would likely have a deterioration pattern resembling Asset IV and Asset V, respectively. Intervention point 2, in which assets are replaced or renewed when they fall into poor condition, is currently the default condition for many of our assets. However, critical assets should be kept in a fair or good condition for as long as practicably possible, thus it is more desirable to improve their condition level at intervention point 1 before they fall into fair condition.

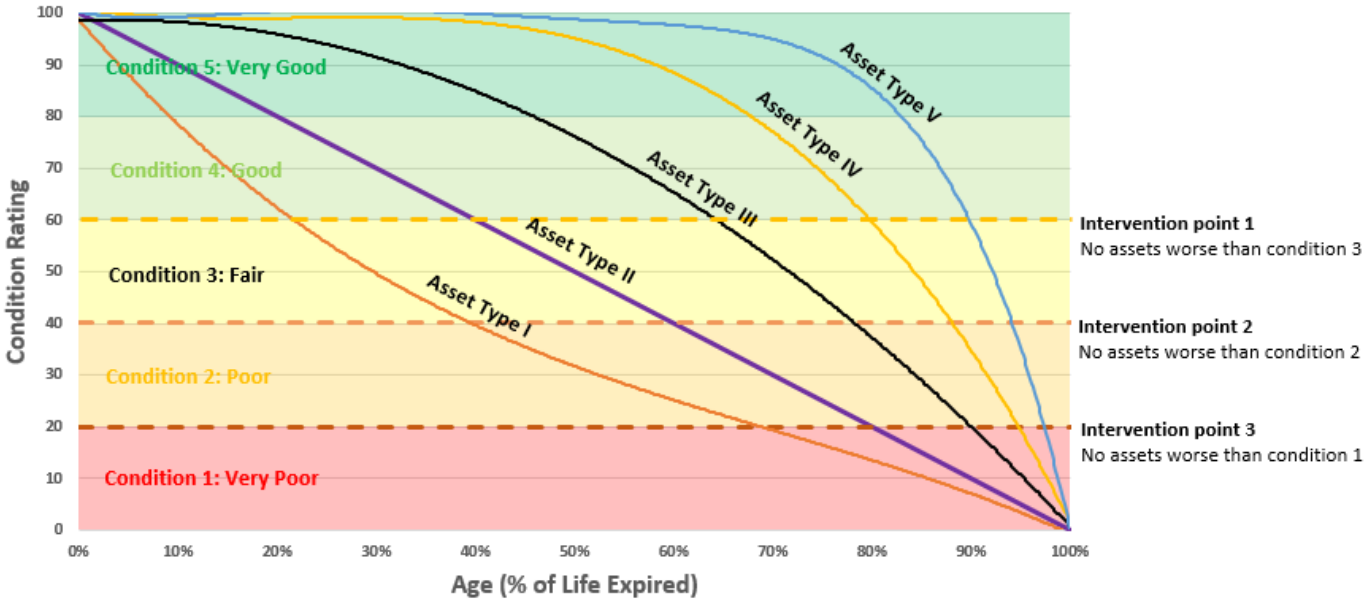


Figure 2.8: Nominal Deterioration Curves – Condition vs. Age

Replacement Value, Current Value, & Data Confidence

"Replacement value" quantifies the total value of Seattle's transportation infrastructure. It represents the cost in 2019-2020 dollars to replace all SDOT assets and does not imply that the entire infrastructure requires replacement. Knowing an asset's replacement value helps direct decision-making about investment strategies for repair or replacement. Postponing asset maintenance could result in earlier replacement rather than reaching or even extending an asset's useful life if we perform preventive maintenance. Replacement value typically includes soft costs, such as those encountered during the planning, design, and bidding phases, along with hard construction cost items (labor, materials, and equipment). Raw land purchases and easements are not included in these estimates. The estimated replacement value of our infrastructure assets is currently approximately $28.58 billion. It is important to note that the value of the ROW is not included in this total.

A new measure introduced in this report edition is the "current value." This measurement takes into consideration the present state of our infrastructure when estimating its worth. Using the condition distribution of each asset type and an assumed equivalence of how much remaining life they still hold at each condition (i.e., assets in good, fair, and poor condition were assumed to retain 80, 50, and 20 percent of their useful lives, respectively) the replacement value is adjusted to reflect the status of the assets. Appendix B contains the details for assessing current values by condition. Figure 2.9 below shows the estimated current value to the replacement value ratio of our five highest value asset types, which together comprise approximately 95% of our organization's overall portfolio value.

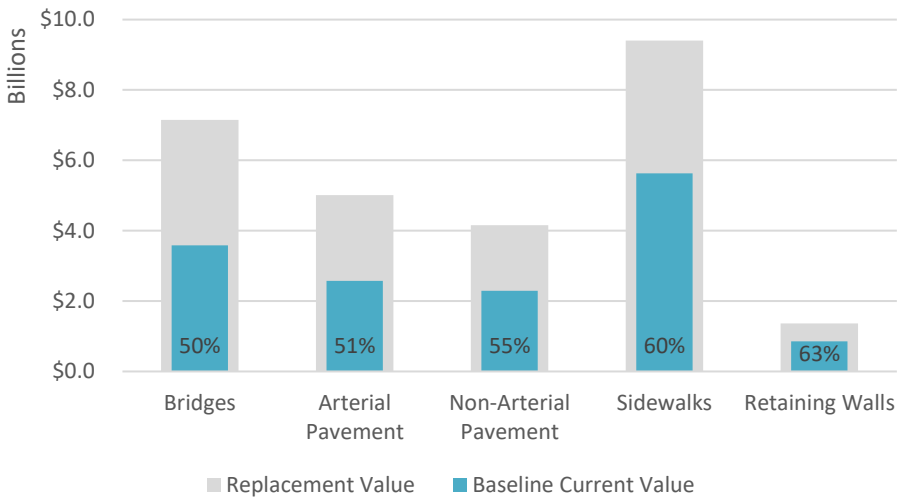


Figure 2.9: Current Value as a Percentage of Replacement Value

As the figure shows, we estimate that bridges and arterial pavement have the lowest current to replacement value ratio at 50 and 51 percent, respectively. In other words, current condition information suggests that these assets would benefit the most from identifying strategic investment priorities, similar to the Business Practice Upgrades (BPU) effort underway focused on bridges. Asset types with a lower current value to replacement value ratio tend to be older, however, the length of the original expected useful life used in the calculation can be a significant factor. Less valuable asset types have not been included in this current value analysis.

We evaluate data quality to assist the Department in determining unknown risks based on asset value and other factors. Overall, we have verifiable asset condition ratings for over 95% of our current infrastructure replacement value. Since 2015, SDOT has increased the amount of assets with a "high data confidence" from 45 to 93% of the total asset replacement value. Collecting condition data can be expensive and we must determine where to best expend limited resources. We may decide not to collect condition ratings on some assets because they are short-lived, relatively inexpensive to replace, or pose limited risk.

Funding of modernization and expansion projects and activities increases our asset inventory while adding to the cost of future maintenance. Without corresponding increases in maintenance funding, this means less money is available to maintain existing assets resulting in a decline in asset condition, ultimately negatively impacting customer satisfaction levels and increasing liability.

Figure 2.10 below summarizes the condition profiles of SDOT's asset classes with replacement values of $10 million or more. As can be seen from the figure most assets are in "fair" or better condition however a significant percentage of some key assets are currently in "poor" or "very poor" condition.

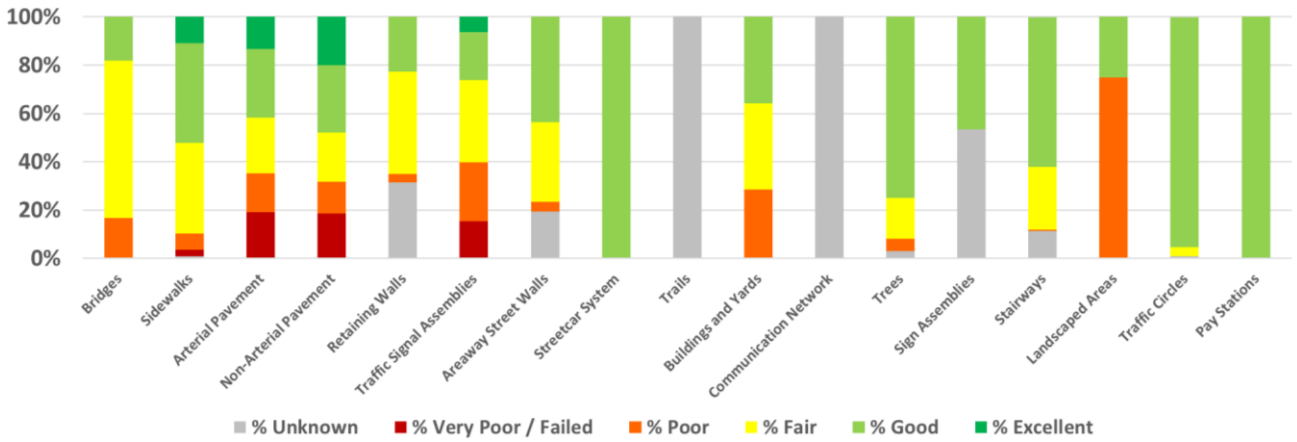


Figure 2.10 – Summary Condition Profile of Asset Classes (> $10M in Value)

Sections 3 to 13 cover inventory, condition, and maintenance approaches for SDOT's 11 asset classes in detail. In these sections, data confidence levels consider availability of asset condition data, accuracy of inventory counts, and presence of critical attribute data. In the discussion of asset useful life, statements about cost of routine maintenance over the life of the asset represent maintaining the asset through an optimized investment strategy that factors in risk, condition, and available funding. The discussion of maintenance approaches includes references to repair activity or work performed to address maintenance concerns. Financial figures used in this document are in 2020 dollars unless otherwise noted. Financial and budget data was obtained from the City's Financial Management System (PeopleSoft 9.2) and Infor databases. Asset data was pulled from Infor, BridgeWorks, and StreetSaver as of August 2020.

Sidewalk System

The estimated funding requirements are based on available financial information about each asset. This report does not cover a rigorous reconciliation to budget and financial information primarily because current financial systems, with few exceptions, do not track budgets or costs by asset. Actual asset maintenance and replacement needs may differ from the current projections and are less certain in the out years of the analysis. Thus, the long-term forecasting charts in Sections 3 through 13, that present unmet funding needs, are for informational purposes only.

Relationship to Other Planning Documents

This Asset Status & Condition Report is a snapshot of the state of our transportation infrastructure. Over time, we will refresh and refine this report to depict historical trends in the expected life, value, and condition of our assets. This companion document helps in strategic decision making by utilizing asset data from our enterprise systems and asset knowledge to inform asset needs as we implement the Department's multi-modal plans. In addition, the various guiding, planning, and reporting documents listed below influence our asset management practices:

- ✓ VISION 2050 - Puget Sound Regional Council's regional plan to guide growth through 2050. For more information about the plan: psrc.org/transportation/vision/
- ✓ Regional Transportation Plan – Puget Sound Regional Council's action plan to meet transportation needs of the central Puget Sound area into the future. For more information about the plan: psrc.org/our-work/rtp

- ✓ Transportation Capital Improvement Program (TCIP) – Updated annually, the TCIP is a six-year plan for improvement and asset preservation projects: seattle.gov/city-budget-office

- ✓ SDOT Biennial Budget – A two-year projection of the revenues and resources required to support our annual operations and maintenance activities, including the planning and administration of the organization: seattle.gov/city-budget-office

- ✓ City of Seattle Comprehensive Plan – A 20-year plan (Amendments released in May 2020) that outlines a vision and roadmap for Seattle's future. For more information on the transportation chapter in the plan: seattle.gov/opcd/ongoing-initiatives/comprehensive-plan

- ✓ Move Seattle – A 10-year (2015-2024) strategic vision for SDOT. This document identifies how we will integrate, prioritize, and implement the visions established in the Bicycle, Pedestrian, Freight, Intelligent Transportation System (ITS) and Transit Master Plans as well as the City of Seattle's 2035 Comprehensive Plan. Furthermore, it lays out performance measures to ensure that SDOT remains accountable to those plans and the public. For more information about the plan: seattle.gov/transportation/moveSeattle.htm

- ✓ Streets Illustrated – Streets Illustrated is Seattle's Right-of-Way Improvements Manual which functions as a roadmap for how we administer the Complete Streets Ordinance. It is an online non-mandatory resource that provides design guidance and standards, and processes on how to design, build, and manage within the right-of-way. Seattle's Complete Streets policy is about creating and maintaining safe streets for everyone. In 2007, the Seattle City Council passed the Complete Streets Ordinance 122386, which directs us to design streets for pedestrians, bicyclists, transit riders, and persons of all abilities, while promoting safe operation for all users, including freight. This is the lens through which we view all our major projects. Streets Illustrated considers and attempts to balance the access and mobility needs of everyone who uses and travels in the ROW. Procedures and design standards were developed keeping in mind the critical balance among the following: safety, the preservation and maintenance of roadway infrastructure and utility services, context sensitive design, and preserving our environment: streetsillustrated.seattle.gov/

- ✓ Bicycle Master Plan (BMP) – A 20-year plan that identifies projects and programs to meet the vision of making riding a bike a comfortable and integral part of daily life in Seattle for people of all ages and abilities. For more information about the plan: www.seattle.gov/transportation/bikemaster.htm

- ✓ Freight Master Plan (FMP) – The 20-year FMP addresses the unique characteristics, needs, and impacts of freight mobility by focusing primarily on urban truck freight movement to support Seattle's increasing demand for goods and services in a safe and reliable manner. For more information about the plan: seattle.gov/transportation/freight_fmp.htm

- ✓ Intelligent Transportation Systems (ITS) Strategic Plan – A 10-year approach for implementing ITS in Seattle. ITS employs electronics and communications technologies and automated traffic systems to enhance mobility for all modes of transportation by increasing the efficiency and safety of the transportation infrastructure. For more information about the plan: seattle.gov/Documents/Departments/SDOT/TechnologyProgram/ITSStrategicPlan20102020.pdf

- ✓ Pedestrian Master Plan (PMP) – Both a near-term and a long-term plan, the PMP takes an extended view of the actions that must happen to sustain Seattle as a walkable city. For more information about the plan: seattle.gov/transportation/pedestrian_masterplan/default.htm

- ✓ Transit Master Plan (TMP) – The TMP is a comprehensive 20-year look ahead toward the type of transit system that will be required to meet Seattle's transit needs through 2030. For more information about the plan: seattle.gov/transportation/transitmasterplan.htm

- ✓ Vision Zero – A plan to end traffic fatalities and serious injuries in Seattle by 2030. Vision Zero provides an opportunity to integrate our safety efforts by combining the street design recommendations of our Pedestrian, Bicycle, Transit, and Freight Master Plans with targeted enforcement patrols and educational outreach to address behavioral issues. For more information about the plan: seattle.gov/visionzero

Future Opportunities for this Report

This Transportation Status and Condition report, in combination with the previously mentioned FTA required transit Asset Management Plan (AMP) and the FHWA required WSDOT bridge and roadway statewide AMPs, will provide the foundation for building out future reports and AMPs. These AMPs contain detailed asset management strategies that will be the source of information used in subsequent systemwide Transportation Asset Management Plan reports. Further recommendations are covered in Section 14, which provides a concluding report summary along with improvement strategies to advance strategic departmental goals and objectives.

SDOT also plans to start a citywide long-range planning effort in 2022 that builds from many of the planning documents mentioned above. The Seattle Transportation Plan will guide future investments in equity, sustainability, stewardship, and safety.

Fremont Bridge

3 - BICYCLE AND PEDESTRIAN SYSTEM ASSET CLASS

The Bicycle and Pedestrian System asset class serves pedestrians and bicyclists and encourages walking and bicycling for transportation and recreation. It includes the following assets:

Asset	Replacement Value	Condition						Data Confidence
		Excellent	Good	Fair	Poor	Very Poor	Unk	
Bicycle Facilities	$71,815,000	-	-	-	-	-	-	Medium
Bicycle Racks	$2,372,000	-	86.2%	1.0%	0.4%	-	12.3%	Med-High
Kiosks	$1,313,000	-	-	-	-	-	100%	Low
Marked Crosswalks	$3,713,000	-	72.4%	11.7%	13.8%	0.0%	2.1%	High
Sidewalks	$9,404,448,000	11.0%	41.1%	37.7%	6.6%	2.8%	0.8%	High
Stairways	$73,229,000	-	70.1%	28.6%	1.3%	-	-	High
Street Furnishings	$3,050,000	-	-	-	-	-	100%	Medium
Trails	$124,080,000	-	-	-	-	-	100%	Medium

Total: $9,684,020,000

Assets in the Bicycle & Pedestrian System have ownership responsibilities distributed across multiple divisions. For some of these assets, the general maintenance budget may include assets from other classes. Figure 3.1 below provides an estimated long-term forecast of financial needs.

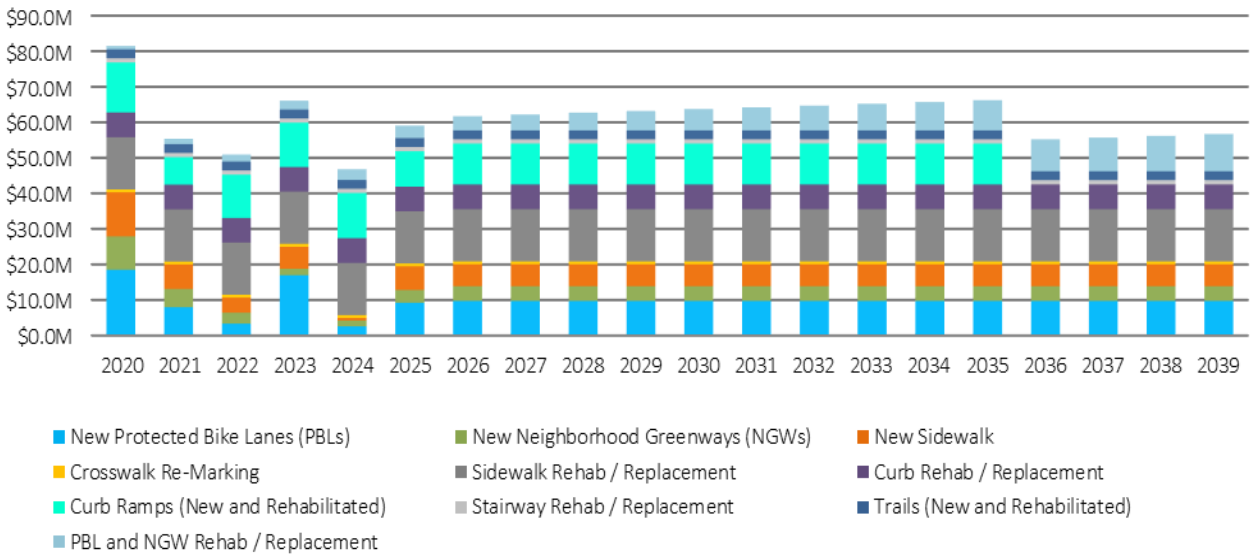


Figure 3.1: Bicycle & Pedestrian Long-Term Cost / Needs Forecast (2020 dollars) [6]

[6] Curb ramps forecasting assumes future replacement will no longer be a separate line item following the end of the Consent Decree in 2035.

3.1 BICYCLE FACILITY OVERVIEW

SDOT's bicycle infrastructure includes a range of different bicycle facilities including protected bicycle lanes (PBLs), buffered bike lanes (BBL), sharrows / painted bike lanes (BL), and neighborhood greenways (NGW). SDOT installs bicycle lanes to provide a connected bicycle infrastructure network. The Bicycle Facility asset is a new addition to the 2020 version of this report. Multi-use trails, which are identified as their own asset in the asset hierarchy, provide both bicycle and pedestrian throughways. Figure 3.2 on the next page provides a citywide map of bicycle facilities by type.

Protected Bicycle Lane

PBLs are an especially important facility type as they have been shown to increase cycling for people of all ages and abilities. These lanes physically separate cyclists from motor vehicle traffic and are distinct from the sidewalk; they may be one-way or two-way and may be at street level or raised several inches. PBLs categorized as major separated are physically separated from vehicle lanes by planters, curb, curb stops, landscaping, raised median, delineator posts, and concrete barriers.

Bicycle lane with delineator posts

BLs have no physical separation. They alert vehicle and bicycle users to more informal bike facilities using minor separation elements such as paint. BBLs are enhanced by a 2 1/2 -foot striped "shy zone" between the bike lane and the moving vehicle lane. With the shy zone, the BBL offers a more comfortable riding environment for bicycle riders who prefer not to ride adjacent to traffic. BLs are included on neighborhood greenways as well as arterials. Paint and sharrows are also represented in the channelization class section of this report.

NGWs are installed along residential streets with low motorized traffic volumes and speeds that are designated and designed to give bicycle and pedestrian safe and pleasant travel priority. Key features of neighborhood greenways are sharrows, signs, and speed humps/cushions along the neighborhood streets. Where neighborhood greenways cross arterial streets through congested areas short sections of PBL/BL may be used to provide safety and priority for people biking. These sections, a half-block or less long, of PBL/BL are part of the NGW asset, not the PBL/BL.

3.1.1 Bicycle Facility Inventory Status and Anticipated Annual Growth

Bicycle facilities are new to SDOT's asset inventory. Neighborhood Greenways were first installed in 2012, and the Department began installing PBLs in 2016 following the 2013 publishing of the Bicycle Master Plan (BMP). The BMP Implementation Plan (2019 to 2024) was adopted by City Council in June 2019. It identifies projects and programs which, combined with existing facilities, will deliver a robust connected citywide bike network.

Asset	Inventory Count	Data Confidence	Replacement Value/mile	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
PBL	22.5 miles	Medium	$2.0M/mile	20	$45,000,000	5-8 miles/yr. through 2024
BBL	40.2 miles	Medium	$275k/mile	20	$11,055,000	1-5 miles/yr. through 2024
BL (Standard)	40.2 miles	Medium	$200k/mile	20	$8,040,000	
NGW	38.6 miles	Medium	$200k/mile	20	$7,720,000	8-10 miles/yr. through 2024
Total	**141.5 miles**	**Medium**			**$71,815,000**	

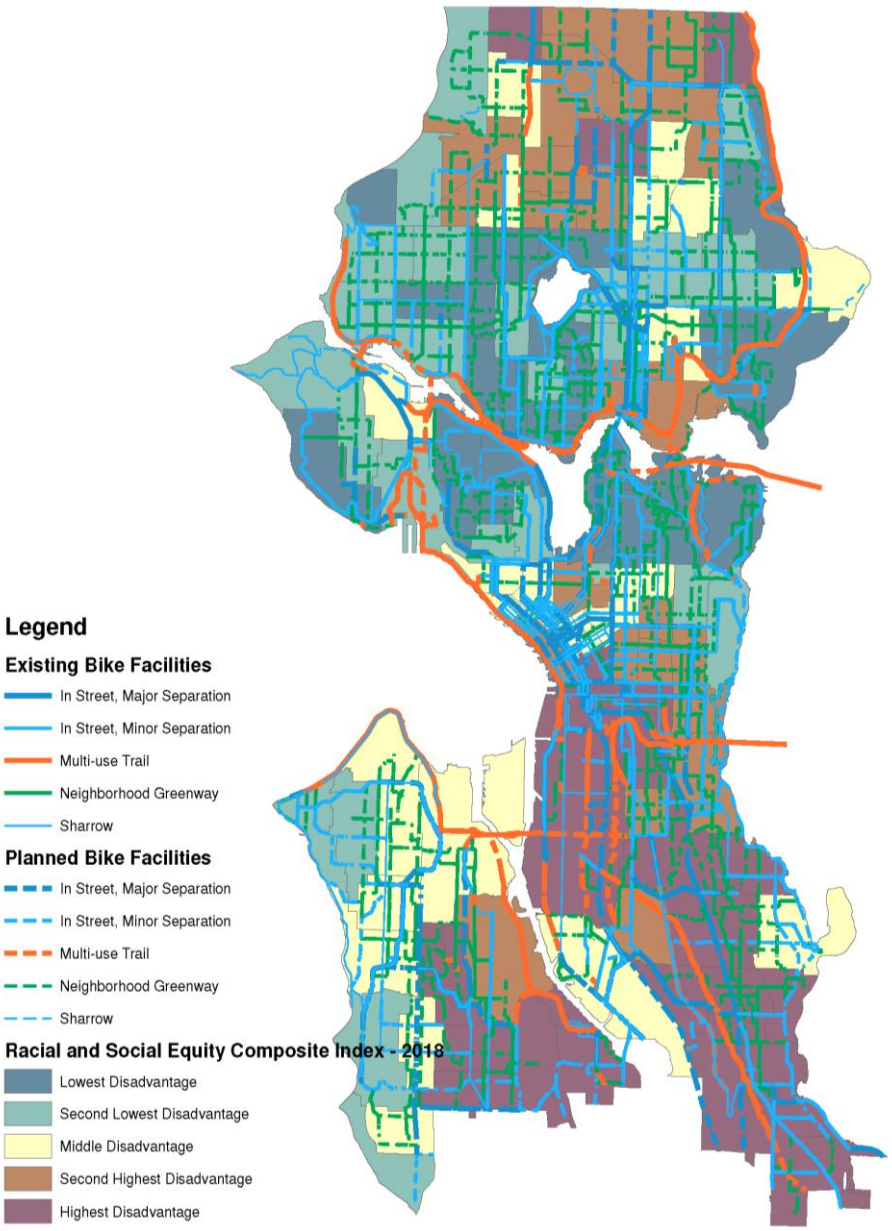


Figure 3.2: 2019 Citywide Planned and Existing Bicycle Facilities

3.1.2 Bicycle Facility Life Cycle Costs, Maintenance Approach, and Funding

Given the recent addition of this asset type, SDOT does not have a formal maintenance plan. However, there are four typical ways maintenance is completed on a bike facility: the maintenance overlaps with a routine maintenance practice for a component of the facility (e.g., landscape planter clean-out, sweeping, and delineator post replacement); the maintenance crew discovers an issue; a public complaint or claim is reported; or a portion of the maintenance is controlled and completed under an interdepartmental or interagency agreement.

Routine maintenance of a PBL varies based on associated assets and width. PBLs less than nine feet wide, including obstructions like poles, require smaller sweepers or hand cleaning. In higher traffic areas, PBL components like delineator posts, planters, and rails are more susceptible to damage and collisions. The Department continues to evaluate full life cycle and programmed maintenance needs, especially for new PBL components. Crews generally perform maintenance in response to customer requests, accident reports, or in conjunction with regular roadway maintenance. The Maintenance Operations branch performs sweeping, replaces posts and paint, maintains landscape planters, and performs other maintenance activities on PBLs. SDOT has not tracked maintenance costs independently for PBL assets by type and has not historically included additional budget beyond the general maintenance budgets for this work type; hence, life cycle costs are not available.

Maintenance Operations crews perform regular sweeping along downtown corridors. SDOT uses two sizes of sweepers depending on the bike lane width and access points. Recently SDOT purchased one dedicated PBL sweeper and leases a second sweeper for bike lanes where the regular street sweeper cannot fit. Previously, three people were required to properly clean the bike lanes – two people using blowers and the crew staff running the street sweeper. Utilizing this newer technology for smaller bike lanes brings down customer complaints due to noise, improves cleanliness, reduces damage to the assets, saves money, and helps keep our crew staff safe. The Department is in the process of analyzing routinized PBL street sweeping needs, which were not available prior to publishing this report.

3.2 BICYCLE RACKS

Bicycle parking supports the bicycle network by establishing an end-of-trip facility. Providing an adequate supply of convenient bicycle parking is an important amenity to increase cycling. Traffic Signs and Markings Crews install and maintain bicycle racks. Building developers also install bike racks in the public right of way as part of their projects. Developers and property managers may transfer these racks to SDOT's inventory if they meet usability standards.

Bicycle Rack Corral for Bike Share at Alki Beach

Seattle launched its pilot free-floating bike share program in 2017. Two years after, in 2019, SDOT installed 1,078 more bike parking spaces and launched a public education program to address the problem of improperly parked bikes which are left blocking sidewalks and curb ramps, creating barriers for people with mobility disabilities.

3.2.1 Bicycle Rack Inventory Status and Anticipated Annual Growth

In 2009, the Traffic Operations group conducted a comprehensive field inventory of bicycle racks. The survey focused on known locations of racks, as well as urban villages throughout the city. The Department obtained its baseline inventory and condition for 2,500 racks and uploaded the information into the asset data repository. Staff in the Bicycle Program has maintained the inventory ever since. The latest counts are presented in the table below.

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
Bike Racks	3,953 racks / 10,802 spaces[7]	Medium-High	$600 per rack	20	$2,372,000	50 spaces / yr. through 2024

The table below shows the number of bike parking spaces that were added since 2014:

	2014	2015	2016	2017	2018	2019[8]
Bike Parking Spaces Added	515	566	622	466	306	1,078

3.2.2 Bicycle Racks Life Cycle Costs, Maintenance Approach, and Funding

Routine maintenance of a bicycle rack requires one bolt-reset over the 20-year life of the asset, which costs approximately $330. In higher traffic areas, racks are more susceptible to damage and collisions. The Bicycle Program continues to evaluate full life cycle and programmed maintenance needs. Lifecycles for on-street bike corrals are shorter due to the likelihood of car impacts and require more regular repair or replacement.

We generally perform bicycle rack maintenance in response to customer requests or accident reports. We have not tracked maintenance costs independently for this asset and have been included in a general maintenance budget; hence, life cycle costs are not available.

Wayfinding Area Kiosk

3.3 KIOSKS

Kiosks are small, non-dynamic physical structures in the right-of-way that provide information and pedestrian wayfinding. In 2020, SDOT began replacing and adding new kiosks and signage for a pilot approach to improve pedestrian wayfinding. The new design will allow for easier updates. This effort is driven by the Pedestrian Master Plan, which aims to deliver on the strategic transportation target that 35% of all trips be completed by pedestrians by 2035.

Strategy 5.2 of the Plan describes developing a coordinated wayfinding system to improve awareness of the opportunities for and benefits of walking in accessing and connecting to other transportation services. As Seattle is a complex and rapidly changing city, a citywide wayfinding system is proposed to coordinate individual

[7] Most racks provide two bike parking spaces, except corrals, which vary in size. Corral spaces only include "lock-to" rack spaces and exclude "wheel-lock" dock-less bike share spaces.

[8] 962 lock-to (rack) bicycle parking spaces installed with revenue from the private bike share permits, which do not count towards Move Seattle Levy deliverables. Wheel-lock spaces are excluded from this calculation.

efforts and resources towards a common aim of helping people understand the city and its transportation options as a human, and so walkable, scale.

3.3.1 Kiosk Inventory Status and Anticipated Annual Growth

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
Ped Wayfinding Kiosks	13	Medium	$7,500 – 10,000	20	$1,313,000	5-10
Lapsed Permit Kiosks in ROW	137[9] estimate	Low				Unknown
Total	**150**	**Low**			**$1,313,000**	

3.3.2 Kiosk Life Cycle Costs, Maintenance Approach, and Funding

SDOT owns and maintains multiple colors of kiosks. Colors typically represent the time period or project associated with installation and are an easy reference point for the style of kiosk. There is an opportunity for the Department to develop a replacement and maintenance strategy based on kiosk color and identification of associated type failures. As part of refining its kiosk policy, SDOT may choose to obtain a full inventory of kiosks. Kiosk maintenance includes updating the maps with new graphics, printing, and installing new maps; replacing glass; graffiti removal; base repair; and relocation due to construction (on request). In some cases, the Department considers kiosk removal.

There is currently no dedicated funding for maintaining this asset. With the new kiosk and signage program, we anticipate an earmarked maintenance budget. Previously, maintenance costs have been included in a general maintenance budget, and specific costs for maintenance of kiosks are not available.

3.4 MARKED CROSSWALKS

Intersections contain either a marked or unmarked crosswalk, unless posted signage indicates otherwise. Some crosswalks are marked to establish a visible demarcation guiding pedestrians by delineating paths in the roadway for crossing. These roadway markings also alert road users of a pedestrian crossing location.

Raised Crosswalks

There are four marked crosswalk categories:

- ✓ Raised – which includes a paved platform in addition to the striping.
- ✓ Torch-down – a type of crosswalk marking where the material is integrated into the pavement through the application of intense heat provided by a torch.

[9] Some types of Kiosks in the ROW may have lapsed permits, and thus unknown ownership and responsibility. To better identify risks associated with these assets, the Department could undertake a review of existing Street Use Permits to develop a proactive management plan. These counts exclude Seattle Parks Department owned kiosks added under the Feet First effort.

- ✓ Thermoplastic – predominant marking citywide, this is a crosswalk marking where a plastic amalgam is applied to the pavement.
- ✓ Community Crosswalks – Crosswalks designed and maintained by community groups. SDOT is responsible for remarking the outer parallel lines of the crosswalk, while designed portion maintenance costs are covered by the responsible community group.

Marked crosswalks are maintained by the Maintenance Operations Branch crews at the direction of the Transportation Operations group in the Transportation Operations Division. The Maintenance Operations Branch maintains the pavement component of the raised crosswalks at the direction of the Traffic Operations group.

3.4.1 Marked Crosswalk Inventory Status and Anticipated Annual Growth

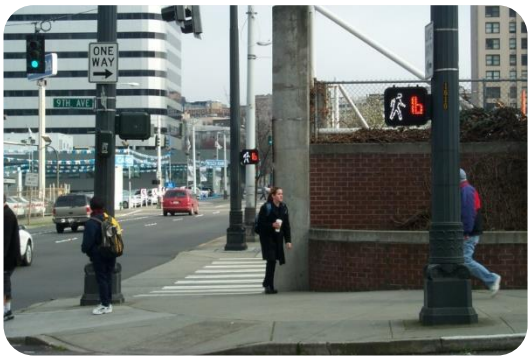
The Department completed a field inventory of marked crosswalks on arterial streets in 2008 and subsequently recorded the collection in the asset data repository. The inventory is updated regularly and recently added stop bar attributes. Stop bars are linear markings perpendicular to the vehicular travel that indicate where a vehicle should stop for all modes of traffic.

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
Raised including concrete or asphalt	5 (e)	Low	$15,000	40 (hardscape only)	$75,000	Unknown
Thermoplastic	5,579	High	$600	3-5	$3,347,400	Unknown
Thermoplastic with Stop Bar	41	High	$650	3-5	$26,650	Unknown
Community Crosswalks	24	High	$11,000	5	$264,000	Unknown
Total:	**5,649**	**High**			**$3,713,000**	

3.4.2 Marked Crosswalks Life Cycle Costs, Maintenance Approach, and Funding

Crosswalks wear in varying ways, so SDOT may maintain some crosswalks more frequently than others. While SDOT anticipates a four-year life cycle deterioration, heavy pedestrian and vehicle traffic patterns may affect the crosswalk lifecycle. The Department continues to respond to customer notifications for reactive maintenance. The crosswalk marking design can reduce wear and tear. For example, ladder patterns parallel to the flow of traffic tend to have longer life because vehicle tire spacing can be directed between the thermoplastic application.

Prior to the Bridging the Gap Levy, which began funding crosswalk remarking in 2007, the Department performed maintenance in response to a customer request, or maintenance crew observation. Using BTG funding, SDOT developed a maintenance program for remarking crosswalks on a regular maintenance cycle.



Fueled by a Move Seattle Levy performance measure of marking every crosswalk within a four-year lifecycle, SDOT, through continuous improvement, has built efficiencies in this program. SDOT provides more services, increased asset maintenance schedules, lower maintenance cost, and reduces liability and risk with a proactive program. Based on the new efficiencies of the program, the average replacement cost of a crosswalk has reduced from $1,000 to $600 to remark/maintain the existing asset. Aside from the Levy, the Safe Routes to Schools (SRTS) program, capital projects, and private projects remark crosswalks annually as well.

The Move Seattle Levy crosswalk remarking performance measure targets 1,500 for remarking annually. However, efficiency gains are not enough to fully cover the remarking cost to meet the performance target. Currently budgeted at $440,000 annually through 2025, the budget only covers $293 per crosswalk. The program is underfunded and provides the equivalent budget of remarking only 730 crosswalks. In 2019, the program was $600,000 over budget. If this pattern of overspending persists in the future, the reasonable annual budget to meet the performance target is about $1 million. As of now, this funding delta is covered by the general signs and markings budget.

Funding requirements for maintenance of the concrete platform for raised crosswalks are included in a general maintenance budget and are not separable at the asset level.

3.5 SIDEWALK SYSTEM

The sidewalk system consists of paved walkways (concrete, asphalt, and pavers), a few soft-surface pathways, curbs, filler areas, curb bulbs, and curb ramps. Curbs, if present, separate the pedestrian area from the street and provide a drainage function. The filler area, or planting strip, is between the sidewalk and the roadway. The sidewalk system may be improved or unimproved, and is the zone occupied by the street shoulder, planting strip, trees, light poles, pay stations, and other street furniture. Transit Island platforms and median islands share similar infrastructure attributes with the sidewalk system in the Infor database and thus are included in this section with a reference in the Transit and Traffic Safety Device Asset Classes. Curb bulbs are extensions of the sidewalk or curb line into the parking lane that physically narrow the roadway, thereby reducing pedestrian crossing distance. Curb bulbs improve pedestrian safety by increasing the amount of protected, dedicated space for walking and encourage walking as a mode of transportation.

Transit island platforms are paved areas within the street that we designate for bus passenger waiting and loading and may also allow the buses to stop in lane. The island is a free-standing paved area usually with

asphalt entrance ramps. Median islands are physical barriers that divide streets into two or more roadways, act as a hard scape spot treatment at an intersection or extend along a corridor.

We maintain landscaping in the islands under the Urban Forestry asset class. This asset restricts certain vehicular turning movements and may serve as a place of refuge for pedestrians crossing the roadway. Median and transit islands may also provide a hardscape walking surface and include accessible crossings.

Curb ramps provide access to the sidewalk system at street crossings and are usually located at intersections but may also be located mid-block. Some sidewalks in the existing sidewalk system do not have curb ramps, and without a curb ramp, the Americans with Disabilities Act (ADA) may not consider a sidewalk fully accessible.

Most sidewalks in Seattle were constructed at the time each area was originally subdivided and were paid for through Local Improvement Districts (LIDs), along with each development's roads, sewers, and water service. Not all developers chose to build sidewalks. Areas annexed to the city in the 1950s developed sidewalks under the standards of unincorporated King County, which did not require sidewalks.

The land use code requires public and private development projects to build new sidewalks. SDOT's Pedestrian Program also installs new sidewalks.

The Seattle Municipal Code, 15.72 requires that adjacent property owners keep their sidewalks in good repair and safe for public travel. This means keeping the sidewalk clear from vegetation overgrowth, snow, and ice accumulation, as well as making repairs to the sidewalks when damaged.

SDOT is responsible for 1) sidewalk repairs when adjacent to an SDOT owned property or damaged by SDOT (e.g., SDOT owned trees) and 2) maintaining safe passage. Curb repairs are SDOT's responsibility. The Department splits responsibility for the sidewalk system between the Project Development Division, which plans, designs, and builds new sidewalks, and the Maintenance Operations Branch, which is responsible for maintenance of the sidewalk system.

3.5.1 Sidewalks Inventory Status and Anticipated Annual Growth

Sidewalks are key building blocks of an effective pedestrian network. Approximately 75% of Seattle's block faces (one side of one block) have sidewalks, for a total of over 34,400 existing block faces with paved sidewalks. This leaves almost 11,500 block faces that are unimproved or have gravel sidewalks. The PMP Implementation Plan and Progress Report targets specific sidewalk locations and strategies including cost effective pathway installation.

The Infor database maintains the sidewalk system physical inventory. We maintain sidewalk asset attributes in our inventory including category, surface type, width, length, incomplete sidewalks, planting (or filler) strip type, planting strip width, and primary cross slope.

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
Sidewalk / Walkway	79,143,531 sf	High	$52-111/sf[10]	40-400	$5,980,166,000	45,800 lf
Curbs[11]	12,371,489 lf	High	$225/lf	100	$2,783,585,000	9,100 lf
Curb Ramps	31,823	High	$20,000 ea.		$636,460,000	1,250
Curb Bulb	807	Med-High	$5,250[12]	100	$4,237,000	Unknown
Total	**34,425 block faces 2,288 miles**	**High**			**$9,404,448,000**	

Building on a 2007 inventory and 2008 partial condition assessment[13], SDOT performed a sidewalk assessment over the summer of 2017. The assessment not only validated asset data on over 34,000 blocks of sidewalk, but also produced information that helps inform the proactive repair and mitigation program.

Using the data acquired through this assessment, we can focus on making the city more equitable and accessible for everyone, including those living with mobility disabilities and those living in underserved geographical areas. The information collected allows us to:

- Predict system-wide repair needs
- Recommend additional funding for proactive repairs and prioritize mitigation activities
- Increase awareness of sidewalk maintenance needs and enhance property owner education
- Evaluate sidewalk re-inspection cadence and recommend enforcement programs
- Respond to claims and litigation
- Take advantage of funding opportunities
- Explore the possibility of implementing property point of sale programs when property owners transfer or sell their property, property owner cost sharing programs, and sidewalk repair under adjacent private and publicly permitted projects

Following the assessment, SDOT's sidewalk repair and mitigation budget tripled, and the Department employed a prioritization model that analyzed severity of damage, mobility impairment, cost, usage, and proximity factors identified under the ADA Act.

[10] Surface costs vary by material (asphalt, concrete, and brick). Does not include cost of working around utilities, drainage, tree issues, complex traffic, or business accommodations.
[11] Includes at-grade walkways
[12] Curb bulb sf est. at 125 sf
[13] The 2008 partial sidewalks condition survey focused on areas of known higher pedestrian volume such as the Urban Villages.

Height differences accounted for the highest quantity of issues (92,000), which is also the highest claim for trip and falls. By developing a proactive model for mitigation, SDOT has increased height difference reductions by tenfold, or over 10,000 spot treatments annually. SDOT crews or contractors help minimize liability and maintain accessibility by placing asphalt shims between sidewalk sections or grinding to achieve a more level walking surface.

The BTG Levy provided the funding to build 7 to 20 new block faces of sidewalk per year between 2007 and 2015. In all, BTG funding was used to repair 220 block faces and build 118 new blocks of sidewalks. The Move Seattle Levy includes funding to build 250 blocks of traditional and non-traditional sidewalk between 2016 and 2024. The cost of a new sidewalk assumes minimal drainage costs and does not include ROW acquisition, substantial excavation, or retaining wall construction. Any of those exclusions can substantially increase the cost of a new sidewalk project causing the cost to vary substantially between projects.

In 2015, SDOT hired a consultant to perform an ADA self-evaluation field survey of existing curb ramps. Data from this effort continues to support the Pedestrian Master Plan while improving data quality for compliance with Department of Justice and Federal Highway Administration guidance.

Then in 2017, the City settled a class action lawsuit for curb ramps in the Seattle public right-of-way. The Reynoldson v. City of Seattle Consent Decree obligates the City to permit or build a minimum of 1,250 curb ramps per year for 18 years, through July 1, 2035. This has significantly increased SDOT's curb ramp inventory and tracking needs. Many improvements in curb ramp data quality can be seen in the publicly available SDOT Assets Map, Planned Curb Ramp Web App, and Compliant Curb Ramp Web App.

Under the Title II of the Americans with Disabilities Act (ADA) regulation 28 C.F.R. § 35.150(d)(2), state and local governments are required to self-assess in the effort of identifying barriers accessing programs, services, and activities. These self-assessments are conducted and plans to remove accessibility barriers are prioritized or documented in an ADA Transition Plan.

With authority over streets and sidewalks in the City of Seattle, SDOT has updated its ADA Transition Plan which includes self-assessment and barrier removal efforts relative to pedestrian facilities in the public right-of-way. This plan also includes additional information about the Department's efforts towards compliance with the ADA and improving accessibility in Seattle. The SDOT ADA Transition Plan is considered a living document, with progress and updates provided periodically.

Efforts have been made to ensure that this plan is accessible to all users. Please contact the SDOT ADA Coordinator for inquiries on the appendices, including referenced data, maps, or any other supporting documents in an alternative format.

3.5.2 Sidewalks Life Cycle Costs, Maintenance Approach, and Funding

SDOT provides two (2) basic types of maintenance for its sidewalks:

- ✓ Preliminary repair or mitigation
- ✓ Permanent repair

In 2017, preliminary repair or mitigation work, typically involved a site visit where maintenance staff painted issues with white paint, placed a barricade, and/or initiated a preliminary repair. Beginning in 2018, SDOT embarked on a proactive mitigation program allowing for more equitable management and prioritization of sidewalk work across Seattle.

The sidewalk assessment project successfully heightened awareness about sidewalk repair needs and increased funding. Once the sidewalk data was analyzed in 2018, SDOT executed a three-week "shim blitz" where crews placed asphalt adjacent to uplifts to mitigate trip hazards. In a coordinated effort, contractors also beveled hundreds of vertical differences on sidewalks. In 2018 and 2019, crews and contractors applied over 10,000 shims and bevels annually. SDOT crews report being invested in the outcome of an effective approach that gives them the ability to organize their work within grids rather than responding to single customer requests that inefficiently took them all over the city daily.

SDOT crews install shims by applying an asphalt patch to correct faults, settlement, or other distress. If crews cannot correct the issue with a spot repair, SDOT may close or evaluate the sidewalk as a candidate for permanent repair. Beveling, which is performed by contractors, grinds the height difference to match the adjacent panel.

The intent of permanent repairs is to extend the useful life of the sidewalk surface by 100 years, although sidewalks adjacent to street trees may require much more frequent maintenance.

As of 2019, the Sidewalk Safety Repair Program (SSRP) is enacting a comprehensive proactive repair and maintenance program to deliver the best value of services to the traveling public. Prior to 2018, three primary sources triggered sidewalk repairs:

- ✓ Customer Requests
- ✓ Claims
- ✓ Field observations

For the SDOT sidewalk repair program to consider a damaged sidewalk for repair it generally is adjacent to City-owned property, or City owned trees causing the damage.

Program staff forward damage caused by other City agencies or public utilities to the appropriate agency for repair. If the location meets the above criteria, then the Sidewalk Repair Program repairs selected locations based on the following criteria:

1. Leveraging opportunities with other capital projects as part of SDOT's commitment to Complete Streets principles as expressed and adopted in Ordinance 122386
2. Within an urban village
3. Adjacent to an arterial street
4. High priority project areas as identified in the Pedestrian Master Plan
5. Within three blocks of a community or healthcare facility such as a school, park, library, clinic, hospital, or senior housing
6. On a block with a transit stop
7. Geographic and social justice distribution
8. Constructability and cost

The above criteria are intended to ensure that the repairs will benefit a significant number of pedestrians, and the greatest number of users. The greater the number of selection criteria a specific location meets, the more likely the program will prioritize repair at that location. However, the City has a significant backlog of potential repair locations and SDOT is unable to repair many of the identified locations that meet all the criteria.

Program staff refer sidewalk damage associated with private property to the Maintenance Operations Division for action. The Seattle Department of Construction and Inspections (SDCI) typically handles notices of vegetation overgrowth from private property that impacts the sidewalk, although SDOT Maintenance Operations crews may abate immediate concerns. In addition to implementing a new enforcement and inspection tool (Accela), SDOT is evaluating ways to encourage and enforce property owner repair as defined under the Seattle Municipal Code to ensure compliance.

In 2019, Seattle City Council passed Resolution 31908 directing SDOT to present a range of policy alternatives to improve sidewalk repair and address the large volume of observations recorded in the sidewalk assessment. SDOT collaborated with the University of Washington School Evans School Consulting Lab to examine sidewalk maintenance practices, policies, and program options to advance accessibility and equity in Seattle. The report recommends the following strategies to improve the stability and sustainability of the department's sidewalk repair approaches[14]:

1. Implement a five-year shim/bevel plan
2. Increase property owner awareness and education about sidewalk responsibilities
3. Simplify the sidewalk repair permitting process
4. Institute an income-based cost-sharing program for lower-income property owners
5. Implement clearer enforcement methods
6. Seek increased and stable funding sources

[14] herbold.seattle.gov/wp-content/uploads/2020/10/Sidewalk-Repair-Policy-Report_Final_6-30-20.pdf

BTG Levy funding ended in 2015 and was replaced with funding from the Move Seattle Levy starting in 2016. Previous performance measures focused on "block face equivalents" and "days to perform an engineering review. In 2018, the days to complete an engineering review was replaced with "# of areas mitigated" to better track field crew efficiency. The Pedestrian Master Plan (PMP) performance targets are defined by blocks of new and replaced sidewalk.

The Sidewalk Development Program uses prioritization criteria established in the PMP to determine new sidewalk installations. The PMP uses a data-driven prioritization process to identify high priority locations. Each block receives a score that reflects safety factors, including traffic speeds and collision data. A second scoring process identifies high priority areas in the city by evaluating health and equity data and potential pedestrian demand.

Funding for new sidewalks in Seattle currently comes from a variety of sources, including:

- ✓ Sidewalk Development Program
- ✓ Safe Routes to School (SRTS) Program
- ✓ Neighborhood Street Fund
- ✓ Capital projects
- ✓ School Speed Camera Proceeds
- ✓ Private development
- ✓ Other agencies

Projects funded through the Safe Routes to School program are prioritized using similar criteria. The Neighborhood Street Fund program applications are prioritized by the community, then voted on by community members in each Council District. Final project selection is done through the Move Seattle Levy Oversight Committee.

Using the 2017 sidewalk assessment data, SDOT estimates a permanent repair backlog between $500 million and $1.33 billion. Historically, sidewalk repair and mitigation funding ranged from $1.5 to $1.7 million annually. In 2017 and 2018, an additional $2 million was provided for the sidewalk repair program. This increased total funding to $5.8 million in 2019.

Sidewalk maintenance requires a holistic approach of working with property owners and other City Departments to improve the pedestrian right-of-way. Where full condition information is not available, based on the 100-year life cycle of sidewalks, an estimated 2% of the sidewalk system, including curbs, filler, and curb ramps, would typically need to be permanently repaired, or replaced annually.

We estimate new sidewalks constructed by SDOT, developers and capital projects will require additional funding for maintenance and operations of approximately $5,700 per year. While initially a modest amount, it is a compounded cost for each year and would be factored into the long-term cost of routine maintenance and operations.

3.6 STAIRWAYS

Due to the many hills throughout Seattle, there are numerous locations where it becomes too steep for a street or sidewalk. The city-built stairways to maintain the connection between adjacent neighborhoods and to provide an interconnected network of sidewalks. Stairways encourage walking and provide access to public transportation. Some stairways include pedestrian viewing platforms. These structural decks provide space for pedestrians to view the city and its surroundings away from vehicular traffic.

Stairways are maintained by SDOT's Roadway Structures Division.

3.6.1 Stairways Inventory Status and Anticipated Annual Growth

The Structures database has maintained the inventory of stairways since 1994. In 2012, data was migrated to the Infor central data repository which is also the current tool for work order creation. Condition information has been entered in Infor since then though updates for the last two years are still in the process of being entered into the system.

SDOT conducts periodic inspections of stairways as well as emergency response to an incident or customer request. Funding is needed to establish a regular, 7-year cycle of inspections. Inspectors completed 94 stairway inspections in 2018 and have averaged 50 per year since 2014.

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
Stairways	35,794 lf; 497 units	High	$2,046	75 (Concrete) 40 (Wood)	$73,229,000	0-5 per year

3.6.2 Stairways Life Cycle Costs, Maintenance Approach, and Funding

Rehabilitation of a stairway in poor condition can range from $10,000 to $250,000 and costs $200,000 on average. A stairway that degrades to poor condition has a life expectancy of less than 15 years and goes on the replacement list. Crews repair stairways on a priority basis within the available funding. The following table describes the priority classification codes they use:

Priority Classification	Maintenance Response
Emergency	Condition warrants immediate attention
High	Maintenance should be scheduled in the work plan for attention in the next six months
Medium	Schedule the maintenance work within next one-three years
Note	Schedule as priority long-term maintenance
Routine	Schedule as routine long-term maintenance
Low	Monitor the condition of the deficiency

The Department allocated the funds it received in in 2019 for rehab and replacement according to the priorities above as it strived to meet its MSL annual goal of rehabilitating five stairways from poor to good condition. With only about 12 poor, mostly streetcar slabs, stairways remaining in our current inventory, this means that this portion of the inventory can be restored to good condition in two -three years. Alternatively, with Roadway Structures estimating the cost of rehabilitating a stairway to be approximately $2,000/linear foot and an average stairway measuring 100 linear feet, a onetime cost to rehabilitate all currently poor condition stairways will be about $2.4 million.

The number of poor stairways each year, however, is not static. Roadway Structures engineers estimate that 5% of the stairways rated as fair condition will deteriorate to poor condition each year, and that 3% will deteriorate from good to fair condition in that same period. Using the average length and unit cost to rehabilitate a stairway, this translates to about $1.4 to $1.8 million/year to avoid having any poor stairway in the future. Note that this funding amount was computed using averages, and individual stairway projects in any one year will vary. However, at some point the total linear feet of stairway in fair or poor condition will need to be rehabilitated, and this funding requirement represents an average amount of annual funding that must be sustained over the next 20 years to accomplish the rehabilitation. Because the rate of deterioration of aging stairways exceeds the present rate of rehabilitation, the backlog of stairways rated in poor condition will continue to grow.

3.7 STREET FURNISHINGS

Street Furnishings include walls, benches, chairs, tables, a clock, and rails in the right-of-way and typically come from capital projects and private developments. An inventory of street furnishings was obtained during the 2017 Sidewalk Assessment and the 2018 Shoreline Street End review, however only 16 are known to be owned and or maintained by SDOT. Some types of street furnishings in the right-of-way may have lapsed permits, and thus unknown ownership and responsibility.

3.7.1 Street Furnishings Inventory Status and Anticipated Annual Growth

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
Bench	813	Medium	$2,700	20-50	$2,195,000	20-30
Historic Clock	1	Medium	$50,000	100-150	$50,000	Unk.
Rail	146	Medium			$592,000	Unk.
Table	79	Medium	$2,700	20-50	$213,000	Unk.
Wall	Unk.	Low	Unk.		Unk.	Unk.
Total	**1,039**	**Medium**			**$3,050,000**	

3.7.2 Street Furnishings Life Cycle Costs, Maintenance Approach, and Funding

Maintenance costs have been included in a general maintenance budget, and specific costs for maintenance of street furnishings are not available. Street furnishing maintenance includes graffiti removal; base repair; and

relocation due to construction (on request). There is no dedicated funding for this asset type. In 2019, we spent approximately $20,000 on maintenance, replacement, and installation of way-finding signs and street furniture maintenance.

3.8 TRAILS

SDOT multi-use trails are off-road paved paths. Trails encourage walking and biking, as well as other forms of recreational transportation, such as rollerblading. These trails provide important connections to the sidewalk network, greenways, urban centers, and to the region. Maintenance primarily falls on SDOT, the Department of Parks & Recreation, and the Port of Seattle, depending on various agreements. Maintenance crews perform minor trail maintenance.

Under the City's Bicycle Master Plan, SDOT is developing a multi-use trails upgrade and maintenance plan. This plan assesses existing multi-use trail conditions, provides recommendations to improve the multi-use trail environment, and develops multi-use trail capacity studies to evaluate trail expansion needs, crossing improvements, maintenance agreements, and public outreach.

3.8.1 Trails Inventory Status and Anticipated Annual Growth

Trail reconstruction costs do not include construction of other structures, such as bridges or retaining walls, required to support the asset and continuous access over Seattle's topography. The 2016 Trails Upgrade Plan includes maintenance cost estimates.

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
Multi-use Trail	47 lane miles	Medium	$2,640,000	40 (Asphalt) 20 (Gravel)	$124,080,000	0.5 to 1 mile

3.8.2 Trails Life Cycle Costs, Maintenance Approach and Funding

Prior to BTG funding, crews performed maintenance only in response to customer requests. BTG and the Move Seattle Levies have allowed the Department to complete the following activities on multi-use trails:

- ✓ Spot repair of pavement, drainage, bollards, and curb ramps
- ✓ Sign and marking maintenance
- ✓ Mowing, trimming, and sweeping

Before BTG, the Department did not fund trail maintenance separately. We completed trail spot repair as part of the overall budget to maintain pavement. Maintenance costs have not been tracked independently for this asset and have been included in a general maintenance budget for bicycle facility improvements; hence, life cycle costs are not available. Multiple capital and interagency projects funded recent trail upgrades.

4 - BRIDGES AND STRUCTURES ASSET CLASS

The Bridges and Structures asset class consists of the transportation structures that are associated with the street network and a few one-of-a-kind roadway structures. The Roadway Structures group maintains all roadway structures.

Asset	Replacement Value	Condition				Data Confidence
		Good	Fair	Poor	Unk	
Air Raid Siren Tower	$548,000	-	100%	-	-	High
Areaway Street Walls	$194,401,000	43.6%	33.1%	3.8%	19.5%	Medium
Bridges	$7,143,508,000	26.2%	57.4%	16.4%	-	High
Bridge Hydrant Vaults	$5,160,000	17.1%	53.1%	29.8%	-	High
Elevator	$3,000,000	100%	-	-	-	High
Retaining Walls	$1,361,213,000	30.2%	34.2%	2.6%	33.0%	Medium
Tunnels	$2,624,000	-	100%	-	-	High
Total:	$8,710,454,000					

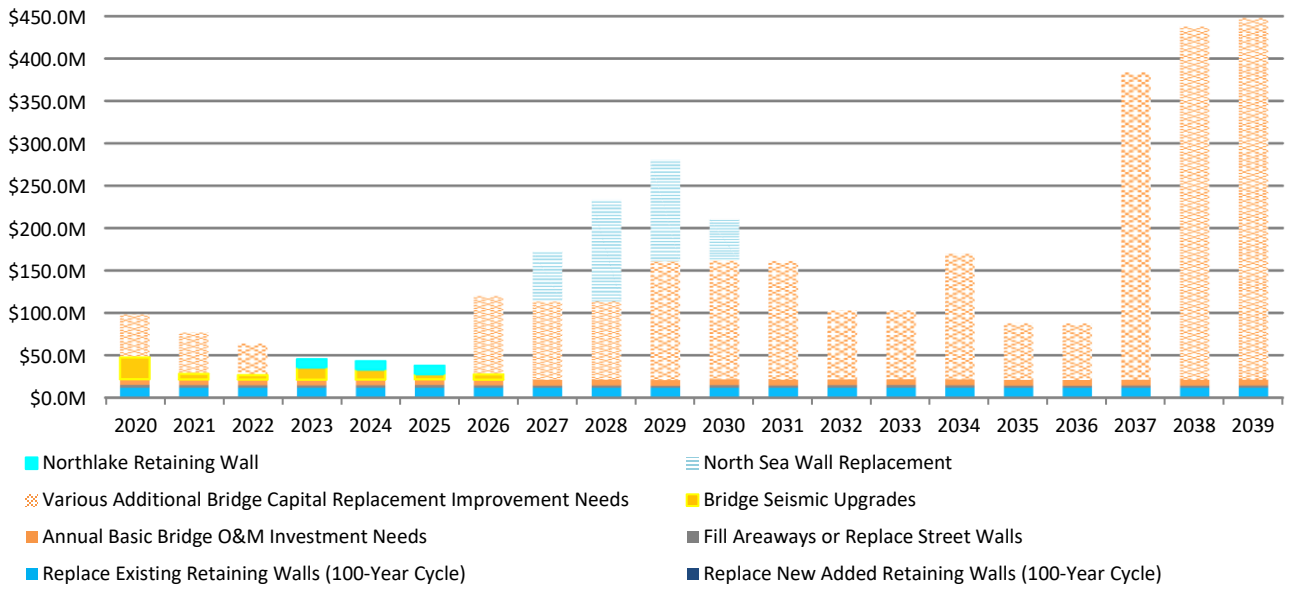


Figure 4.1: Bridges & Structures Long Term Cost / Needs Forecast (2020 dollars)

The bridge needs presented in Figure 4.1 is the best conjecture based on historical operations and maintenance spending levels and cost replacement studies available prior to the bridge audit report. The bars with pattern (versus solid) fill represent financially unprogrammed structure replacements. As part of its response to the audit report, SDOT will be undertaking a detailed reassessment of its bridge data relating to the condition, useful life, and lifecycles costs to accurately estimate the bridge maintenance needs. These data improvements along with a more informed strategic asset management plan are expected to be completed no later than the end of

2023. For more information on SDOT's bridge program, see the City Auditor's Office report which was published September 2020[15].

4.1 AIR RAID SIREN TOWER

The Seattle Engineering Department, the precursor to SDOT, built the air raid siren tower in 1957 with the Department of Civil Defense as a response to the threats of the Cold War. Recognized as a historical landmark, it is in the Phinney Ridge neighborhood at the intersection of N 67th St and Phinney N. The air raid siren tower was once part of a 21-siren system throughout the Seattle area designed to alert residents in the case of a nuclear missile attack.

The Department completed Emergency maintenance on the tower in 2006 and needs funding for additional maintenance. The tower is no longer in service.

4.2. AREAWAY STREET WALLS

Areaways are spaces that exist under sidewalks and between the street and the adjacent building. Although there are a variety of reasons why areaways exist around Seattle, the most common case is the reconstruction and raising of street grades in the Pioneer Square area following the Great Seattle Fire of 1889. The City-built street walls and filled the street area from the 1890s through the 1940s.

SDOT owns and maintains most of the areaway street walls in Seattle, as well as a few of the sidewalks that are adjacent to areaway street walls and supported by them. In most cases, the areaway itself is considered private, as it is used by the adjacent property owner under the authority of a street use permit. The areaway street wall provides a necessary and important support to the sidewalk, street fill, and utilities.

4.2.1 Areaway Inventory, Condition Status, and Anticipated Annual Growth

Roadway Structures has maintained an inventory of areaway street walls since 1994 and manages the inventory in the Infor central data repository. Physical inventories were conducted in Pioneer Square in 2000 and the International District in 2011. An inspection program is currently assessing areaways in Pioneer Square and anticipates completing the remaining areaways in that neighborhood by year end 2021, COVID-19 dependent. In general, SDOT is responsible for areaway street walls and adjacent property owners are responsible for areaway sidewalks.

During the 1930s and 1940s, areaways were heavily permitted by adjacent property owners for a right-of-way usage fee. An example is the building at 3rd Ave and Pine, in downtown, where areaways exist around the entire structure. Records of the original construction of street walls are often missing. We discover new areaways during the process of new development, renovation of buildings, or when property changes hands. When this

[15] seattle.gov/Documents/Departments/CityAuditor/auditreports/2020_03_SeattleBridges_FinalReport.pdf

occurs, the Department investigates ownership and maintenance responsibilities and adds the inventory to the system.

Until 2019, SDOT conducted sporadic funding dependent inspections of known areaway street walls. When inspectors note areaway critical sidewalk defects Street Use Division staff are notified and in turn contact the adjacent property owner and request repairs occur. Access to permitted areaways through adjacent private property can often be challenging and delay established inspection cycles.

Much of the areaway condition assessment data outside of historic Pioneer Square remains out of date and sufficient resources are not available to establish a consistent inspection cycle. Roadway Structures estimates a 1 to 10-year inspection cycle is desirable depending on age, condition, and adjacent uses. This provides adequate condition monitoring and timely response to deterioration.

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
Areaway Street Walls	236 each; 204,774 sq. ft.	Medium	$900/sf of wall space; $60 / cubic feet for cavity fill	75	$194,401,000[16]	Growth occurs when areaways are discovered

4.2.2 Areaway Life Cycle Costs, Maintenance Approach, and Funding

Sidewalks are an integral structural component of the areaway and are considered in the areaway street wall condition rating. SDOT and the adjacent property owner decide maintenance responsibility on a case-by-case basis, which is stated in each Street Use permit.

Areaway Below Sidewalk

Roadway Structures has limited funding for a regular maintenance program for the areaway street walls. Emergency response situations may require midyear budget adjustments or new appropriations. The largest risk for this asset is the age and lack of historic maintenance. Many areaways in Pioneer Square are past the point of rehabilitation and require filling. Due to the condition, the weight of heavy vehicles that park on top of sidewalks or falling construction debris can damage the areaway. As they deteriorate, sections of the sidewalk can collapse posing a risk to the public and emergency responders. The recent closure of the Alaska Way Viaduct which moved buses onto city streets has impacted the areaway condition due to increased loading (more frequent and heavier vehicle loads). In 2019, SDOT established a 10,000-pound weight limit for curb and parking lanes with adjacent areaway street walls. Through the areaway inspection program, we are identifying opportunities to execute capital street wall improvements to reopen some load zones.

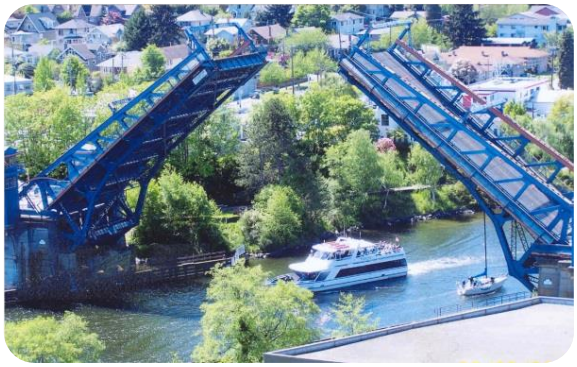
[16] System value has decreased due to an improvement in data quality. During 2019, SDOT performed inspections on 42% of areaways and added actual height (previously estimated at 10 feet) and condition details to the assets. Replacement value also includes cavity filling non-historic areaways.

The City's capital project improvement process allocates funding for areaway work, either fill or restoration, on a case-by-case basis. SDOT recommends continuing funding for a multi-year effort to acquire current condition data on all areaway street walls.

The areaway street walls are of varying construction including brick/mortar, rubble/mortar and lightly reinforced concrete. None of the street walls meet current design standards. Around 20% of known areaway street walls under SDOT's responsibility have been rebuilt, filled, or replaced since initial construction. Current rehabilitation / replacement funding is not at an adequate level given advanced asset age which in some cases is over 130 years. Areaways/areaway street walls in poor condition are candidates to either be cavity filled or restored depending on historic designation. SDOT updates and re-categorizes the asset attributes after filling an areaway. The heightened condition assessment program mentioned above allows SDOT staff to better evaluate proper long-term funding for the future specifically for areaways in Pioneer Square.

4.3 BRIDGES

Bridges are elevated structures that facilitate efficient and direct travel routes between points in Seattle's street network disrupted by physical features or topography. Absent a bridge at such locations, travel routes would be inefficient and circuitous, if at all possible. One exception to this definition is the structural deck over water (also considered a pier) that provides a viewing or fishing platform for pedestrians. Several examples include the Alaska Way Seawall, 24th Ave NW Pier, and Fishing Pier bridge at Spokane St over the east Duwamish.



Movable Fremont Bridge

4.3.1 Bridges Inventory Status and Anticipated Annual Growth

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
Movable Vehicular Bridges	4	High	$6,400/SF	75	$602,000,000	Unknown
Over Railroad Bridges	23	High	$2,100/SF	75	$2,449,000,000	Unknown
Overwater Bridges	29	High	$2,600/SF	75	$2,837,000,000	14,000 SF
Other Bridges	66	High	$1,700/SF	75	$1,256,000,000	500 SF
Total	**122**	**High**			**$7,144,000,000**	

In previous editions of the Asset Status & Condition report, bridges were classified under three categories: movable vehicular, non-movable vehicular, and pedestrian bridges. Since then, the Roadway Structures group at SDOT has switched to using the four categories in the table above when estimating the replacement cost of the bridge system. For maintenance purposes, non-movable vehicular bridges are classified based on the structural materials used in the bridge:

- ✓ Steel
- ✓ Reinforced Concrete
- ✓ Timber
- ✓ Composite

Since its inception Seattle has experienced periods of large cyclical growth. As a result, the City constructed infrastructure in large waves and replacement may also be required in an uneven fashion. The first generation of steel and concrete bridges is nearing the end of their design lives. In 2020, the average age of all of SDOT's

bridges is 61 years. The age of the last bridge we replaced was 6 years. Bridges 70 years of age or older, represent $3.5 billion in replacement value.

Between 2015 and 2018, SDOT's bridge deck square footage in the bridge inventory had a net increase of 2%. Over the next four years, the City's bridge inventory is expected to increase from major capital projects including S Lander St Bridge, Northgate Bike-Pedestrian Bridge, and structures built by the Office of Waterfront.

SDOT has both sole ownership and maintenance responsibility for the 122 bridges reported in the table and shares partial ownership and maintenance responsibilities for other bridges within City of Seattle boundaries.

The Roadway Structures group maintains bridge inspection and asset inventory data in the Washington State Department of Transportation's BridgeWorks database. SDOT utilizes another database, Infor, to track work activities on bridges and shares this data with the BridgeWorks database. The bridge inventory is updated annually as routine bridge inspections are completed or if new discoveries regarding condition are made.

The inventory includes all bridges where SDOT performs maintenance work, not just those owned by SDOT. For bridges partially owned by SDOT, the Department is responsible for maintenance which is funded through the General Fund and in most cases, the partner funds full replacement except when there is an agreement stating otherwise. SDOT performs reimbursable maintenance work on bridges belonging to other city and state departments and performs inspections on SDOT bridges as well as privately owned bridges within the right of way. Occasionally, SDOT inspects and maintains other City department bridges on an as needed basis. During the annual bridge inspection program, SDOT inspects components of each bridge on a regular cycle:

- ✓ Routine Inspection – at least once every 2 years
- ✓ Underwater Inspection – every 5 years
- ✓ Fracture Critical – every 2 years
- ✓ Special Features – every 2 years

The Department follows the standards and establishes an inspection schedule for each bridge according to federal regulations (Federal Law 23 CFR 650). However, if condition dictates, a bridge may undergo more than one inspection in any given year.

A Sufficiency Rating (SR) is a calculated value that indicates a bridge's sufficiency to remain in service and determines federal funding eligibility. An SR value of 100 represents a bridge in new condition. A bridge with an SR rating of less than 80 is typically a candidate for rehabilitation. A bridge rated with an SR of less than 50 is considered 'poor' but it does not imply that the bridge is unsafe for vehicular traffic. A bridge condition rating considers many factors beyond component assessments, including traffic volumes. Bridges rated in poor condition qualify for full replacement funding, and the Department may pursue funding, for example, when current traffic demand has grown to a level that exceeds the traffic volume for which the bridge was designed.

Eleven percent of SDOT's bridges have an SR of less than 50 and are therefore candidates for full replacement. This cohort of bridges represents the current replacement backlog and has a combined current (2020) value of $854 million.

If the condition of a bridge deteriorates below a level considered safe for the load carrying capacity, the allowable vehicle weight is restricted on that bridge. SDOT has five bridges where weight restrictions have been posted and two bridges that have been closed to vehicular traffic.

4.3.2 Bridges Life Cycle Costs, Maintenance Approach, and Funding

The useful life of a bridge depends on the structural materials and the level of ongoing maintenance applied to the bridge. The cost of a new bridge varies considerably and is dependent on many factors, including structural materials, span, expected traffic volume, and topography. Construction costs average $3,130 per square foot of bridge deck area.

The lifecycle cost of routine maintenance on non-movable bridge can range from $150,000 to $10 million depending on the size, material, and complexity of the bridge. Over the past 14 years SDOT has spent an average of $6.6 million per year on bridge maintenance. Figure 4.2 below shows a comparison of the annual bridge maintenance spending and budget since the BTG levy expired in 2015.

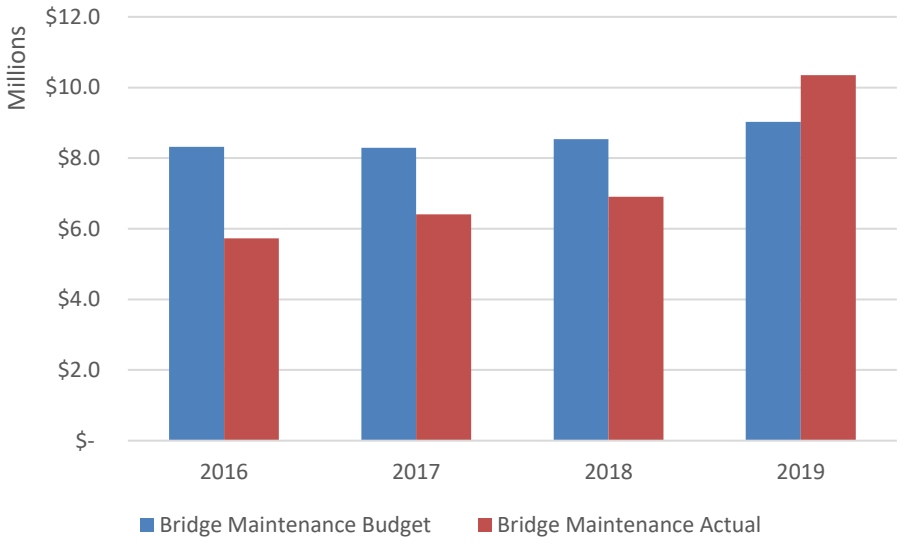


Figure 4.2 2016 - 2020 Bridge Maintenance Actuals vs. Budget (2020 Dollars)

SDOT repairs bridges on a priority basis up to the level of available funding according to the criteria in the following table. Issued work orders represent routine maintenance activities and do not include major rehabilitation or replacement of major bridge components, such as expansion joints.

Priority Class	Maintenance Response
Emergency	Condition warrants immediate attention
High	Maintenance should be scheduled in the work plan for attention in the next six (6) months
Medium	Schedule the maintenance work within next 1-3 years
Note	Schedule as priority long-term maintenance
Routine	Schedule as routine long-term maintenance
Low	Monitor the condition of the deficiency

Since a bridge can potentially have a very long useful life, programmatic management requires maintenance and replacement of major components of the bridge on a recurring cycle, rather than replacement of the entire structure. Maintenance can be broken down into two major types: routine and preventive. Routine maintenance covers short-term work that requires regular reoccurring attention. Preventive maintenance (PM), on the other hand, focuses on preservation and encompasses actions or strategies that slows down deterioration or restores the function of a bridge which can extend their useful life long past original design life. PM work includes seismic improvements, major rehabilitation (strengthening structural members and replacing deck surfacing to keep the bridge functional for freight and transit), and other maintenance activities based on the type of bridge.[17] SDOT's routine and preservation maintenance programs are described in the table below along with the current state of their funding.[18]

Program	Description	Funding
Annual routine maintenance	Routine repair of bridges	Move Seattle Levy
Annual program for painting bridges	Routine painting of steel structures	Annual roll-over of funds from one budget year to another to allow the accrual necessary to address this high-cost maintenance activity
Seismic retrofit	Seismic retrofit of high priority bridges	Specific bridges identified in Move Seattle Levy
Bridge control system	Replace Bridge Control System (Spokane St Bridge due for replacement)	Currently unfunded, target replacement of one (1) control system every five years
Deck replacement	Seal the deck surface so water doesn't affect the steel. Minimize impact loading for joints. Resurface or replace the entire deck ideally every 25 years	Currently unfunded
Bridge Vehicle Rail Safety Program	Upgrade bridge vehicle rails to current AASHTO industry construction standards, which support heavier vehicle heavier and higher clearances. The ideal replacement cycle for railing is once every 50 years	Currently unfunded
Expansion joint replacement	Replace deteriorated joints periodically, ideally every 25 years	Currently unfunded

Since the BTG funding ended in 2015, the Department has rehabilitated two bridges and seismically retrofitted three. With the remaining BTG funding, the Department was able to design and begin construction on the Yesler

[17] The inclusion of painting in the routine maintenance budget vs. actuals report is a deviation from the FHWA suggested treatment of this activity as preservation work.

[18] As part of its response to the Bridge Audit Report, SDOT has committed to improving its condition data, estimated useful life calculations, and lifecycle cost calculations of its entire bridge inventory which would be essential in the development of a strategic asset management plan for its bridges no later than the end of 2023. This project is referred to as the Business Practice Upgrades (BPU).

Over 4th Ave Bridge and design the Fairview Bridge (with the latter now being constructed and expected to open to the public in the summer of 2021).

SDOT evaluates bridges under a robust inspection program that identifies each defect and prioritizes the work. Roadways Structures staff understands the backlog well in terms of routine maintenance. At the beginning of 2020, the Roadway Structures group carried a backlog of 863 bridge-related work orders. Work orders vary in cost, but the current average is more than $5,000. As a bridge ages, there is a point at which the amount of required routine maintenance begins to rise significantly. Where rehabilitation is completed, the amount of maintenance decreases. When we replace bridges, the maintenance backlog of the associated bridge is eliminated, allowing the Department to focus on other defect-related work. Both factors will affect the rate of increase/decrease of the backlog, and, if maintenance is deferred, the amount of maintenance will increase accordingly.

As the amount of defect-related maintenance grows with aging bridge infrastructure, current funding levels will not sustain the existing bridge transportation network. In turn, decreases in bridge infrastructure quality will likely accelerate. Comprehensive federal bridge regulations require mitigation measures for certain defective conditions, ranging from load limits to full closures in the event of a structural failure.

Aside from maintenance and replacement costs, the Department also incurs cost to operate the 4 SDOT-owned movable bridges (i.e., Ballard Bridge, Fremont Bridge, Spokane St. Bridge, and University Bridge) which in 2019 amounted to $3.75 million. Roadway Structures must operate movable bridges in accordance with Coast Guard regulations and, therefore, must maintain the bridges at a level that will ensure compliance, as well as meet expectations of commuter traffic, namely:

- ✓ Open drawbridges within ten minutes of a vessel request,
- ✓ Provide immediate response to issues or when a bridge is stuck in the “open” position, and
- ✓ Keep all lanes open during defined “peak” commute hours.

4.4 BRIDGE HYDRANT VAULTS

Bridge hydrant vaults are utility vaults located on bridges that house the piping and electrical for either a deluge or a fire system. These systems provide water to hydrants used by the Seattle Fire Department (SFD). Hydrant vaults are built to meet SFD guidelines for hydrant placement.

4.4.1 Bridge Hydrant Vaults Inventory Status and Anticipated Annual Growth

Bridge hydrant vaults are located on the Klickitat Bridge (3 deluge systems), the Spokane Viaduct/West Seattle Swing Bridge (3 deluge systems), the West Seattle/Spokane High-rise Bridge (10 deluge systems), the 1st Ave Bridge (1 fire system), and the Royal Brougham Bridge (1 deluge system). Upon completion of the Lander St Bridge project, an additional fire system will be added to the inventory.

There remains a lack of clarity on whether SDOT or Seattle Public Utilities (SPU) own the bridge hydrants. SDOT operates under the assumption that the Roadway Structures Division is responsible for maintenance related to the bridge pipe and main valve where the water originates. Currently, we include these assets and components in our inventory and track them through bridge utility maps that show where they are located underground.

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
Bridge Hydrant Vault for Deluge System	17	High	$300,000	30	$5,100,000	None
Bridge Hydrant Vault for Fire System	1	High	$60,000	30	$60,000	1
Total	**18**	**High**			**$5,160,000**	

4.4.2 Bridge Hydrant Vaults Life Cycle Costs, Maintenance Approach, and Funding

Condition is not currently recorded for bridge hydrant vaults, however, SDOT performs preventive maintenance monthly to ensure that they remain in service 98% of the time on a 24/7 basis. We did not pursue additional information for this reporting period.

4.5 ELEVATOR

SDOT has two elevators in its inventory that it owns and maintains. The first one is at the Royal Brougham Bridge installed under the 519 Phase II project and the other is at the S Spokane St Swing Bridge. The elevators provide ADA access along the pedestrian corridor due to steep grades.

4.5.1 Elevator Inventory Status and Anticipated Annual Growth

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
Elevator	2	High	$1,500,000	30	$3,000,000	None

4.5.2 Elevator Life Cycle Costs, Maintenance Approach and Funding

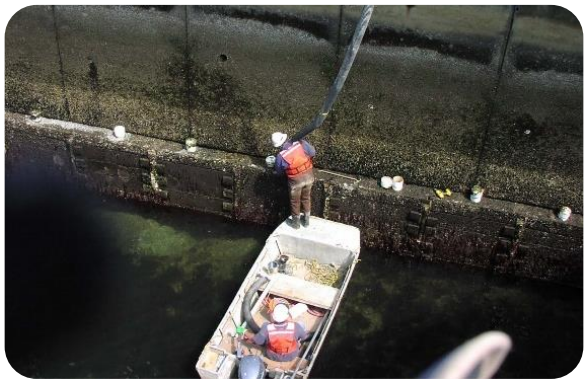
Roadway Structures assesses the elevator structure during annual bridge inspections. FAS maintains a service blanket contract to perform routine and emergency elevator maintenance. The contractor follows elevator regulations established under the Seattle Department of Construction and Inspections (SDCI). We did not pursue additional information for this reporting period.

4.6 RETAINING WALLS

A retaining wall is a roadway structure that supports a street when there is a near-vertical grade separation. A retaining wall prevents overburden (soil) and/or water from collapsing onto Seattle's transportation infrastructure by establishing level areas on hillsides when roadways are constructed. Seawalls are a category of retaining walls installed along the shore and are partially or fully submerged. The Alaskan Way Seawall is the City's longest retaining wall, measuring over 7,000 feet in length, and protects the central city waterfront along Elliott Bay.

Retaining wall construction varies by type and materials used: cantilevered reinforced concrete (RC), concrete gravity, slab & rail, rockery, timber pile & lagging, mechanically stabilized wall, steel "H" pile & RC, and steel "H" pile & reinforced concrete lagging.

4.6.1 Retaining Wall Inventory Status and Anticipated Annual Growth



Roadway Structures database has maintained the retaining wall inventory since 1994. In 2013, we converted the inventory to the Infor, central data repository.

On average, five to ten new retaining walls have been built each year in the past, or approximately 1,125 – 3,375 exposed vertical square feet though only two to five per year is anticipated to be added in the future. Developers build retaining walls and depending on the circumstance, may turn over ownership and maintenance responsibility to SDOT after construction. The number of new retaining walls built per year may increase dramatically if there is a high incidence of landslides in any given year, as was the case in 1996-1997 when ten new retaining walls were built. SDOT's Street Use Division maintains an inventory of steep slopes and may also build new retaining walls to protect the ROW.

We assess retaining wall condition through periodic inspection. Complete inspection of retaining walls started in the late 1980s and has been conducted on an average of once every ten years given current funding levels. Roadway Structures engineers would prefer to conduct condition assessments every five years, but funding limitations do not allow this.

SDOT conducts regular inspections, including underwater inspections, and monitoring of the Alaskan Way Seawall. The northern portion of the central seawall is more than 70 years old and considered to be in poor condition. In 2017, SDOT completed the replacement of the southern 3,450 feet of the central waterfront section of the seawall. This new Elliott Bay Seawall was designed to last more than 75 years and improve the nearshore environment. Prior to the start of the Seawall Project, the existing seawall had protected Seattle for more than 70 years, but time and a harsh marine environment weakened its structure.

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
Earth Retaining	600	Medium	$400/SF	75	$361,371,000	2-5
Water Retaining (Seawall)	6	Medium	$6,400/SF	75	$999,842,000	Unknown
Total	**606**	**Medium**			**$1,361,213,000**[19]	

4.6.2 Retaining Wall Life Cycle Costs, Maintenance Approach, and Funding

Retaining walls rated as fair have a life expectancy of 15-39 years and a retaining wall that has degraded to poor condition is assumed to have a remaining useful life of less than 15 years.

Earth and sea retaining walls have different capital and maintenance needs. This is because the marine environment tends to cause increased deterioration rates. Retaining walls are repaired on a priority basis up to the level of available funding according to the same maintenance response criteria described in the bridge

[19] Reported replacement value for retaining walls decreased significantly from 2010. This is due to accidental double counting of a pier and the Alaska Way Seawall.

section (Section 4.3.2). This funding allows Roadway Structures to inspect and maintain the retaining walls in a functional state but does not allow establishment of a maintenance program that will ensure repair of defects that would prevent further deterioration of the retaining wall while minimizing the overall life cycle costs. The current level of funding does not adequately fund the rehabilitation or replacement of aging retaining walls. Rehabilitation and/or replacement of retaining walls is conducted on a case-by-case basis as part of a capital project.

One exception to the priority-based maintenance approach for retaining walls is the recently built Alaskan Way Seawall. The seawall is designed with cantilevered sidewalks embedded with glass blocks for light transmissivity to the salmon migration corridor and habitat shelves below. The Army Corp of Engineers permit requires SDOT to annually clean and replace damaged glass blocks and maintain gravel on the fish bench along the habitat shelves. Annual funding for this work varies. Over the next six years, $3.827 million is budgeted in a capital fund for this work, with $1.4 million budgeted in 2020. The tideline promenade image below represents the Waterfront project's promenade design, multi-modal uses, and adjacent seawall.

The Roadway Structures group has a modest annual budget of approximately $212,000 for routine maintenance of retaining walls. This funding is static and does not cover the annual increase in square footage of new retaining walls nor replacement of poor condition retaining walls. The Department strives to maintain retaining walls in a manner that there is no more than one lane closure per year due to a failure in the retaining walls. Roadway Structures estimates approximately $1.5 million is required per year to sustainably fund replacement, not including the Northern Alaskan Way Seawall.

4.7 TUNNELS

Tunnels provide an underground means for underpass or below grade crossings. There is only one crossing underpass/tunnel owned by SDOT, and it is located under Aurora Ave at N 79th. The pedestrian / bicycle tunnel was built in 1929 and is currently walled off and closed for public safety reasons.

4.7.1 Tunnel Inventory Status and Anticipated Annual Growth

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
Tunnels	1	High	$1,100/SF		$2,624,000	Unknown

4.7.2 Tunnel Life Cycle Costs, Maintenance Approach, and Funding

Maintenance costs have been included in a general maintenance budget, and specific costs for maintenance of tunnels are not available. The Roadway Structures group maintains the records for the tunnel.

5 - CHANNELIZATION ASSET CLASS

The Channelization asset class consists of pavement markings, other than crosswalks, and delineator posts that define usage of city streets and direct the flow of traffic. Painted lane line channelization is not long-lived, and we generally do not consider it in the same category of infrastructure such as bridges, pavement, or signals which typically last decades. Painted center lane and dashed lane channelization markings along arterials generally require annual maintenance.

Asset	Replacement Value	Condition				Data Confidence
		Good	Fair	Poor	Unk	
Pavement Markings	>$10,000,000	-	-	-	100%	Medium

We do not track condition assessment data due to the short-lived nature of the asset. We use annual remarking and other scheduled maintenance activities to manage risk associated with quality of line markings. It is estimated that SDOT's pavement markings are valued at slightly greater than $10 million (see Figure 5.1), however this is an inherently imprecise estimate due to the lack of inventory data and replacement costs of some types of the pavement marking assets. The number was calculated by combining SDOT pavement marking crew annual budgets and accomplishments along with pavement marking costs associated with SDOT CIP projects.

5.1 PAVEMENT MARKINGS

Pavement markings communicate essential information about the roadway to road users in relation to the use of the roadway and how to negotiate city streets safely and efficiently.

Pavement marking data is managed in GIS and the channelization is updated from project files and field observations along each street segment. Map layers are available to citywide users to view this information. The pavement marking inventory and maps change over time as adjustments are made to lane usage.

While map layers serve as the basis for the inventory of pavement markings on arterial streets, they only represent lines and are indistinguishable by the categories identified in Figure 5.1. At this time, SDOT tracks marked crosswalks, which are covered in the Bicycle and Pedestrian Asset Class, by category and location. This best practice approach allows SDOT to manage marked crosswalk annual maintenance, track claims and collisions, report on accomplishments, and project maintenance funding needs.

SDOT has a wide variety of different pavement markings which are described below:

Bus Boxes - Red methyl methacrylate (MMA) boxes delineating bus -only lanes on arterials. Methyl methacrylate is a polymer with better wearing than traditional thermoplastic. It has been shown to have a lower life-cycle cost than thermoplastic, especially under heavy vehicle loads and where snowplowing is frequent.

Bike Boxes – Green bike boxes are designated areas at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase.

Protected Bike Lane Crossings - Intersection crossing markings, typically painted in green, which indicate the intended path of bicyclists. They guide bicyclists on a safe and direct path through intersections, including driveways and ramps. Protected bike lane crossings provide a clear boundary between the paths of through bicyclists and either through or crossing motor vehicles in an adjacent lane.

Pavement Marking Curb Bulbs – Painted, rather than physically constructed, curb bulbs. SDOT's pavement marking curb bulbs may include tuff post traffic delineators.

Decorative Curb Bulbs – Pavement marking curb bulbs which include decorative design elements and multiple color schemes. Decorative curb bulbs may include tuff post traffic delineators.

MMA Curb Bulbs – Painted curb bulbs utilizing methyl methacrylate (MMA) intended for extended wear and added durability in areas of heavy vehicle loading and frequent snowplowing.

Legends – Painted pavement symbols used to delineate specific intended uses/locations such as ADA or bike facilities.

Delineator Posts – Channelizers ideal for exit lane delineation, head-to-head traffic separation, urban turn restrictions to protect bicycles and pedestrians, edge line delineation, bike lanes, or anywhere that durable, flexible, channelization is required. A reactive spring system ensures the post will return to its original position impact after impact, reducing replacement costs and resulting in negligible vehicle damage.

Bike Corrals - Bike corrals typically consist of multiple rows of bike racks installed in the curbside lane of the street instead of on the sidewalk. Bike corrals are often used where demand for bicycle parking outstrips the available sidewalk space.

Pavement to Parks – Underused public street spaces temporarily reallocated to pedestrian-oriented purposes. These spaces typically consist of decoratively painted pavement, street furniture, planter boxes, and other physical features to create pedestrian-oriented public space in underutilized road right-of-way.

5.1.1 Pavement Markings Inventory Status and Anticipated Annual Growth

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	Anticipated Annual Growth	Maintenance Approach
Painted lane markings	1,726 centerline lane miles	High	$175 per mile of 4" line	1	UNK	Re-stripe annually
Bicycle Lane Line	See Bike Facility Asset	High	$175 per mile of 4" line	3	UNK	Customer request, field observation
Legends, Bike Sharrows	40+ lane miles	Medium-low	$1,000 per legend	5-7	UNK	Customer request, field observation
Legends, Channelization	1,400+	High	$1,000 per legend	3-5	UNK	Customer request, field observation
Hatchings (also called painted barrier areas)	UNK	Low	UNK	5-7	UNK	Customer request, field observation
Stop Bars	5,000-7,000	Medium-low	$250 each	3-5	UNK	Customer request, field observation
Delineator Posts.[20]	2,000+	Medium-low	$250 each	5-7	UNK	Customer request, field observation
Parking Space Delineators (typically no longer maintained)	UNK	Low	UNK	5-7	UNK	Customer request, field observation
Raised Pavement Markings ("buttons")	43,000+	Low	$20	3-5	UNK	Customer request, field observation
Curb Markings (not currently marked due to budget constraints)	UNK	Low	UNK	5-7	UNK	Customer request, field observation
Red MMA Boxes	30+	Medium	$7,500	3-5	UNK	Customer request, field observation
Green Bike Boxes	70+	Medium	$3,000	3-5	UNK	Customer request, field observation
Protected Bike Lane Crossing	70+	Medium	$6,000	3-5	UNK	Customer request, field observation
Pavement Marking Curb Bulb	UNK	Low	Varies	3-5	UNK	Customer request, field observation
Decorative Curb Bulb	UNK	Low	Varies	3-5	UNK	Customer request, field observation
MMA Curb Bulb	UNK	Low	Varies	3-5	UNK	Customer request, field observation
Total			>$10 million estimated			

Figure 5.1 Channelization Inventory by Category

[20] Delineator posts provide visual barriers between bicycle and pedestrian uses of the right-of way. The replacement value of delineator posts related to Bicycle Facilities is included in the Bicycle Facility valuation.

5.2.2 Pavement Markings Life Cycle Costs, Maintenance Approach, and Funding

SDOT maintains legends and stop lines, typically thermoplastic material, when they deteriorate over a three-to-five-year period, depending on traffic volumes. Channelization design may include perpendicular or angled line hatching to further delineate traffic behaviors. This type of channelization is labor intensive to install and remark. Line hatching is a low maintenance priority because it requires hand applied equipment rather than traditional vehicle equipment. Lane use markers may endure indefinitely if they are not impacted by snowplow operations. Delineator posts are often placed adjacent to traffic flow and are subject to vehicle impact.

In some situations, channelization is re-engineered to support multi-modal transportation, reduce collisional potential, and/or address maintenance concerns. Also, SDOT evaluates existing marking patterns for revision as roadways undergo new development, capital project improvements, and overlay maintenance.

The Traffic Signs and Markings group in the Maintenance Operations Division maintains pavement markings.

Annual restriping is part of the maintenance budget while capital improvement projects often construct new layouts. The Move Seattle Levy funding allows for restriping of the arterial pavement painted centerline lane markings, skip dash markings, and edge line markings every year. Other pavement markings are not regularly remarked. The Traffic Signs and Markings group in the Maintenance Operations Branch maintains pavement markings. Remarking work is scheduled based on criticality of the marking in conjunction with field observation and customer request.

In 2020, the adopted budget for signs and markings was $1.66 million. Current funding is considered inadequate to meet all performance targets for arterials, and non-arterials, to adequately maintain lane markings, symbols, bike lanes, and sharrows, and delineator posts - in addition to addressing the current level of customer requests.

SDOT is experimenting with more durable, lane marking materials such as MMA in certain applications (e.g., green bike boxes, red bus lanes) in pursuit of cost-savings through reduced frequency of maintenance.

The program estimates $2 million is needed to adequately manage lane markings and maintain new types of infrastructure (such as green bike lanes) which are typically added by capital projects. Remarking pavement is weather dependent and requires at least three functional vehicles with marking crews. Legends are currently not adequately maintained, and the primary focus of the maintenance program is centerlines, bike facilities, transit facilities, and lane separation lines (dash lane lines).

6 - INTELLIGENT TRANSPORTATION SYSTEM ASSET CLASS

The Intelligent Transportation System, or ITS, class includes all assets that are either electrically- or solar-powered and comprise the system that regulates, controls, communicates and manages the flow of traffic. ITS is a system of interdependent data-driven assets.

Asset	Replacement Value	Condition						Data Confidence
		Excellent	Good	Fair	Poor	Very Poor	Unk	
Beacon	$19,250,000		23.5%	4.7%	0.7%		71.1%	Medium
Camera Assemblies	$4,102,000		99%	-	0.3%		0.7%	Medium
Communication Network	$82,123,000		-	-	-		100%	Low
Counters	$7,680,000		-	-	-		100%	Medium
Dynamic Message Signs	$6,756,000		100%	-	-		-	Medium-High
Network Hubs	$1,074,000		-	-	-		100%	Medium
Radar Speed Signs	$1,275,000		43.1%	-	-		56.9%	Medium
Radio Towers	$1,169,000		13.2%		86.8%			High
Transportation Operations Center	$1,095,000		100%	-	-		-	High
Traffic Signal Assemblies	$293,475,000	6.2%	19.9%	34.1%	24.4%	15.4%	0.0%	Medium-High
Total:	$417,999,000							

Figure 6.1 forecasts the annual ITS asset investment levels. Financial projections assume a consistently applied 33-year replacement cycle.

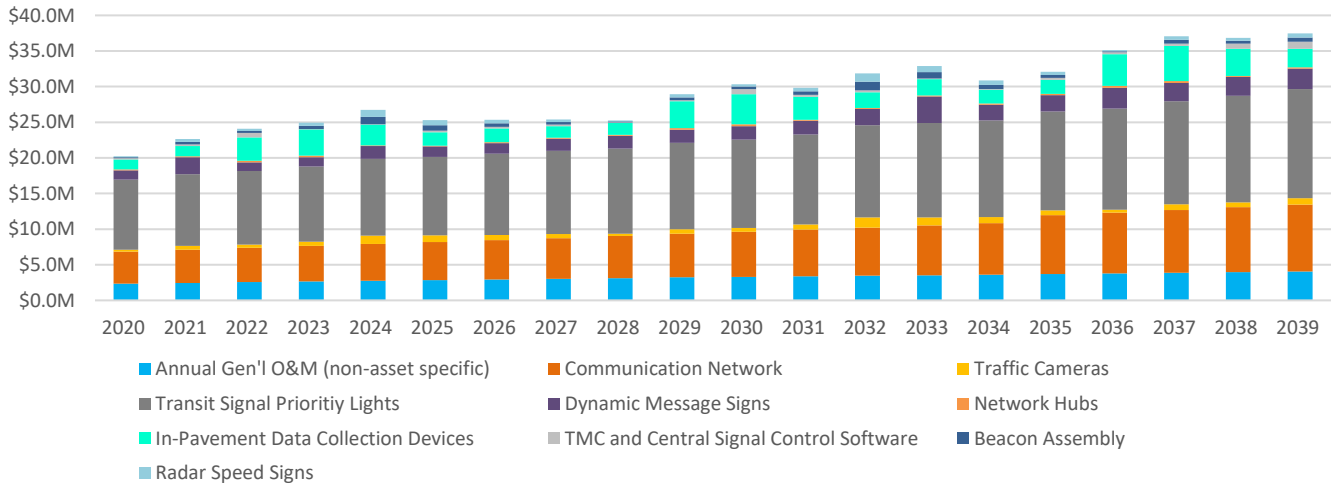


Figure 6.1 ITS Long-term Cost / Needs Forecast (2020 Dollars) 21

[21] Annual expenditure classes denoted by "AE" are not asset classes but annual staff, contracting, or other support expenditures.

ITS uses emerging hardware and software technology to move traffic and improve road capacity by optimizing traffic flows for a more effective and efficient transport system. Benefits of ITS include safety outcomes by enforcing mode separation and managing traffic-flow conflicts at busy intersections, along with hazard alerts and essential travel information. Overall, these systems provide real time roadway related information to the users to improve safety, reduce congestion, decrease travel time, and reduce fuel consumption.

SDOT operates an ITS system composed of radio, twisted-pair, and fiber optics elements that support a citywide transportation network for comprehensive communications. The data that is transmitted over the system comes from many ITS elements that are part of our overall traffic management efforts.

Seattle's first fully operational ITS, corridor traffic responsive operation system, was implemented in 2010 and includes corridors in the ITS Key Arterial Network[22] such as Aurora Ave, Elliott Way, 15th Ave NW, E Marginal Way S, First Ave S, and Fourth Ave S. The traffic responsive operation system is considered one of the most effective operational modes in traffic signal systems. Used in conjunction with historical data methods, responsive operations systems improve traffic conditions by adapting to real time situations. SDOT's ITS Strategic Plan identifies the ITS Key Arterial Network where ITS technology will be implemented.

As part of the ITS system, SDOT maintains the Travelers Information website http://web6.seattle.gov/travelers/ . This website provides traffic conditions on city streets, congestion information, traffic alerts, travel time information, and traffic camera images. Personalized traffic alerts are an example of a common service provided by traveler information websites in the US. SDOT is working with WSDOT and King County Metro to integrate comparisons of travel times by route and mode.

The Transportation Operations Division primarily maintains ITS assets. Current maintenance resource allocations allow for annual ground-level visual reviews of traffic signal hardware such as poles, mounting and support hardware, back plates, and signal and pedestrian indications. Associated follow-up maintenance then occurs for any discovered issues. SDOT performs diagnostic evaluations every four years. ITS assets currently receive only responsive or reactive maintenance. The Department continues to evaluate an age and condition based ITS asset replacement program.

As technology improves and the Department increases the ITS network, more assets are added to the ITS inventory for which no maintenance funding has been identified. Providing comprehensive preventive maintenance of these devices is, therefore, not feasible under current funding levels. Without additional resources, these devices will continue to receive responsive maintenance, only after an issue or a problem has been identified.

[22] SDOT's ITS Strategic Plan identifies the ITS Key Arterial Network where ITS technology will be implemented: seattle.gov/Documents/Departments/SDOT/TechnologyProgram/ITSStrategicPlan20102020.pdf

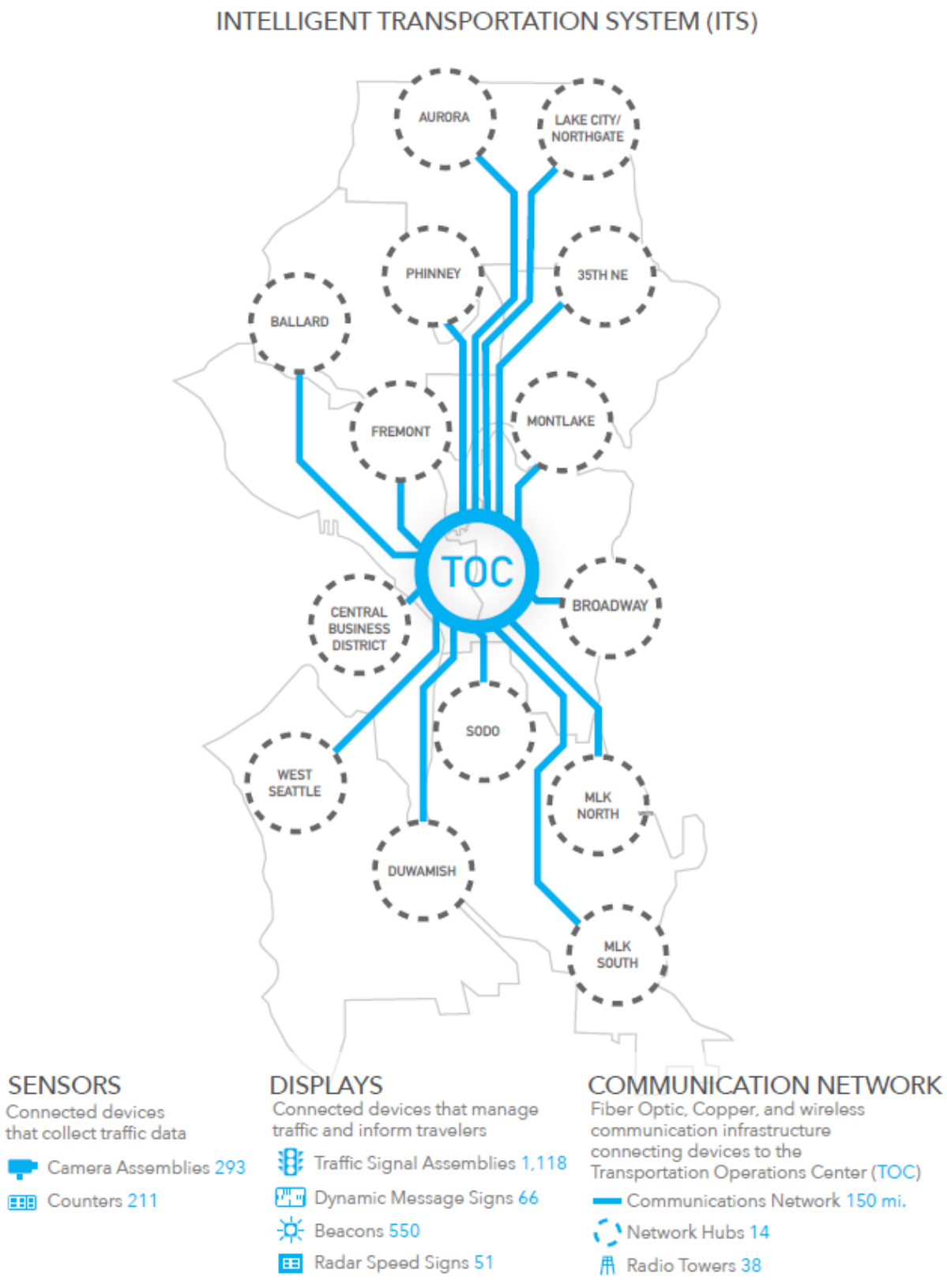


Figure 6.2: Intelligent Transportation System Assets

6.1 BEACONS

A beacon is a warning device to draw a vehicle operator's attention to an associated message that is important to the safe operation of the vehicle on a specific stretch of roadway.

Many of the beacons operate on schedules and have one or more scheduled periods of operation during the day. School beacons are operational twice daily (morning and afternoon) during pre-determined ranges of hours when children are present. All-way stop beacons and emergency/warning beacons are operational on a 24/7 basis.

6.1.1 Beacons Inventory Status and Anticipated Annual Growth

Staff members in the Transportation Operations Center (TOC) maintain the inventory of beacons in the Infor central data repository and program/schedule the hours of operation for the School Beacons.

There are a variety of beacon categories, as follows:

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
School	214	Med-High	$35,000	20	$7,490,000	10-15
Regulatory	121	Med-High	$35,000	20	$4,235,000	Unknown
Crosswalk	157	Medium	$35,000	20	$5,495,000	1-2
Warning	37	Medium	$35,000	20	$1,295,000	10-15
Undetermined	21	Low	$35,000	20	$735,000	Unknown
Total	**550**	**Medium**			**$19,250,000**	

6.1.2 Beacons Life Cycle Costs, Maintenance Approach, and Funding

Maintenance for this asset has not been tracked independently and continues to be included in a general maintenance budget; hence, life cycle costs are not available. Prior to 2007, the maintenance approach for beacons was to respond to damage or operational problems as reports are received and according to maintenance priorities. If the reported problem was safety-related, response was immediate.

Since limited information is available about the beacons, specifically age and condition, it is difficult to assess funding needs in any specific year. Using a life cycle of 20 years for replacement approximately 28 beacons would need to be replaced annually, at a cost of approximately $963,000 per year. In some cases, we can replace beacons with reflective signage, which is less expensive and easier to maintain. This is determined on a case-by-case basis.

6.2 CAMERA ASSEMBLIES

Camera assemblies under the management of the SDOT Traffic Operations Division comprise of closed-circuit televisions (CCTVs). A CCTV camera assembly provides video images of traffic and roadway conditions to the Traffic Management Center, as well as to the public on the Traveler's Map. These images provide information to assist motorists in making smart decisions with respect to their trips, and thereby reduce travel time. A CCTV camera assembly also assists SDOT in diagnosing potential and actual traffic congestion and in determining whether to change the synchronization of traffic signals to enhance the flow of traffic.

6.2.1 Inventory Status and Anticipated Annual Growth

The TOC staff maintains the camera inventory in the Infor Asset Management database. The Department experienced a high rate of growth in recent years in the camera inventory related to the Traveler's Map. Since 2015, travel time technology improvements have made license plate readers (LPR) cameras[23] obsolete due to high installation and maintenance costs. SDOT has removed this camera type from its inventory.

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
CCTV	293	Medium	$14,000	8	$4,102,000	20

6.2.2 Cameras Life Cycle Costs, Maintenance Approach, and Funding

Due to deterioration in the electronic components, cameras undergo periodic repairable random failures. Failures tend to occur and multiply during years 7 and 8. At that point, it is more cost effective to replace the unit rather than continuing to repair the camera to maintain continuous operability.

Maintenance costs for this asset have not been tracked independently and is part of the general maintenance budget; hence, life cycle costs are not available.

SDOT's maintenance approach for camera assemblies is to respond to damage or operational problems as reported and according to maintenance priorities.

Approximately $50,000 is allocated annually for maintenance of camera assemblies. Replacement of these devices began in 2012. From 2015 through 2019, $600,000 has been allocated annually for the replacement of 40 cameras per year.

6.3 COMMUNICATION NETWORK

The communication network includes a system of cables and wireless technologies that link the ITS system. It is the vital link between the ITS assets and the TOC. It serves as the backbone through which all traffic signal data as well as videos are transmitted, allowing for communication between these devices. The communication cable network runs overhead and through underground conduits.

[23] This type of camera was used in combination with CCTV technology to measure travel time along a corridor and convert it to display congestion levels on the Traveler's Information Map.

Fiber optic communications media is required to provide highly reliable communications to all ITS devices. Not only does a fiber network provide robust service to the ITS devices, it reduces maintenance calls. Some locations in the City are served by copper communications, and some locations have no communications for ITS. Long-term ITS deployments require more fiber optic cable. Some of this fiber will be required to replace older copper communications media from major construction projects. Fiber optic resources also support transit signal priority and real-time transit arrival time systems. Three major types of communication networks comprise the system:

1. Twisted pair wiring: Consists of conductors of a single circuit twisted together. The City will phase out this older style of communication network over time and replace with fiber. As we integrate internet protocol (IP) addressable devices, the desire is to replace twisted-pair with fiber. This is primarily due to age, obsolescence, and the increasing need for more data and performance capabilities. SDOT owns and maintains all twisted pair wiring.
2. Fiber: Seattle IT manages and administers the fiber system under the Fiber One Agreement although SDOT technically owns the portion of the system that it uses. The agreement consists of many partners such as: Seattle Fire, Seattle Public Library, King County, and WSDOT.
3. Wireless: The wireless network avoids the costly process of undergrounding cables and is generally implemented and administered using radio communication.

6.3.1 Communications Network Inventory Status and Anticipated Annual Growth

The number of linear feet of the communications network is unknown. SDOT has begun the process of migrating to an IP-based communications network from the existing serial network. This change enables additional communications capacity using the same number of fibers, provides a ring-based network that can withstand a major break in the fiber, and readies the City for the next wave of ITS equipment (which is moving toward becoming exclusively IP-based). We maintain maps of the inventory in the TOC.

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
Twisted pair wiring	UNK	Low		50		Unknown
Fiber	Seattle IT Maintains	High		35		2 miles
Wireless	UNK	Low				Unknown
Total	150 miles	Low	$547,490/mile		$82,123,000	

6.3.2 Communication Network Life Cycle Costs, Maintenance Approach, and Funding

The maintenance approach for the communication network is to respond to damage or operational problems as reported and according to maintenance priorities. Additional funding is required to establish a preventive maintenance program for the network. Maintenance costs have not been tracked independently for this asset, they have been tracked as part of the general maintenance budget; hence, life cycle costs are not available. Approximately $350,000 from the combined general maintenance budget has been allocated for annual maintenance of the communication network.

Very limited condition information is available about the twisted-pair communications network. Maintenance is done as needed; however, the information is not available to determine what level of replacement activity is included in this maintenance. At some point, the City will replace portions of the communications network with fiber and administrate terms under the Fiber One Agreement with Seattle IT. A replacement program has not yet been developed for the communications network, and an annual funding figure for replacement is not available.

6.4 COUNTERS

Vehicle counters are permanently installed devices that provide volume and speed. Recently, the West Seattle Bridge monitoring project installed six locations of vehicle counters to assist with traffic demand analysis and mitigation.

6.4.1 Counters Inventory Status and Anticipated Annual Growth

Traffic Management Data and Records maintain inventory in the Infor database.

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
Vehicle	200	Medium	Varies	10		20
Bike	8	Medium	Varies	7		4
Pedestrian / Bike combined	3	Medium	Varies	7		1
Total	211	Medium	$5,000-40,000		$7,680,000	

6.4.2 Counters Life Cycle Costs, Maintenance Approach, and Funding

SDOT's maintenance approach for counters is to respond to damage or operational problems as reported and according to maintenance priorities. Additional funding is required to establish a preventive maintenance program for these devices. Accurate costs of maintenance have not been determined.

We have not tracked maintenance costs independently for this asset, these specific asset costs have been included in the general maintenance budget; hence, life cycle costs are not readily available.

After approximately seven years, counters generally degrade to fair condition. If a counter degrades to poor condition, then it is anticipated that it may require replacement within one year.

6.5 DYNAMIC MESSAGE SIGNS (DMS)

Travelers use DMS information in making real-time travel decisions. Such information might provide travelers of all modes with important information about traffic congestion, incidents, work zones, transit information, and projected travel times. These signs may also recommend alternative routes, limit travel speed, warn of duration and location of travel delays, or simply provide alerts or warnings. Signs can be pre-programmed, as well as

accessed remotely to update messages with current up-to-the-minute information. We installed DMS starting in 2000.

In the previous report, we included SDOT installed parking guidance signs that displayed dynamic messages regarding parking availability in locations throughout the Central Business District. In 2019, funding to operate these devices was removed and the devices were turned off. These assets are currently identified as out of service until funding is restored for operations.

6.5.1 DMS Inventory Status and Anticipated Annual Growth

Traffic Management Data and Records team maintains DMS inventory in the Infor database.

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
Standard	38	Medium-High	$92,000	15	$3,496,000	1-2
Real Time Transit Info	See Transit	Asset Class				
Parking	16	Medium-High	$92,000	15	$1,472,000	None
Support (9 e-Park with no support)	12	Medium-High	$149,000	50	$1,788,000	None
Total	**66**	**Medium-High**			**$6,756,000**	

6.5.2 DMS Life Cycle Costs, Maintenance Approach, and Funding

The maintenance approach for a DMS is to respond to damage or operational problems as reported and assign work according to maintenance priorities. When a DMS reaches half its useful life, it generally degrades to fair condition. If it degrades to poor condition, the sign will require replacement in three years or less.

Since these are newer assets, only maintenance costs have been recorded so far. Full life cycle costs, which will be needed to establish a preventive maintenance program, have not yet been determined. SDOT plans to continue performing condition assessments during preventive maintenance checks. An accurate assessment of funding requirements for these devices is not available due to their low maintenance priority and limited required maintenance.

6.6 NETWORK HUBS

Network hubs serve as junctions in the communication system between the traffic signal assemblies, the CCTV camera assemblies, and the TOC, using the communication network. We house a variety of electronic communications equipment in the network hubs. We outfit some hubs with Uninterruptible Power Source (UPS) to ensure continuance of communication capability during a power outage lasting less than 24 hours.

6.6.1 Network Hubs Inventory Status and Anticipated Annual Growth

TOC staff maintain the network hub inventory in the Infor database. After approximately six years, the network hub generally degrades to fair condition. If it degrades to poor condition, the network hub will generally require replacement in one year. Electrical components within the hub, such as switches, have useful lives that average four years. Maintenance costs have not been tracked independently for this asset and have been included in a general maintenance budget; hence, life cycle costs are not available.

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
Network Hubs	14	Medium-High	$76,700	7-20	$1,074,000	0-1

6.6.2 Network Hub Life Cycle Costs, Maintenance Approach and Funding

The maintenance approach for the network hub is to regularly provide software pushes, security network penetration tests, verification of operation, and troubleshooting. SDOT repairs the external cabinet damage, performs non-standard preventive maintenance to the cabinet, and repairs electronic equipment failure as problems are reported and according to maintenance priorities. Additional funding is required to establish a preventive maintenance program for these devices. No replacement program has yet been developed for the network hubs.

6.7 RADAR SPEED SIGNS

A radar speed sign provides motorists with feedback of the speed they are traveling as they approach the sign. This feedback reminds motorists to comply with speed limits. This device is intended to lower the frequency of speeding vehicles and the attendant legal risks associated with speeding vehicles. These devices either run on electricity or are solar-powered.

6.7.1 Radar Speed Signs Inventory Status and Anticipated Annual Growth

Radar speed signs were first installed in the City of Seattle in 2006. Anticipated annual growth has not been determined. The acquisition and installation costs are $20,000-$25,000 per location.

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
Radar Speed Sign	51	Medium	$25,000	10	$1,275,000	0 – 4

6.7.2 Radar Speed Sign Life Cycle Costs, Maintenance Approach, and Funding

The maintenance approach for radar speed signs is reactive. SDOT's maintenance approach for radar speed signs is to respond to damage or operational problems as reported and according to maintenance priorities. There is currently no established preventive maintenance program for this asset. After a maintenance program is established, funding requirements will be more readily available.

When a radar speed sign has been in operation about seven years, it generally degrades to fair condition. If it degrades to poor condition, the sign will require replacement in approximately one year. A 3-year warranty is provided with each sign. The manufacturer repairs and upgrades radar speed signs that SDOT crews cannot repair. Since these are newer assets, we have not established maintenance history and or determined full life cycle costs. Maintenance costs have not been tracked independently for this asset and repairs have been included in the Department's general maintenance budget; hence, life cycle costs are not available. The financial need for sign replacement is difficult to predict given our current data limitations and lack of an established maintenance program.

6.8 RADIO TOWERS

The radio tower and associated components are a new asset to the 2020 report. SDOT owns and operates radio equipment, shelters, towers, and auxiliary components. In 2020, the Department completed an asset evaluation and recommendations report that documented the history, location, and condition of SDOT's radio towers and its accompanying assets. Historically, this complex system has been managed by a single staff member in the Department therein posing a significant organizational risk due to a lack of knowledge transfer within the Department. The report recommends next steps for better management and funding of these assets to help ensure that radio tower assets critical to SDOT's day-to-day and emergency operations are well understood and maintained for years to come.

A radio tower facility consists of a radio tower and a radio tower equipment shelter. There are three radio facilities that are critical to SDOT's radio operations: West Seattle location at Westcrest Park, Mapleleaf location (owned by Seattle Information Technology Department - ITD), and North Seattle location at Haller Lake. SDOT owns the radio tower and shelter at the other two facilities, and the land is held by the Department of Finance & Administrative Services (FAS). The Channel 9 tower (leased by ITD) on Capitol Hill is owned by the University of Washington.

Most guests on the City-owned radio towers are involved with emergency operations, the Seattle Police Department (SPD), or the federal government, and lease the space free of charge with the understanding that their operations benefit the greater good of the public. The Federal Communications Commission (FCC) keeps equipment on antennas and shelters, and the Puget Sound Emergency Operations Amateur Radio Group also has equipment in the shelters.

6.8.1 Radio Towers Inventory Status and Anticipated Annual Growth

There are 18 radio facilities in total, 15 of which are on City-owned locations. SDOT pays to lease the other three radio tower locations that are not owned by the City of Seattle. SDOT has 12 different radio channels. SDOT's radio system relies on voting receivers, which are in Bainbridge Island, Maple Leaf Reservoir, West Seattle, Charles St, Haller Lake, and Capitol Hill. Much of the equipment is beyond useful life and no longer supported. For example, the Communications Engineer fixes the antennas by hand.

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Condition	Anticipated Annual Growth
Equipment Shelters	2	High	$100,000	50	$200,000	Good	UNK
Radio Receivers	14	High	$20,000-25,000 ea.	10	$315,000	Poor	UNK
Transmitters	12	High	$20,000-25,000 ea.	10	$270,000	Poor	UNK
Master III Radios	6	High	$20,000-25,000 ea.	10	$130,000	Poor	UNK
Radio Towers (SDOT Owned)	2	High	$50,000-60,000 ea.	50	$110,000	Good	UNK
Antennas	~25	High	$1,200 ea.	20	$30,000	Poor	UNK
Heliax	~2,300	High	$4 per lf.	20	$9,000	Good	UNK
Total:		**High**			**$1,169,000**		

6.8.2 Radio Towers Miscellaneous Inventory

SDOT's radio equipment is on other City-owned assets across Seattle including many bridges and on many of the buildings in the area. Other miscellaneous equipment owned by SDOT includes remote control systems for Spokane St Bridge, and various signs across the city that are controlled by radio. SDOT's radio system also supports pavement temperature sensors, seawall vibration sensors, and automatic vehicle location system.

SDOT has 30-40 leased lines that interconnect all radio transmitting facilities and connect into the Charles Street Dispatch system.

6.8.3 Radio Towers Life Cycle Costs, Maintenance Approach, and Funding

The maintenance approach for the radio towers has historically been to run the assets to failure. In 2020, Asset Management completed an asset evaluation and recommendations report that documented the history, location, and condition of SDOT's radio towers and its accompanying assets. The report recommends next steps for proactive management and funding of these assets to help ensure that radio tower assets critical to SDOT's day-to-day and emergency operations are well understood and maintained for years to come. Below are the recommendations related to asset maintenance or replacement:

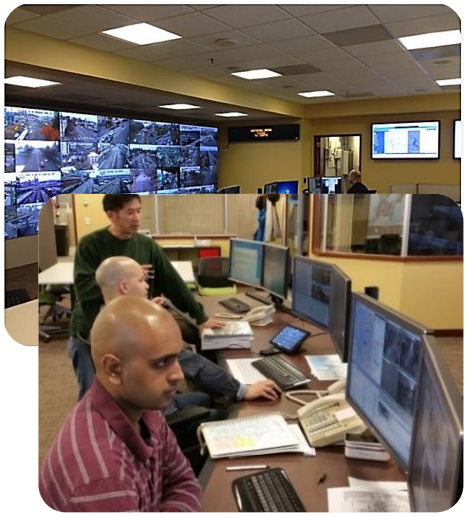
1) Replace entire analog radio system with digital technology. A subsection of SDOT's current system is digital *capable* – this includes dispatch consoles, one broadcast radio on Charles St, and 80-85% of the mobile radios. The transition to digital cannot happen until SDOT obtains the supporting infrastructure changes.
2) Evaluate consolidation of the system components to reduce the number of required vendors.
3) Practice regular maintenance utilizing the recently completed operation manual for the SDOT radio system to keep work practices and technology up to date. This documentation process should prevent losing critical experience-based knowledge as staff retire.
4) Replace leased lines with a microwave system. CenturyLink provides no support for leased line equipment. There was one technician in the state who could service the lines who recently retired.
5) Radio assets are not currently on a condition assessment or replacement schedule and lack a preventative maintenance program. While condition assessments may not be necessary, an expected life and subsequent replacement schedule should be implemented. As with many assets, this run to failure approach does not support sustainably managing this critical asset with interdependent electronic components.

To reiterate, a maintenance plan which takes the aforementioned concerns into consideration needs to be developed. The plan would increase staff knowledge and include regular system condition evaluation, document changes and new useful technology upgrades, and include a preventive maintenance schedule.

6.9 TRANSPORTATION OPERATIONS CENTER (TOC)

The TOC is the central command center for the SDOT ITS. It is the nerve center for SDOT's operations activities. The TOC houses the central computerized control system for nearly 600 of the 1000+ signalized intersections, as well as the main communication hub that connects the central system and those intersections. Home of the camera control system, the TOC operates the system and produces videos for public viewing on the SDOT web page. The TOC also controls the dynamic message signs deployed on Seattle's streets. In addition, the TOC

supports real time information signs for transit, the school beacon operating platform, and road weather information system through operating platforms that leverage the extensive communication network.



There are many sources of real-time information including traffic detectors (Bluetooth Wi-Fi readers and LPR cameras), CCTV cameras, WSDOT feed, SPD scanner, Twitter, road crews, incident response teams, and media traffic reporters. SDOT uses this information to develop real-time situational awareness, coordinate responses to clear accidents, react quickly to problems as they occur, and notify the public and the media of these events to avoid surprises.

The TOC houses SDOT's Traveler's Map website. The map uses an interactive virtual background, which uses live data to display traffic conditions both for city arterials and state highways on one map. We post incidents, planned events, and links to other key transportation sites on the website.

SDOT put the TOC into operation in 2002 and located it in the Seattle Municipal Tower (SMT). The TOC is staffed 24/7 to monitor the effective operation of the transportation system. The TOC has a redundant power source to maintain a 99.99% up-time.

6.9.1 TOC Inventory Status and Anticipated Annual Growth

The TOC houses numerous electronic components. TOC staff maintains these components in a spreadsheet. Condition ratings have not been assigned to the components, although most electronic components have life cycles of four years or less at which point the plan is to replace them with newer technology. The electronic component with the longest useful life is the video wall which is seven years.

Useful life for the TOC itself is indeterminate since a TOC in some form will always be required. The estimated replacement value for the TOC was based on the 2014 TOC upgrade. Maintenance costs are not tracked separately for the TOC.

In the long-term ITS Strategic Plan, SDOT plans to implement a secondary satellite TOC outside of the downtown core. This is currently an unfunded objective. The satellite TOC will provide remote access to ITS assets, if the primary TOC loses power or is inaccessible for any reason. The satellite TOC would serve as a redundant back-up ensuring we can manage traffic signals and ITS functions in case of such emergencies.

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
Transportation Operations Center	1	High	$1,095,000	Varies	$1,095,000	0

6.9.2 TOC Life Cycle Costs, Maintenance Approach, and Funding

The TOC budget is allocated from the combined general maintenance budget. Approximately $50,000 is allocated to the costs of maintenance, which covers the annual cost of replacement for electronic components that make up the TOC, and $1,000,000 is allocated to the annual cost of operations.

Elements of growth that may require additional funding include:

- ✓ Increasing functionality as newer technology is made available
- ✓ Creation of a back-up site
- ✓ Additional staffing for more responsive operations

6.10 TRAFFIC SIGNAL ASSEMBLIES

A traffic signal assembly is the set of assets that comprise a functioning traffic signal at a given intersection or location from the overhead equipment and poles to the controller cabinet and electronics within it that operate the traffic signal.

A traffic signal assembly controls the safe movement of vehicles, pedestrians and bicyclists, minimizes conflicts, and optimizes the flow of traffic throughout the street network. Below is a depiction of the Traffic Signal Assembly components and relationships to other assets:

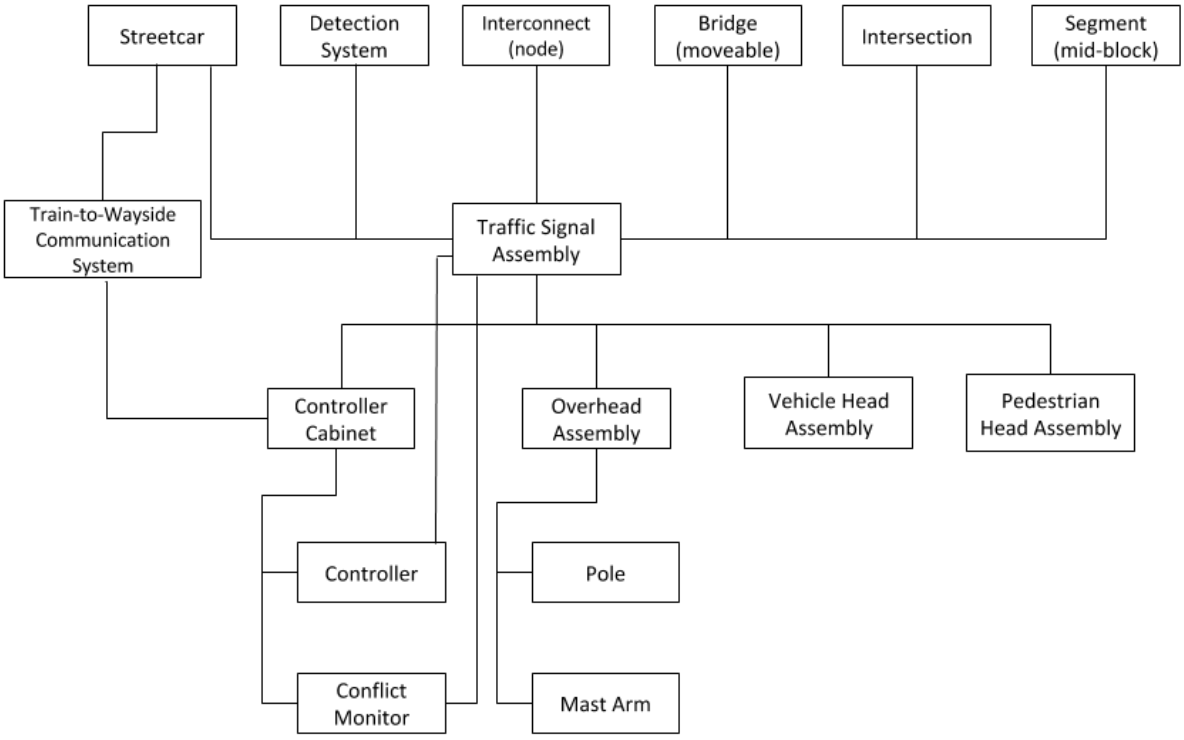


Figure 6.3: Traffic Signal Assembly and Associated Assets

Some traffic signals are populated with detection technology to manage increases in traffic volume data and maximize the efficiency of the roadway. When the volume of both pedestrians and vehicles are low, the traffic signal control system can bypass optimized timing routines and operate the intersection to respond to the detected demand.

Transit signal priority preemption devices are installed along transit routes. These devices detect buses as they approach signalized intersections. If a bus is detected and the signal is about to turn red for the bus, the signal

instead will extend the green light for the bus to reduce delays for riders. SDOT is updating many signal cabinets for the Rapid Ride Transit Corridors to support this functionality.

SDOT purchases Bluetooth/Wi-Fi Reader-gathered data as a service. This service utilizes Wi-Fi device location detection to determine travel times. These devices are housed in signal cabinets and may require maintenance by both SDOT crews and the service provider. Maintenance costs have not been tracked separately for supporting this service.

6.10.1 Traffic Signal Assemblies Inventory Status and Anticipated Annual Growth

The signal inventory is maintained in the Infor database. SDOT is responsible for operating and maintaining assets under other agency jurisdiction such as WSDOT and King County. The traffic signal assembly inventory is partially verified annually during preventive maintenance visits to each location.

SDOT first assessed the overall condition of traffic signal assemblies in 2008. Condition information of the component assets, such as poles, mast arms, spans, and connections were collected and if one component was rated as poor, the entire asset was considered to be in poor condition. In 2014, the rating system was redesigned with point-based scores for each component that correlate to the Infor database standard code values of good, fair, and poor.

Capital projects, SDOT's signal program, or developers may install new traffic signal assemblies as a requirement under a development permit. Developers transfer newly built signals to SDOT for maintenance and operation upon completion.

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
Traffic Signal Assemblies	1,118	Medium-High	$150,000 to 350,000	7-50	$293,475,000	3-8

6.10.2 Traffic Signal Assemblies Life Cycle Costs, Maintenance Approach, and Funding

The collected condition information on components of the signal assembly, such as mast arms and connections, has formed the basis for prioritizing maintenance work to replace aged or damaged components.

BTG funding provided the opportunity to conduct preventive maintenance on an annual basis. BTG also provided funding to install additional traffic signal assemblies or to increase the functionality of existing traffic signal assemblies. SDOT was also able to implement a cabinet/controller replacement program with BTG funding. The Department allocated approximately $4.1 million from the 2020 combined general maintenance budget for maintenance of traffic signal assemblies.

Maintenance costs for this asset type is not tracked separately and are included in the general maintenance budget; hence, life cycle costs are not available. The maintenance approach for traffic signal assemblies is to correct problems identified during annual preventive maintenance of the controller cabinet, and to respond to damage or operational problems as reported and according to maintenance priorities. It is difficult to determine whether current funding is sufficient to address routine maintenance needs. As the number of traffic signal assemblies increases each year, additional funding will be required to maintain these devices. A traffic signal assembly has an open-ended estimate of its useful life. Its useful life is assumed to exist so long as the intersection or mid-block location remains signalized. Moreover, since a traffic signal assembly consists of

numerous components, all of which have differing useful lives, the current life cycle approach is to replace deteriorating or failed component assets, rather than replacing the traffic signal assembly in its entirety.

In the first four years of the nine-year Move Seattle Levy, 13 new signalized intersections have been added to the City's network, 49 traffic signal spot improvements have been performed, 51 signal major maintenance projects have been completed, 900 signal diagnostic evaluations have been carried out, and 3,142 preventive maintenance events have been completed. It will take more than 50 years to replace the SDOT inventory of cabinets/controllers at current funding levels, and additional funding will be required to replace cabinets/controllers in accordance with the useful life or to upgrade the cabinets/controllers to introduce enhanced features or functions.

7 - PARKING PAYMENT DEVICES ASSET CLASS

Parking payment devices collect fees for parking on public property or in the Right-of-Way (ROW). The City of Seattle uses on-street payment devices to manage parking in highly utilized areas to create the turnover needed to support a vibrant city. The Curbside Management group in the Transit & Mobility Division manages parking payment devices.

Asset	Replacement Value	Condition				Data Confidence
		Good	Fair	Poor	Unk	
Pay Station	$11,340,000	100%	0%	0%	0%	High

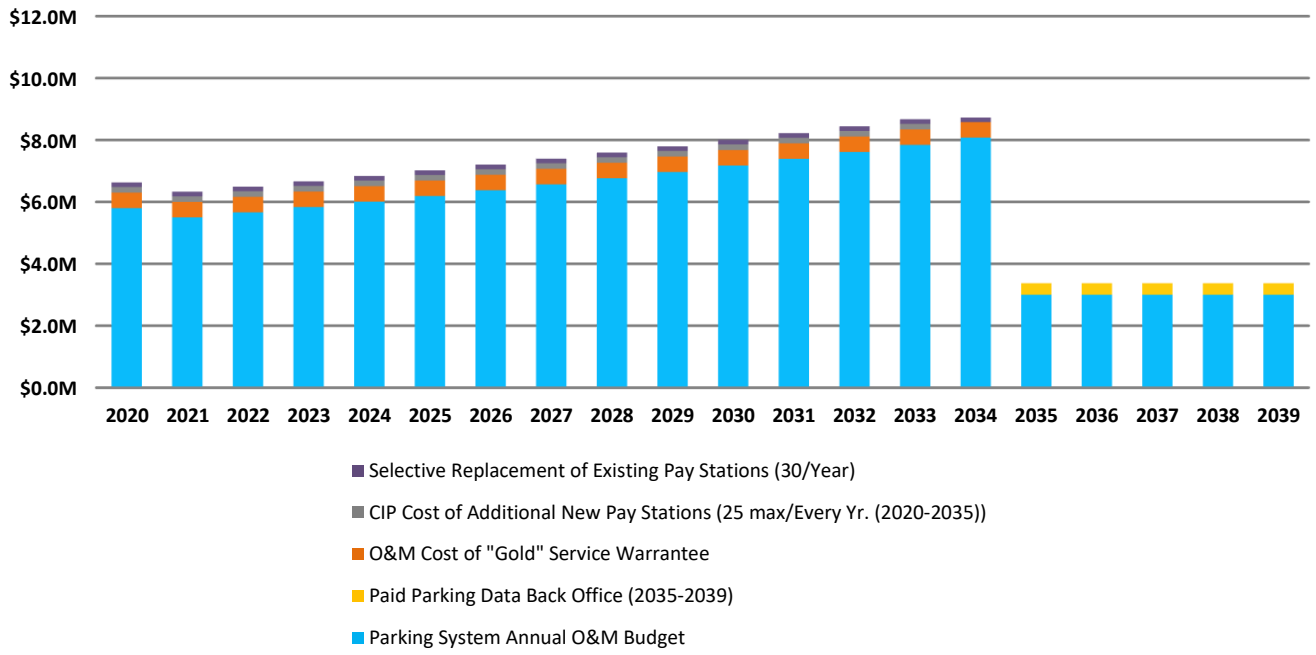


Figure 7.1 SDOT Parking System Long-term Cost / Needs Forecast (2020 Dollars)

SDOT sets parking rates and time limits to achieve the goal of one to two open spaces per block face, to help visitors reliably find parking near their destination. SDOT's innovative performance-based parking pricing program sets rates in over 30 different neighborhood areas to incentivize changes in people's parking behavior, to balance parking supply and demand, reduce traffic congestion and greenhouse gas emissions from drivers circling in search of parking, and encourage alternative travel mode choices when appropriate.

In addition, pay stations allow pre-payment for the next morning's parking in cases where people do not feel safe driving late at night. New technology for pay stations allows SDOT to further refine the program by allowing time-of-day pricing and pay by phone parking.

Tools	Outcome
• Promote parking turnover • Manage a limited amount of on-street spaces primarily in commercial areas where demand exceeds supply • Provide short-term parking spaces for shopping or personal errands • Improve traffic circulation and economic viability of commercial areas by maximizing the number of patron visits by car	• Balance competing needs for limited curbspace (transit, customers, residents, shared vehicles) • Provide access for people to live, work and play in the city • Move people and goods efficiently • Support business district vitality • Create active spaces • Support livable neighborhoods

SDOT actively manages pay stations daily to maintain continuous operations. In 2019, paid parking contributed $37.2 million in annual revenues to the City at an operating cost of approximately $6.8 million.

7.1 PAY STATIONS

Pay stations are electronic payment devices installed on sidewalks adjacent to on-street parking. A pay station controls more than one parking space. Payment is accepted by credit/debit card, coin, or via the "PayByPhone" app. Components of this parking payment device include a payment card reader, a receipt printer, and a solar panel.

We connect the pay stations to a data management system hosted by the vendors, communicating directly with the Parking Maintenance Shop which monitors performance of the pay stations on a real-time basis. During pay station hours of operation, help is provided to customers via telephone.

SDOT began installing pay stations in 2004 to replace single-space parking meters. By 2013, single-space parking meters had been completely replaced by pay stations in the City of Seattle. All pay stations were replaced or upgraded with new technology from 2015-2018. All pay stations now operate in a "pay by plate" mode. No longer do customers have to go back to their car and stick a ticket in their window. Now, they enter their license plate at the pay station and pay for parking. Enforcement systems have been upgraded in coordination with this change.

7.1.1 Parking Payment Devices Inventory Status and Anticipated Annual Growth

The inventory of pay stations is maintained in the Infor database system. Total replacement value represents the vendor contract which includes curb space design, pay station removal and installation, training, user interface development, systems integration, and monthly data and wireless communication costs.

SDOT periodically examines on-street parking conditions in various neighborhoods and business districts throughout the city, which may or may not result in modifications to paid parking in each area. New pay stations come with a comprehensive warranty ("Gold Warranty") that protects and "future-proofs" the City from changes in cellular networks, payment card industry compliance requirements, parts obsolescence, and all component failure.

Asset	Inventory Count	Data Confidence Level	Replacement Value (Each)	Useful Life (Years)	Asset Replacement Value	Anticipated Annual Growth
Pay Station	1,512	High	$7,500	Varies	$11,340,000[24]	0-25 stations every year through 2029

7.1.2 Parking Payment Devices Life Cycle Costs, Maintenance Approach, and Funding

SDOT estimates that if there is another pay station replacement project, it would occur in 2025 or later. Alternatively, pay stations may be upgraded piece by piece under the Gold Warranty until they are no longer needed. The parking industry anticipates that soon, agencies may transition from primarily a physical payment methodology to primarily a virtual payment scheme whereby customers can make all payments by phone or means other than the physical transfer of cash. For the purposes of projecting long-term operational costs for parking payment devices, we assume this will take place in the year 2035. As we move closer to replacing parking payment devices with new virtual technology, SDOT will evaluate race and social justice implications of requiring smart phones or newer technology that may not be accessible to all. Operations and maintenance of Seattle's paid parking system is roughly $5.8 million per year (in 2020 dollars):

- ✓ $2.6 million in annual staffing costs (labor, benefits, and overhead costs). These staff provide all the day-to-day operations and maintenance for the parking pay stations, equipment and system troubleshooting, system maintenance, removal and reinstallation of pay stations for construction, changes to curbspace in paid parking areas (e.g., new loading zones, etc.), some graffiti removal, system and revenue reporting, analytics, customer support and response and management of the operation.
- ✓ $2.8 million in annual fees for wireless communications and back office, credit card fees, data collection, and warrantees.
- ✓ $0.4 million in annual vehicle costs, consumables for pay stations and supplies for the shop.

Malfunctioning components on pay stations are repaired or replaced as needed. While under warranty, these repair costs are borne by the vendor.

[24] Includes purchase, installation, and monthly data and wireless communication costs

8 - PAVEMENT SYSTEM ASSET CLASS

The Pavement System asset class consists of the surface, base, sub-base, and subgrade of Seattle's street network.

Asset	Replacement Value	Condition						Data Confidence
		Excellent	Good	Fair	Poor	Very Poor	Unk	
Arterial	$5,008,263,000	13.4%	28.4%	23.1%	16.0%	19.1%	-	High
Non-arterial	$4,158,207,000	20.0%	27.9%	20.5%	12.9%	18.7%	-	High
Total:	$9,166,470,000							

Figure 8.1 below shows the expected annual planned spending from 2020 to 2039 for SDOT's arterial pavement system as well as the spending needed to maintain the current average system condition (average PCI of 62.2) 20 years from now in 2039.[25] For the purposes of this analysis, it is assumed that arterial pavement spending remains constant (in 2020 dollars) for all years, including the years 2025-2039 after the Move Seattle Levy has ended.

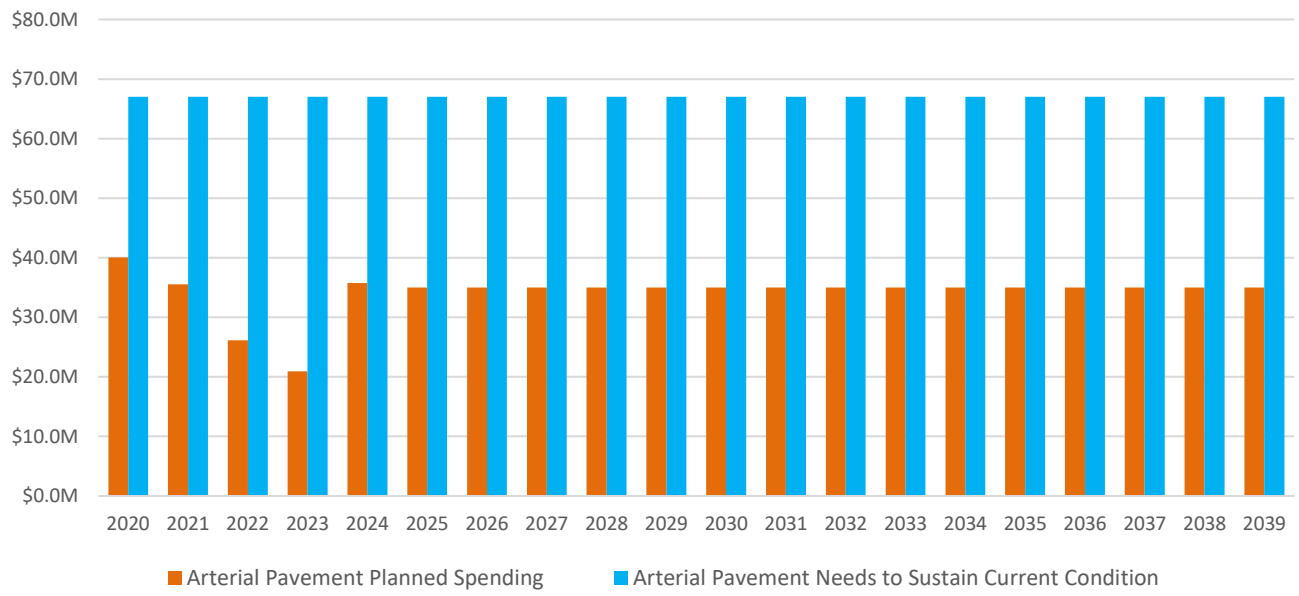


Figure 8.1 Arterial Pavement Current Level of Planned Spending and Investment Needs to Sustain Current Condition (2020 Dollars)

[25] In 2015, a similar estimate was developed for the non-arterial pavement system. At that time, an annual spending of $48 million on pavement rehabilitation and another $6 million in preventive maintenance was deemed necessary to maintain the non-arterial pavement system at a PCI around 60.

Figure 8.2 below demonstrates the rate at which Seattle's arterial pavement has been replenished from 2007 thru 2019, and also how it is planned to be replenished from 2020 thru 2024. With a target ratio of 1.0 to maintain existing pavement quality, the chart shows that historical funding since 2007 has not been adequate to sustain the City's arterial pavement quality, almost certainly resulting in future financial liability. Notably, Figure 8.2 shows that planned arterial pavement replenishment will decline further in the second half of the 9-year Move Seattle Levy.

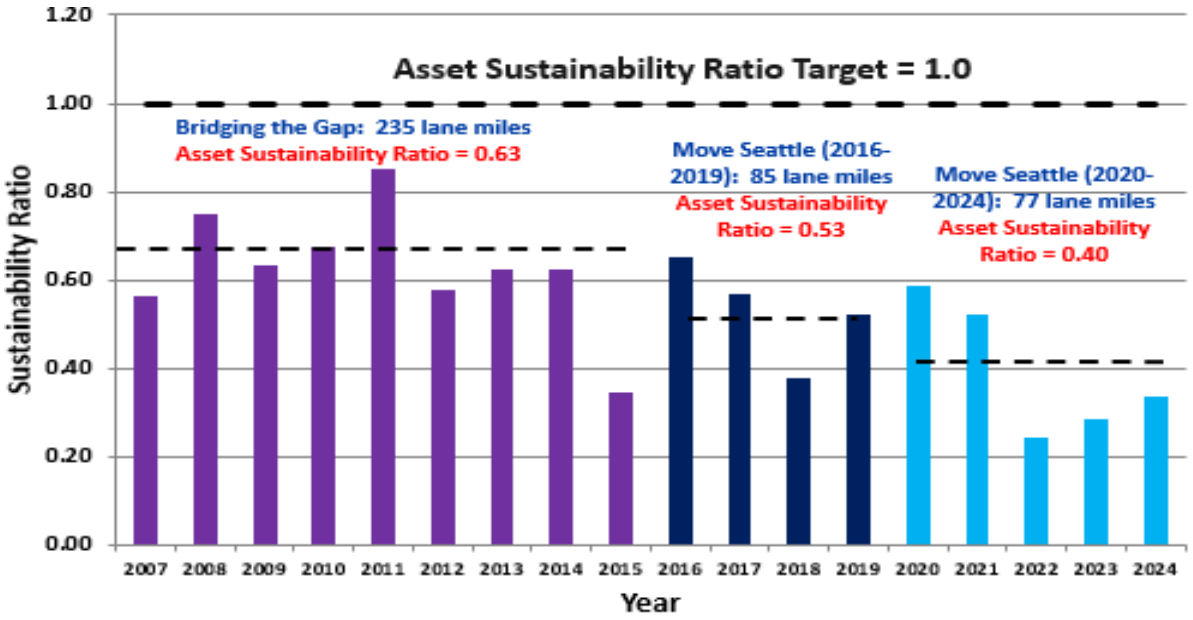


Figure 8.2 SDOT Arterial Pavement Asset Sustainability Ratio

8.1 PAVEMENT SYSTEM

SDOT divides the Pavement System asset class into four major categories:

- ✓ Arterial
- ✓ Non-Arterial
- ✓ Alleyways
- ✓ Excess ROW in use for access and parking

The primary focus of SDOT's pavement management program is the maintenance, preservation, and rehabilitation of existing streets to support evolving transportation uses. Since most of the pavement infrastructure is represented by the arterials and non-arterials, these two pavement categories have been emphasized in this report. The total arterial and non-arterial pavement network in Seattle consists of 3,944 12-foot-wide lane miles. This calculation was based on the most recent comprehensive pavement management assessments conducted for arterial pavements (2017-2018) and non-arterial pavements (2015-2016).

Seattle's street network is essentially "built out" and its overall size changes very little from year-to-year. Over the last decade, the overall size of the street system has decreased by 2 lane-miles from 3,946 lane-miles in 2003 to the current total of 3,944 lane miles. In many cases, SDOT street rehabilitation projects narrow the paved surface used by vehicles in favor of improvements for pedestrians and transit at the roadway edge. The focus of SDOT's pavement management effort is the maintenance, preservation, and rehabilitation of existing streets to support evolving transportation uses. No inventory of alleys and parking areas have been performed to date, therefore, for the purposes of this report, detailed information on alleyways and excess ROW are not presented.

8.2 ARTERIAL PAVEMENT

Arterials are Seattle's busiest streets. They are classified according to the traffic they carry:

- ✓ Principal arterial – the most important, busiest through-streets, such as Rainier Ave S or 15th Ave NW. In 2012, SDOT re-classified principal arterials in their entirety to be included in the Federal Highway Administration (FHWA) National Highway System (NHS).
- ✓ Minor arterial – streets that link neighborhoods together, such as California Ave SW or N 80th St.
- ✓ Collector arterial – streets that tie the least traveled streets, the non-arterials, into the arterial street system, such as Magnolia Blvd W or 31st Ave S.

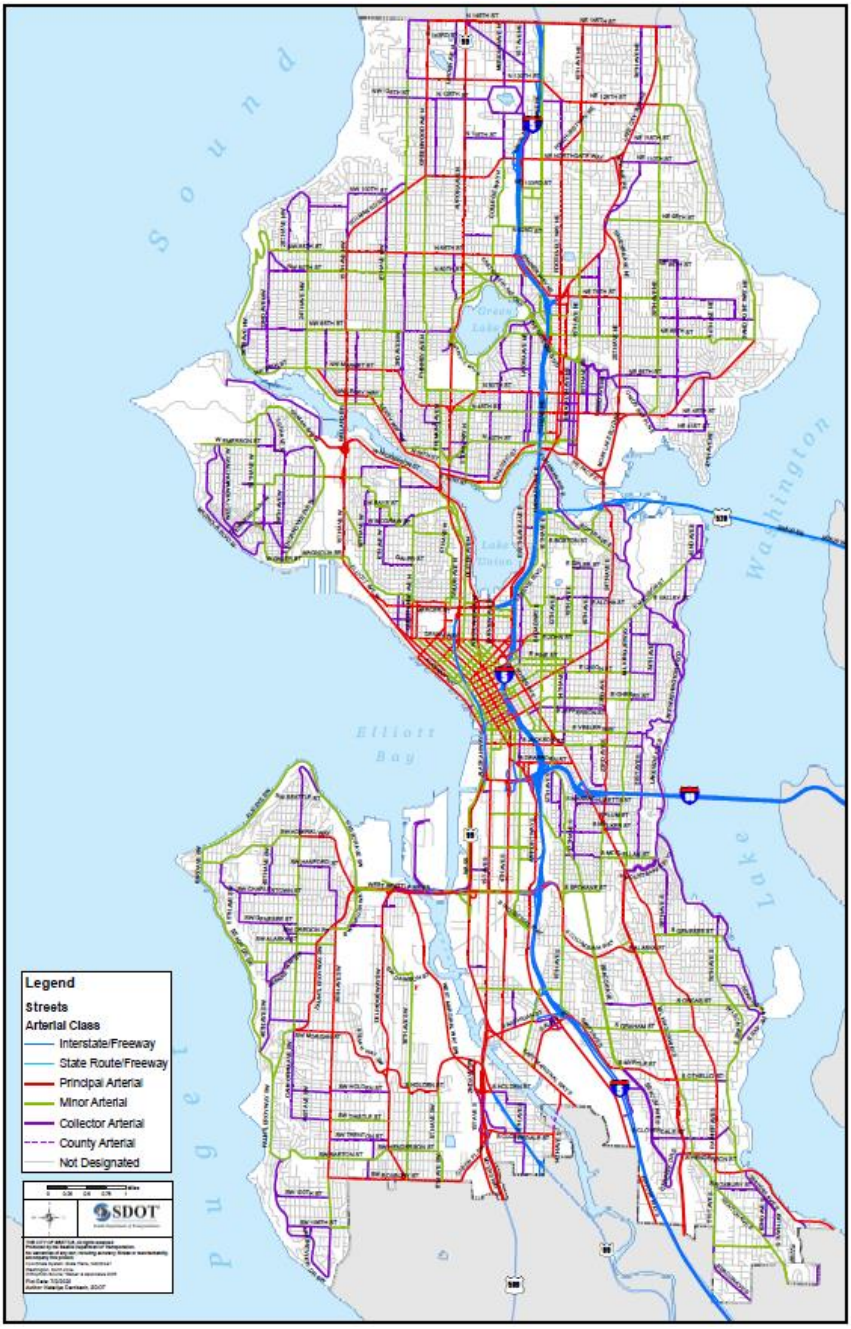


Figure 8.3: Seattle Arterial Classification Planning Map

Arterials account for 39% of Seattle's pavement network, or 1,548 lane miles. The break-down of arterials according to the functional classification is:

Functional Classification	Pavement Area (12-ft Lane Miles)	Fraction of Arterial Network
Principal Arterial	627	40%
Minor Arterial	569	37%
Collector Arterial	352	23%

The pavement inventory is maintained in the Pavement Management System database where condition and maintenance information are also recorded. New pavement is entered into the database annually and SDOT typically updates arterial condition ratings every three to four years with the next assessment tentatively scheduled for 2021-2022. The City adds very little new inventory to the street network annually. Additions that occur are usually in connection with redevelopment, mega projects, or (rarely) annexation.

The arterial pavement network replacement cost is estimated in 2020 dollars, not including the cost of the ROW, drainage improvements, additional new curb ramps, or other improvements that might be required or desired if streets were reconstructed.

SDOT conducted the 2017-2018 arterial pavement condition survey using an automated system that employed an array of cameras and sensors to record pavement distress. In addition to pavement distress information, digital photo logs were collected. Pavement condition is assessed using an industry-standard rating methodology described in Appendix B to derive a Pavement Condition Index (PCI).

8.2.1 Arterial Pavement Inventory Status and Anticipated Annual Growth

Asset	Inventory Count	Data Confidence	Design Life (Years, typical)	System Replacement Value	Anticipated Annual Growth
Concrete Rigid (PCC)	562	High	40+		Unknown
Asphalt Flexible (AC or AC/AC)	132	High	20+		Unknown
Composite (AC/PCC)	847	High	20+		Unknown
Bituminous Surface Treatment (ST)	7	High	20+		Unknown
Other (O)	0.1	High	varies		Unknown
Total	**1,548**	**High**		**$5,008,263,000**	

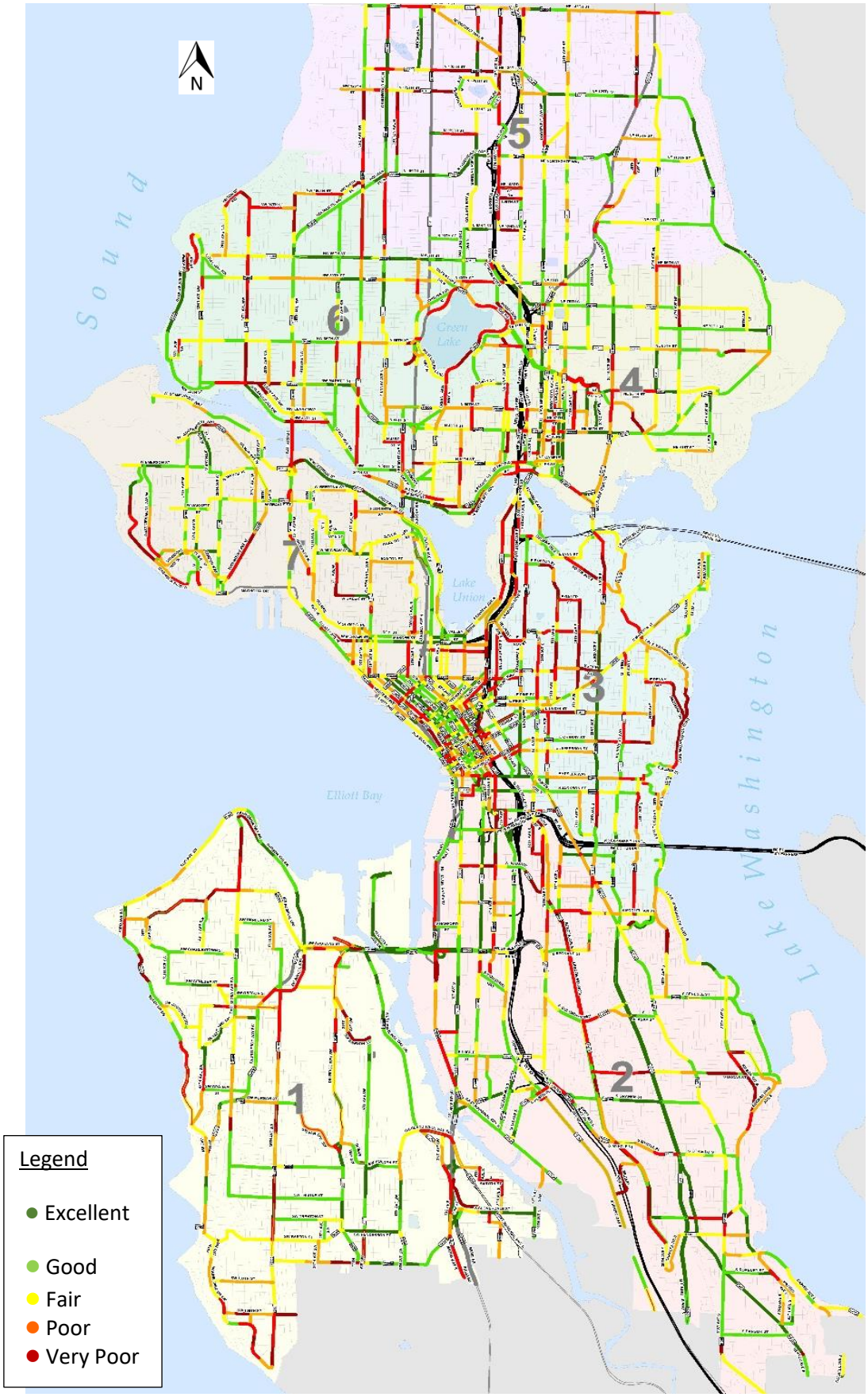
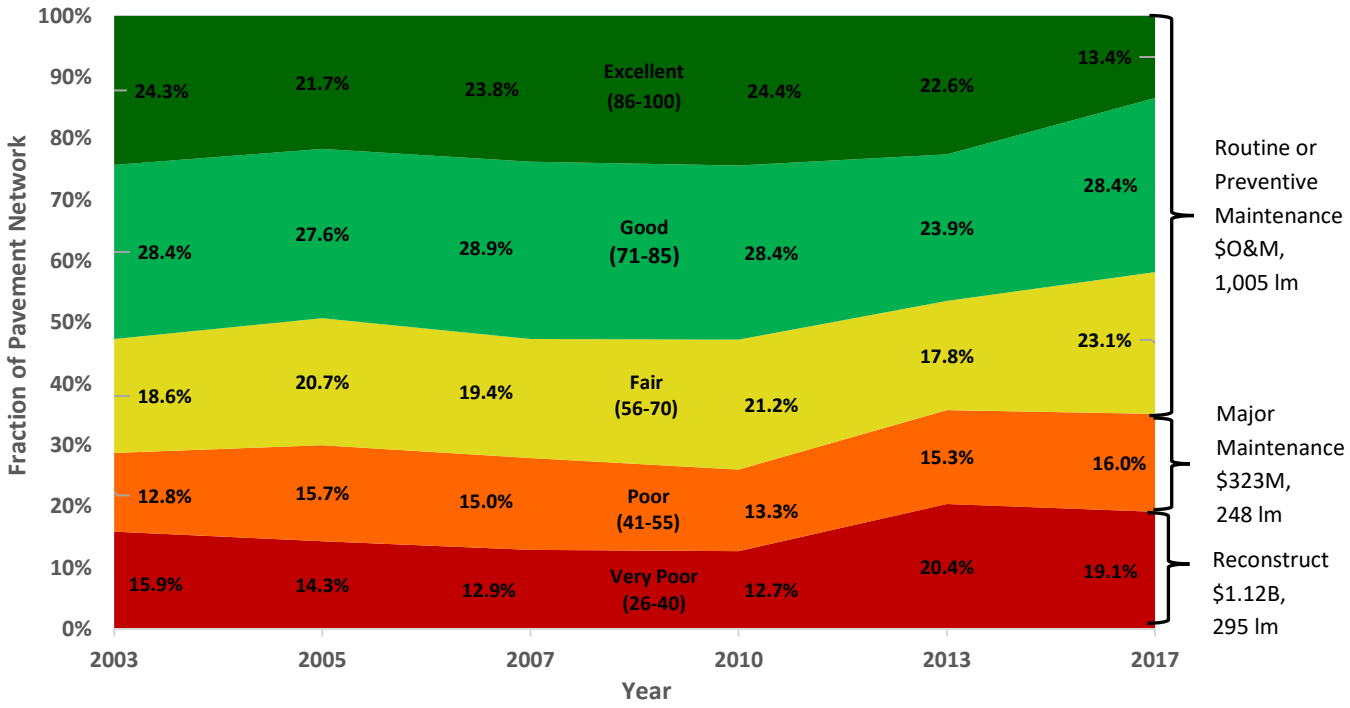


Figure 8.4: Arterial Pavement Condition Ratings 2018



Arterial Average Pavement Condition Index (PCI), Area Weighted

2003	2005	2007	2010	2013	2018
67.5	***66.5***	***68.3***	***68.8***	***63.8***	***62.2***

Figure 8.5: Arterial Pavement Condition Ratings 2003 - 2018

8.3 NON-ARTERIAL PAVEMENT

Non-arterials are Seattle's lowest volume streets. Non-arterial streets serve a variety of users. Most non-arterials are neighborhood residential streets, but some also support industry in areas such as south of downtown (SODO), South Park, and the Ballard/Interbay Manufacturing Industrial areas. Because of their limited use, non-arterials are typically of lighter construction than arterials, however, they still must drain properly, have adequate structure to support some use by heavy vehicles and resist environmental degradation.

8.3.1 Non-Arterial Pavement Inventory Status and Anticipated Annual Growth

Non-arterials account for 61% of the pavement network of Seattle. We store and manage the non-arterial pavement inventory in the Pavement Management System database. In 2014-2015, SDOT performed the first comprehensive condition assessment of non-arterial streets using in-house staff. The assessment gave us some general information about non-arterial pavement.

- ✓ More than half of Seattle's non-arterial streets were constructed of concrete during the first half of the 20th century. Concrete pavements suffer minimal environmental degradation in Seattle's mild climate. They are long lived, particularly in lightly loaded non-arterial applications.

- ✓ Approximately 25% of non-arterial streets are built of composite pavement (AC/PCC), which is jointed concrete, brick, or sheet top that has been topped with a layer of hot mix asphalt. These streets are in Seattle's older neighborhoods in and around the center city. They are referred to as composite pavements because of the combination of flexible (asphalt) and rigid (concrete or brick) materials. The asphalt surfacing improves ride quality, but it adds minimal structural support and generally should be renewed every 20 years or so to address reflective cracking and weathering.

- ✓ Approximately 25% of Seattle's non-arterial streets were gravel roads converted in the 1960s and 1970s to a low-cost pavement called bituminous surface treatment (BST) or chip seal. This occurred primarily at the north and south borders of Seattle where sidewalks and formal drainage systems typically do not exist. We chip seal these streets to patch and reseal on a regular basis to renew the surface and seal the pavement structure against water intrusion. Seattle briefly switched from chip sealing to a treatment called microsurfacing but has since suspended the practice due to lack of funding and has now moved to slurry seal for preventive maintenance. Non-arterial streets often lack sidewalks and formal drainage systems.

- ✓ There is a small inventory, less than 1% of the system, surfaced with gravel or a historic/decorative surface such as cobblestone or pavers.

The non-arterial pavement network replacement cost does not include the cost of right-of-way, drainage, or other improvements that might be required or desired if we reconstructed the streets. Funding for non-arterial pavement has been limited and, hence, reliable cost figures are not available. The cost figures used in this section are rough estimates derived by scaling down the arterial paving costs to account for the thinner pavement sections and reduced traffic control on non-arterials.

Delayed repair on non-arterial pavement has similar impacts as arterial pavement although 2014-2015 condition information on non-arterial pavement shows that non-arterial pavement quality declines at a much slower rate than arterial pavement quality, likely due to the lower traffic volumes and lighter vehicles found on those streets.

Asset	Inventory Count (Lane miles)	Data Confidence	Design Life (Years, typical)	System Replacement Value	Anticipated Annual Growth
Concrete Rigid (PCC)	1,264	High	40+		Unknown
Asphalt Flexible (AC or AC/AC)	558	High	20+		Unknown
Composite (AC/PCC)	9	High	20+		Unknown
Bituminous Surface Treatment (BST)	545	High	20+		Unknown
Gravel (GR)	10	High			Unknown
Other (O)	10	High			Unknown
Total	**2,396**	**High**		**$4,158,207,000**	

8.4 PAVEMENT SYSTEM ASSET CLASS - Life Cycle Costs, Maintenance Approach & Funding

Several reasons have likely contributed to the recent decline in arterial pavement quality:

- ✓ Evidence suggests that the increasing use of heavy vehicles on Seattle's arterials, and buses in particular, which have uniquely heavy axle loads in addition to filling them to crush load capacity, are accelerating a decline in pavement quality on arterials.
- ✓ More stringent Americans with Disability Act (ADA) requirements which add to paving project costs in the form of replaced or retrofit curb ramps.
- ✓ State safety rules limiting the equipment that can work around Metro trolley bus lines, pushing work onto weekends at overtime rates.
- ✓ In 2006, Seattle Public Utilities (SPU) began requiring SDOT to fund and construct drainage improvements on virtually all paving contracts involving full-depth pavement repairs. Paving projects must now install storm water detention and treatment facilities in accordance with the City's Stormwater Code to meet SPU requirements.
- ✓ The provisions of the "Complete Streets" ordinance and resolution require paving projects to improve the ROW for all modes of transportation.

Compounded inflation over the 9-year life of the Move Seattle Levy means that a dollar spent in 2024 will have about 20% less buying power than a dollar spent in 2016. Available funding does not accomplish as much paving as in previous decades. In addition, and as can be seen in Figure 8.3, arterial paving projects were somewhat front-loaded in the early and middle years of the Move Seattle Levy.

8.4.1 Useful Life & Life Cycle Cost of Arterial Pavement

Delaying repairs on arterial pavement when the pavement condition indicates a need creates deferred maintenance. Deferred maintenance is work that is postponed to a future budget cycle or until funds are available. As maintenance is continuously deferred, arterial pavement deteriorates to the point where it will eventually need to be completely reconstructed.

When an existing pavement structure is sound, we can often renew the driving surface at a fraction of the cost of digging up and replacing the entire roadway. If we cannot apply a major maintenance treatment, the arterial pavement structure continues to deteriorate to the point where it must be completely reconstructed as shown in the Figure 8.6 below. Reconstruction, where we remove and replace the entire pavement structure to the sub-base, is approximately 5 to 7 times more costly than resurfacing or other forms of major maintenance. Pavement managers strive to follow a lowest life-cycle-cost approach to pavement maintenance, emphasizing treatments that extend the life of existing pavement structures where possible. However, we must balance this against reconstruction needs on streets critical to the transportation system.

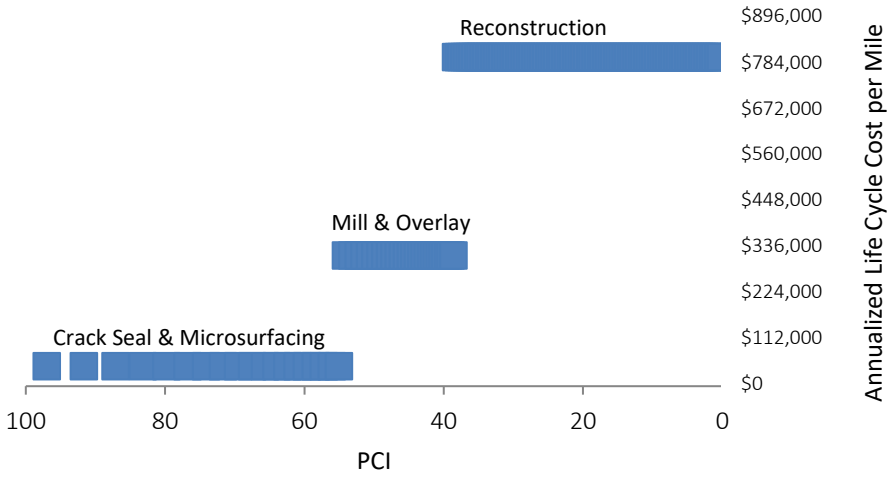


Figure 8.6: Cost of Restoration Increases as Pavement Condition Declines

8.4.2 Arterial Pavement Project Prioritization

Since the last report, SDOT has improved its method of prioritizing pavement preservation and restoration work by determining the highest benefit-to-cost street segments in need of maintenance treatment. Through estimating the cost to road users of deteriorated pavement conditions and the cost of appropriate treatment to restore its condition, a benefit/cost ratio for restoring each street segment can be calculated. The benefit/cost ratio provides an initial screening of street segments designating those segments with the highest ratio as the best candidates to receive the limited funds for pavement rehabilitation.

SDOT's tool for first-cut prioritization is an economic decision model that uses street segment data on: a) traffic – average daily volume of cars, trucks, buses and bikes, b) current pavement condition, c) future condition based on expected deterioration rate without treatment based on pavement type and use, d) impact on vehicle operating costs of current and future pavement condition, and e) the cost of pavement restoration using the appropriate treatment with the lowest life-cycle cost for each segment. The model calculates the life-cycle benefits to road users from reduced vehicle operating costs and compare them to the life-cycle costs of pavement restoration. Streets with high traffic volumes, highly deteriorated conditions, and low life-cycle cost restoration will likely make it to the highest first-cut priority for funding.

The chart below illustrates the increase in Vehicle Operating Costs (VOC) as pavement condition deteriorates as measured by the Pavement Condition Index (PCI). The higher the traffic volumes and the lower PCI, the greater the total costs to users of the street segment. One of the benefits of pavement restoration is returning the vehicle operating costs to lower levels associated with pavement in good condition.

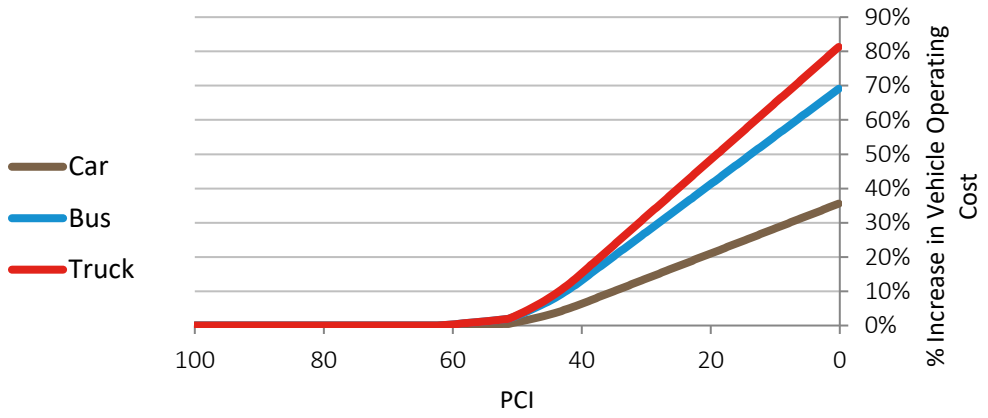


Figure 8.7: Road User Cost Increases as Pavement Condition Declines

Final project prioritization will require "packaging" of street segments into practical and efficient pavement projects, and applying additional criteria for project priority, including:

- ✓ Feasibility of model treatment
- ✓ Grants and other leveraged funding opportunities
- ✓ Utility and other project coordination
- ✓ Complaints and claims
- ✓ Equity and geographic balance across the city

8.4.3 Arterial Pavement Maintenance Approach

We subdivide arterial streets by surface type. Seattle has three primary arterial surface types:

- ✓ Portland cement concrete (PCC, Rigid)
- ✓ Asphalt concrete over Portland cement concrete or other rigid base (AC/PCC, Composite)
- ✓ Asphalt concrete over aggregate base (AC, Flexible)

SDOT currently provides four basic types of maintenance services and capital improvements for arterial pavement:

- ✓ Routine Maintenance - All streets receive routine maintenance as needed to keep the street serviceable. This is typically filling potholes and other small patching work as localized conditions warrant and in consideration of other day-to-day operations/functions like street sweeping and vegetation control routine maintenance.
- ✓ Preventive Maintenance – Streets with a PCI rating of 61-80 are typically candidates for preventive maintenance. These are streets that are smooth, in good structural condition, and have only minor defects related to exposure to the elements. Work of this type typically consists of low-cost preservation treatments such as sealing cracks & joints and, on asphalt pavements, the application of surface seals.
- ✓ Major Maintenance or Minor Rehabilitation – We typically consider streets with a PCI rating of 41-60 candidates for major maintenance. These are typically deeper preservation treatments intended to extend the life of the existing pavement structure. Common treatments in this category include milling

off the top layer of an asphalt pavement and then overlaying a new asphalt surface and, on concrete pavements, replacing select concrete panels and re-profiling the surface.

- ✓ Reconstruction or Major Rehabilitation – When streets fall below a PCI of 40, they have typically accumulated enough structural distress where they must be reconstructed from the subgrade all the way to the surface. In some cases, we can save a portion of the existing pavement and refer to it as partial reconstruction.

While the BTG and Move Seattle levies have provided an increase in funding for SDOT's arterial pavement starting in 2007, the overall quality of Seattle's arterial pavement has declined recently, particularly from 2010-present.

8.4.4 Non-Arterial Maintenance Approach

Seattle's non-arterial roads can be subdivided into the four primary surface types:

- ✓ Portland cement concrete (PCC)
- ✓ Asphalt concrete over Portland cement concrete or other rigid base (AC/PCC)
- ✓ Asphalt concrete over flexible base (AC)
- ✓ BST (Chip Seal)

Brick, stone, or gravel (classified as "Other") makes up a small fraction of the non-arterial street network. Each pavement type has different maintenance requirements.

8.4.5. Non-Arterial Life Cycle Costs, Maintenance Approach and Funding

SDOT currently provides two basic types of maintenance services for non-arterial pavement:

- ✓ Pothole and spot repair
- ✓ Preventive maintenance (rehabilitation)

Pothole and spot repair do not improve non-arterial pavement condition. This treatment is a stop-gap measure to keep the streets in a safe driving condition until a rehabilitation project can be undertaken.

Routine or preventive maintenance (rehabilitation) is carried out as funds permit. The Move Seattle Levy funding does not provide for non-arterial pavement maintenance. The current maintenance budget primarily provides spot safety repair and a small amount of asphalt and concrete rehabilitation, including microsurfacing under SDOT's Preventive Maintenance Program.

9 - REAL PROPERTY ASSET CLASS

The Real Property asset class includes land, buildings, and yards that support SDOT transportation purposes. While SDOT's primary mission is the management of the ROW, the Department owns real property assets for several reasons. SDOT uses buildings and yards to support operations and maintenance activities and personnel. SDOT pays for capital improvements and maintenance on SDOT real property. Property used for operations is either under the jurisdiction of SDOT or is located on leased land. SDOT, the Department of Finance & Administrative Services (FAS), or King County Facility Operations provide maintenance and management of operational facilities. In addition, SDOT has acquired parcels and buildings for construction purposes during capital projects construction, which include a variety public and private uses. FAS's Facility Operation's Division, with direction from SDOT, manages these parcels and buildings.

Asset	Replacement Value	Condition				Data Confidence
		Good	Fair	Poor	Unk	
Buildings & Yards	$47,700,000 [26]	35.7%	35.7%	28.6%	N/A	Medium-High
Parcels	N/A	-	-	-	N/A	Medium-High
Shoreline Street Ends (ROW)	N/A	-	-	-	N/A	Medium-High

The Facility Operations Division in FAS maintains a comprehensive inventory of real property assets owned by SDOT in the Real Property Asset Management System. In cooperation with SDOT Division, FAS provides varying degrees of management services for these parcels and buildings along with other non-transportation related infrastructure. SDOT manages assets that affect the delivery of transportation services to the public.

9.1 BUILDINGS & YARDS

SDOT owns buildings that support transportation services and buildings indirectly acquired through the ROW acquisition process for capital projects. When acquiring parcels for street and multi-purpose ROW usage, a parcel may have a building present, which is purchased as part of the transaction. Buildings that directly support the delivery of transportation services are typically sited on FAS jurisdictional properties. These buildings support several divisions in SDOT including Maintenance Operations (MO), Roadway Structures (RS), Transit & Mobility (TM), and Transportation Operations (TO – as shown in Section 9.1.1 below).

The values listed in the tables below were estimated by real estate category and include both the structure and land. For buildings and yards that support transportation services, the Department or a representative is actively providing building maintenance. Many of the non-operational buildings do not appear on a planned capital improvement or maintenance schedule. Thus, lease agreements typically stipulate the lessee is responsible for maintenance. These facilities will be used in their current state until they are unfit, or the property is disposed.

[26] Replacement value excludes non-transportation related infrastructure, captured in the report below.

9.1.1 Buildings and Yards that Support Transportation Services Inventory Status

Asset	SDOT Divisions	Building SF / Yard SF	Year Built	Condition (FAS Identified Building Deficiencies)	Structure Replacement Value
1010 Building / Meters Shop	MO, RS, TO	9,935/ 0	1967	Fair	$5,000,000
714 Charles St	MO	19,680 / 0	1951	Fair	$10,000,000
Charles St Yard (Racks, small buildings)	MO, RS, TO	0 / 109,539	2013	Fair	$500,000
Fremont Bridge (Temporary Mobile Units)	RS	1,165 / 6,295		Fair	$300,000
Haller Lake Buildings	MO, RS, TO	10,695 / 112,074	1960	Poor	$5,200,000
West Seattle Shops - 9200 8th Ave SW Building - Temporary Mobile Units	MO	2,225 / 57,334		 Poor Good	$2,000,000
Sunny Jim	TO	45,036 / 148,410	1962	Good	$22,500,000
Salt Storage (8th Ave S/S Forest St)	MO	9,846 / 10,873	2012	Good	$1,000,000
King St Station	TM	67,755 / 0	1906	Good	See Section 12
South Lake Union Trolley Facility	TM	9,428 / 10,707	2007	Good	See Section 12
First Hill Trolley Facility	TM	20,993 / 10,000	2014	Good	See Section 12
Total:	**11**				**$46,500,000**

Inventory Status for Non-Operational Buildings with Interim Uses

Asset	Use	Building SF / Yard SF	Year Built	Building Deficiencies	Structure Replacement Value
330 Fairview Ave N. Offices	Office	8,488/ 14,400	1959	Poor	$500,000
614 Aurora.[27]	Retail	6,000 24,192	1926	Fair	$500,000
900 Broad St	Retail	5,595 7,711	1941	Poor	$200,000
Total:	**3**				**$1,200,000**

[27] Currently under contract as part of the Mercer MegaBlock sale. Anticipate sale closure in 2021.

9.2 PARCELS

A parcel is a defined piece of real estate consisting of physical land. SDOT jurisdictional parcels have been acquired for capital projects, or are properties remaining after projects are completed, or parcels that need to be dedicated as ROW. Some parcels are remnants of former railroad ROW purchased for the Burke Gilman Trail. Other parcels are large pieces or remnants that were purchased for various reasons, such as to widen streets and sidewalks, and for constructing bicycle and pedestrian trails. These parcels may include buildings or other structures. The FAS Facility Operations Division maintains an inventory of City-owned property, including those parcels under the jurisdiction of SDOT.

9.2.1 Parcels Inventory Status and Anticipated Annual Growth

As capital projects are completed, and at the direction of SDOT, FAS manages the disposal or jurisdictional transfer of excess SDOT parcels. In 2015, FAS began to identify a work plan for the eventual transfer of jurisdiction or disposal of many excess SDOT properties:

Asset	Inventory Count	Data Confidence	Anticipated Annual Growth
Parcels to be Retained and Dedicated as ROW[28]	12		-1 to -4
Parcels to be Jurisdictionally Transferred to Other City Departments	7		-1 to -4
Parcels to be Disposed of	31		-1 to -4
Parcel Options Under Development	5		
Total	**55**	**High**	**Unknown**

The parcel inventory is recorded in the Real Property Asset Management Information System. SDOT and FAS are evaluating whether parcels should be converted to right-of-way and may embark on a legislative action to dedicate the properties.

Anticipated annual growth for this asset is identified as property disposal or surplus, which is subject to City Council approval and City of Seattle surplus procedures and applicable street vacation requirements as noted under RCW Title 35.79, Ordinance 113915, and Clerk File 310078.

9.3 SHORELINE STREET ENDS

While most of the ROW is paved surface, SDOT also owns and manages unopened ROW and shoreline street ends. Shoreline street ends are the land portions of street segments that provide, or could provide if improved, the public with visual or physical access to a body of water and its shoreline. Resolution 29370 established the Shoreline Street Ends Program and adopted policies guiding the development of public access improvements to shoreline street ends. The original 149 site locations are outlined in Exhibit A of the resolution.

[28] May involve a partial parcel transfer.

Considered a Regulated Asset, SDOT holds a jurisdictional interest in shoreline street ends, rather than ownership. The Public Space Management group in the Street Use Division administers shoreline street ends.

SDOT Director's Rule 12-2015 establishes the Shoreline Street End Program overall policy guidance outlining that the highest and best use of the street ends is public access. Shoreline street end permit fees of approximately $500,000 currently fund the Program annually and cover the cost of the program.

In 2019, we completed a review of the existing inventory, which has been reduced to 141 sites due to transfers to other entities or vacations. The resulting inventory categorizes the type of shoreline street end by public access type such as having boat launches, kayak launches, water only access, or view only access. Photographs and descriptions of each site are available on the SDOT Assets Map.

Improved Shoreline Street End

9.4 REAL PROPERTY ASSET CLASS - Life Cycle Costs, Maintenance Approach, and Funding

The useful life of a building depends on the materials and level of ongoing maintenance. The cost of a new building varies considerably.

The lifecycle cost of routine maintenance on buildings has a large range depending on the size, material, and complexity of the building. Operational costs are funded out of a general budget and cost by building has not been historically tracked. Buildings are repaired on a priority basis up to the level of available funding.

Shoreline street ends permit fees fund two Urban Forestry Gardeners who maintain these assets.

10.1 SIGN ASSEMBLIES OVERVIEW

A Sign Assembly is a static message board that conveys essential information to road users, pedestrians, and bicyclists about how to navigate city streets and trails. The Sign Assembly asset class includes the sign face or blade and the mount. Multiple blades may be installed on a single mount, which represents the asset location. SDOT categorizes signs to align with the Manual on Uniform Traffic Control Devices (MUTCD). Traffic Signs and Marking Operations crews, at the direction of the Traffic Operations group in the Transportation Operations Division or by Transit and Mobility Division staff, maintain most sign assets. Parking crews maintain parking related sign assets.

Asset	Replacement Value	Condition				Data Confidence
		Good	Fair	Poor	Unk	
Sign Assemblies	$73,348,000	46.6%	.01%	<.01%	53.4%	Medium

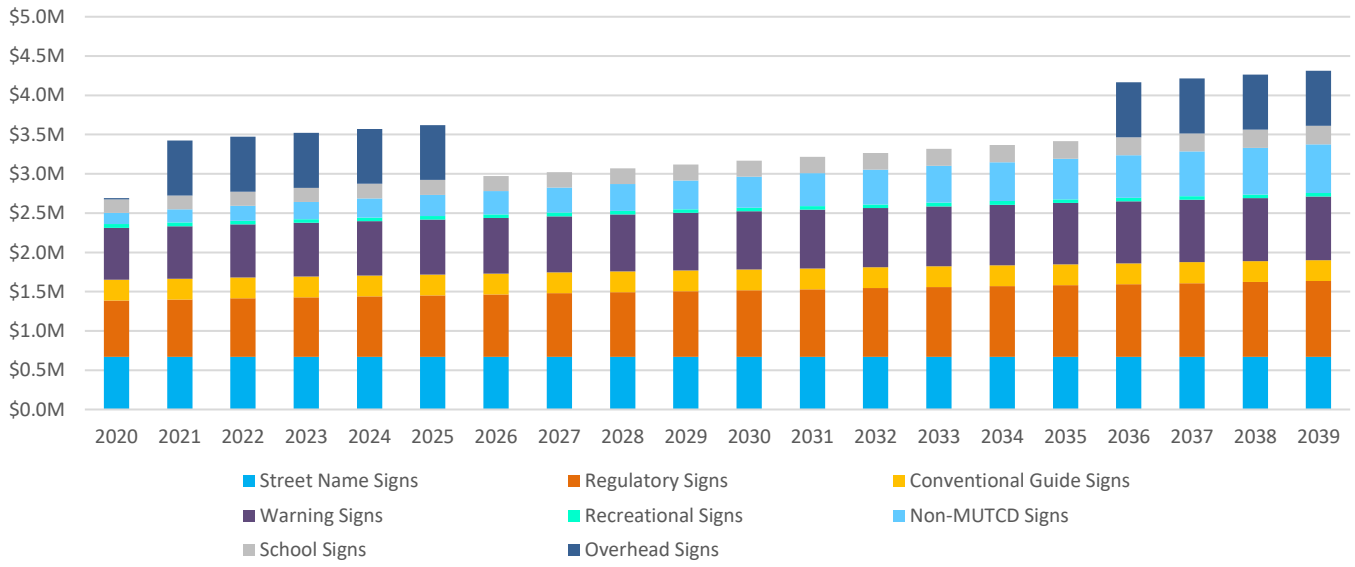


Figure 10.1 Long-Term Cost / Needs Forecast for "Ideal" New & Replacement Sign Program (2020 Dollars)

Projected future growth of sign assemblies is somewhat uncertain due to the Department's Vision Zero and Move Seattle Levy efforts, both of which may or may not significantly increase the amount of signage.

The Department has maintained an inventory of signs since the 1920s when they were initially recorded in a system of card files. From 1979 – 1981, this inventory was transcribed into electronic format in the Data General System which was later imported in 2000 into the Infor Asset Management database where it is currently maintained. This inventory counted the signs rather than the sign assemblies. Multiple signs may exist on any sign assembly. SDOT's current inventory of signs is as follows:

10.1.1 Sign Assemblies Inventory Status and Anticipated Annual Growth

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
Regulatory Signs (R1-R6, R9-R10)	22,349	Medium-High	$438	10	$9,788,676	250-420
Regulatory Parking Signs (R7-R8)	90,641	Medium - High	$274	12	$24,812,501	200
Guide Signs Conventional (non-SNS)	9,063	Low	$547	15	$4,961,898	Unknown
Street Name Signs (D3-103, D3-104, D-106)	37,068	High	$301	15	$11,161,889	Unknown
Warning Signs	20,561	Medium-Low	$438	12	$9,005,547	240
Recreational and Cultural Interest, Tourist Direction Signs	3,997	Medium-low	$547	15	$2,188,316	Unknown
Non-MUTCD Signs.[29]	1,272	Low	$547	15	$696,407	750
School Signs	7,065	Medium - High	$438	12	$3,094,411	100
Overhead Signs	1,993	Medium - High	$3,832	15	$7,638,027	Unknown
Total:	**194,009**	**Medium**			**$73,347,672.00**	

SDOT has not performed a physical inventory of signs/sign assemblies. In 2014, the Department replaced its paper sign binders with an electronic sign map. The application provides an interactive GIS map to field users from a tablet or smart phone with cellular service. The asset database refreshes sign data nightly unlike the paper sign books which were published quarterly so were immediately out of date and, not to mention, costly. The electronic GIS map provides process efficiency. As staff discovers incorrect records, they easily identify the asset identification record and notify data maintainers for resolution.

The asset inventory does not have a full count of bike trail signs, most of which are informational (conventional guide signs) and many signs from capital and permitted projects. Since 2007, BTG and the Move Seattle Levy have provided funding to replace many of the signs/sign assemblies on major corridors. This effort has resulted in updated sign/sign assembly records from crew related installations. However, adequate data maintenance resources have not been available to update sign and support assets for capital and permitted projects dating back to 2007 primarily due to the difference in linear reference versus plan set identified locations. In 2020, SDOT began updating signs and supports affected by capital projects. These large, non-crew delivered projects constitute up to hundreds of signs that need to be updated in records from replacement, onboarded from new

[29] Non-MUTCD Signs include bike / pedestrian wayfinding, neighborhood identification, alley utilization regulation, storage of material, no loitering, shoreline street end signs, and views.

installs, or offboarded when removed. Because these projects did not have asset maintenance resources assigned, there is a large gap between what is in records and what is in the field on several corridors, major project locations, and areas touched by permitted projects.

10.1.2 Sign Assemblies Life Cycle Costs, Maintenance Approach, and Funding

Except for programmatic replacement, sign assemblies are not regularly inspected and are maintained on a customer request basis. A sizable monetary component of the sign assembly replacement budget is for emergency repair/replacement of damaged sign assemblies. If crews discover failing signs assemblies, they perform the work as required.

Limited analytical information is available that would enable a precise determination of funding requirements for categorical replacement of non-regulatory signs. However, age is often used as a surrogate for the condition of a sign assembly. Signs typically degrade to fair condition in seven years depending on location. Variable factors influence sign deterioration such as exposure to UV rays or saltwater and the color of the sign (e.g., red signs degrade faster than white or green signs). A sign which has reached ten years of age is typically below the legal retro-reflectivity requirement. At this point, we consider a sign to be in poor condition and eligible for replacement. Illuminated overhead signs do not require retro-reflectivity and thus typically have longer lives.

11 -TRAFFIC SAFETY STRUCTURES & DEVICES ASSET CLASS

The Traffic Safety Structures & Devices asset class includes all SDOT assets whose primary purpose is to provide an acceptably safe transportation system. It includes:

Asset	Replacement Value	Condition						Data Confidence
		Excellent	Good	Fair	Poor	Very Poor	Unk	
Chicanes	$660,000						100%	Medium
Crash Cushions	$898,000		78.0%	4.9%	0.0%		17.1%	Medium
Guardrails	$9,401,000		42.7%	36.6%	0.4%		20.2%	Medium
Median Islands	$62,453,000	24.8%	17.4%	6.6%	2.2%	5.6%	43.4%	Medium-High
Railroad Crossing	Unknown		29.5%	31.5%	24.1%	0.0%	14.9%	Medium-High
Speed Cushions	$2,835,000		95.6%		14.3%	0.0%	4.4%	Medium
Speed Dots	$17,000						100%	Medium
Speed Humps	$2,046,000		73.1%		0.0%	0.0%	26.9%	Medium
Traffic Circles	$23,498,000		95.2%	3.7%	0.2%	0.0%	0.8%	Medium-high
Total:	$101,808,000							

Many traffic safety structures and devices have been installed as a component of a capital project, or under the Neighborhood Spot Improvement or Neighborhood Street Fund in response to citizen or neighborhood interest. Traffic calming devices supplement traditional traffic control devices, such as regulatory signs. Other than crash cushions and guardrails, maintenance is currently performed only as a result of an emergency or by customer request. Depending on the type of safety structure or device needed, repair is handled either by the Maintenance Operations Branch as part of its spot safety repair program or by Transportation Operations crews except for railroad crossings which are repaired by the railroad owner, in coordination with SDOT, per franchise agreement and state law.

Asset	Inventory Count	Replacement Value	Useful Life (Years)
Chicanes	22	$30,000 (each)	20 (AC);40 (Concrete)
Crash Cushions	41	$21,900 (each)	10
Guardrails	85,859 LF, 925 units	$109 (per LF)	20
Median Islands	241,262 sf walkway, 199,052 lf. curb, 500 est. units	$52 – 111 / sf walkway and $225 / lf of curb	20 (AC);40 (Concrete)
Railroad Crossing	336	Unknown	20 (AC);40 (Concrete)
Speed Cushions	567	$5,000 (each)	20
Speed Dots	3	$5,500 (each)	20
Speed Humps	372	$5,500 (each)	20
Traffic Circles	1,073	$21,900 (each)	20 (AC); 40 (Concrete)

The primary responsibility for traffic safety structures and devices lies with the Arterial and Neighborhood Traffic Operations group in the Transportation Operations Division.

11.1 CHICANES

A chicane is a set of landscaped curb extensions that extend out into the street, narrowing the road to one lane, thereby forcing motorists to decrease vehicle speed to maneuver between them. Chicanes increase safety and also encourage walking as a mode of travel. Inventory is maintained in a non-centralized manual and GIS files. Chicanes are infrequently used as traffic safety devices.

11.2 CRASH CUSHIONS

A crash cushion is a repairable device used to increase safety for motor vehicle operators and passengers who collide with safety barriers at gore points. Aside from improving safety, crash cushions also help protect the transportation infrastructure.

Due to the need for accurate point locations, coordinates are maintained for these assets in GIS and asset data in the Infor Asset Management database. Age is used to determine the replacement cycle of crash cushions. If a collision damages a crash cushion, crews typically replace it in kind. Emergency repair or replacement of crash cushions is incident driven and therefore spending may vary from year to year.

11.3 GUARDRAILS

Guardrails are devices designed to keep pedestrians and motor vehicles from straying off the road into potentially dangerous or off-limit areas of the ROW. Guardrails improve safety and protect the transportation infrastructure.

Emergency repair or replacement of guardrails is incident driven and therefore spending is variable from year to year. Funding for this asset is considered inadequate based on field assessment. In particular, upgrading legacy guardrail to current standards exceeds the current budget. Replacement goals for guardrails may be reevaluated as SDOT obtains overall condition levels for its inventory.

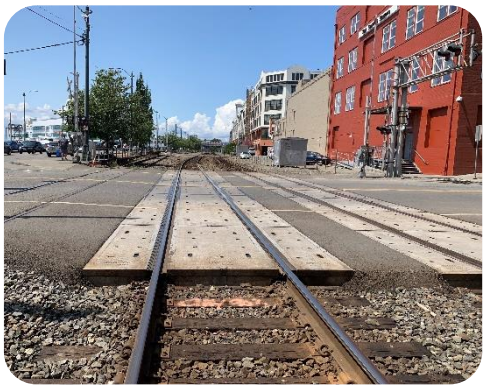
11.4 MEDIAN ISLANDS

Median islands are physical barriers that divide streets into two or more roadways, act as a spot treatment at an intersection, provide longer walkways, or extend along a corridor. We maintain landscaping in the islands under the Urban Forestry asset class. This asset restricts certain vehicular turning movements and may serve as a place of refuge for

pedestrians crossing the roadway. Median islands increase safety and encourage walking as a mode of transportation.

The Infor database maintains the median island as part of the physical inventory within the sidewalk system. Building from a 2007 inventory and 2008 partial condition assessment, SDOT performed a sidewalk, median island, and transit island platform assessment over the summer of 2017. The assessment validated asset data on 283 medians. The Department also maintains four separate manual file locations, based on installation records, by the sponsor of the particular project under which the median island was installed: Arterial Operations, Neighborhood Traffic Calming, Bicycle / Pedestrian, and Capital Projects. Funding for the median islands asset is generally considered adequate based on the level of customer requests.

11.5 RAILROAD CROSSING



Railroad crossings, which include at-grade light rail crossings, typically located at an intersection where a roadway crosses railroad tracks at the same grade, are new to the 2020 report. This inventory does not include the Streetcar which is covered in the Transit Asset Class, Section 12. In 2019, driven by increased federal regulations, SDOT conducted a field inventory validation using Federal Railroad Administration (FRA) records of crossing USDOT identification numbers and the FRA's GIS data. .. These assets were mapped in GIS and uploaded to the central database repository for better asset, claim, reimbursement, and work tracking and used to update FRA USDOT crossing inventories. FRA requires agencies to update and reporting on advance warning devices (signs and markings), gates, lights, flashers, and annual average daily traffic data every three years.

Depending on the agreement, public and private railroad agencies have varying responsibilities for roadway, barrier, and traffic control devices maintenance and replacement adjacent to the crossing. This asset is not valued due to the varying ownership between railroads and the City. Many components of this asset, such as pavement, signage, and marked crossings, are already valued in other asset categories. Components specific to railroad crossings that may be valued in a future report include gate arms and warning lights or railroad signals. In addition, with the new railroad crossings asset and work management tracking, we anticipate future reports will project future maintenance funding needs in alignment with regular inspection and railroad company communication.

Funding is considered inadequate for this asset based on field assessment. The field assessment identified areas where assets or components such as signage, barriers such as gate arms and fencing, and roadways require replacement. The Department is working with freight rail companies and commuter rail agencies as well as with its existing resources to maintain and make restoration improvements. With better management of railroad maintenance agreements, the Department strives to continue improving grade crossing safety while reducing damage and the potential for injuries due to deteriorating crossing surfaces.

11.6 SPEED CUSHIONS

A speed cushion is a set of several small speed humps that are installed across the width of the roadway with space in between. We design spacing of the speed humps to force cars to slow down as one or both wheels ride over one of the humps. The spacing is also designed to allow wider-axle emergency vehicles to pass through without slowing down. Speed cushions reduce motor vehicle speeds in neighborhoods and encourage walking as a mode of transportation. The inventory is maintained in non-centralized, manual and GIS files.

11.7 SPEED DOTS

A speed dot is a raised section of pavement in the middle of an intersection and is intended to slow traffic. While uncommon, these assets are used as an alternative to a traffic circle. Inventory is maintained in manual and GIS files.

11.8 SPEED HUMPS

A speed hump is a paved mound in the street that forces motor vehicles to slow down. Speed humps improve safety and encourage walking as a mode of transportation. The inventory is maintained in manual and GIS files.

Maintenance funding for existing speed humps is generally considered to be adequate. However, the Department receives up to five times more requests for new installation of speed humps than can be funded.

11.9 TRAFFIC CIRCLES

Traffic circles are raised islands constructed at intersections of residential streets. Traffic circles provide separation of oncoming vehicles and cause motorists to decrease speed. Many of SDOT's existing traffic circles include landscaping, which a local neighborhood group maintains. However, enthusiasm to maintain the landscaping has diminished over time for many traffic circles. Traffic circles increase safety for pedestrians and bicyclists by reducing speeds. When landscaped, they also contribute to a more vibrant neighborhood.

The inventory of traffic circles is maintained in the Infor database by the Transportation Operations Division and is based on installation records. Funding is generally considered to be adequate based on the level of customer requests.

11.10 TRAFFIC SAFETY STRUCTURES & DEVICES - Life Cycle Costs, Maintenance Approach, and Funding

Maintenance costs for traffic safety structures and devices are held within a general budget, thus individual life cycle cost is not available for most of these assets. The Transportation Operations Division will revisit the need for a routine maintenance program and request additional funding if it concludes that more of these assets require aggressive upgrades or replacement.

The long-term impact of SDOT's Vision Zero safety policies on the future growth of this asset class is yet to be determined. For this reason, and due to both the uncertain nature of upcoming emergency replacement needs and the relatively small budget of this asset class, we have not performed a long-term operational cost forecast.

12 - TRANSIT ASSET CLASS

The Transit Asset Class includes the Seattle Streetcar assets along with facilities and structures that support transit operations and a passenger rail station. The SDOT-owned capital asset inventory includes any individual equipment with an acquisition value above $50,000. King County Metro is responsible for reporting Seattle Streetcar assets to the National Transit Database (NTD). Capital assets supporting SDOT's Transit System are inventoried in multiple systems, depending on the party responsible for asset maintenance. Each element section below includes a brief description of the assets, system or record, resources, special attributes, cost, data confidence, valuation, age, and condition when available. For transit assets without condition assessments, we establish a Useful Life Benchmark (ULB) based on age and/or mileage data. This information is covered in SDOT's 2019 – 2023 Transit Asset Management Plan.

Asset	Replacement Value	Condition				Data Confidence
		Good	Fair	Poor	Unk	
Streetcar Guideway	$42,009,000	100%				High
Transit Facilities	$13,587,000	100%				High
Transit Systems	$20,249,000	100%	-	-	-	High
Transit Stations	$49,834,000	100%				High
Streetcar Rolling Stock	$52,839,000	100%				High
Total:	$178,518,000					

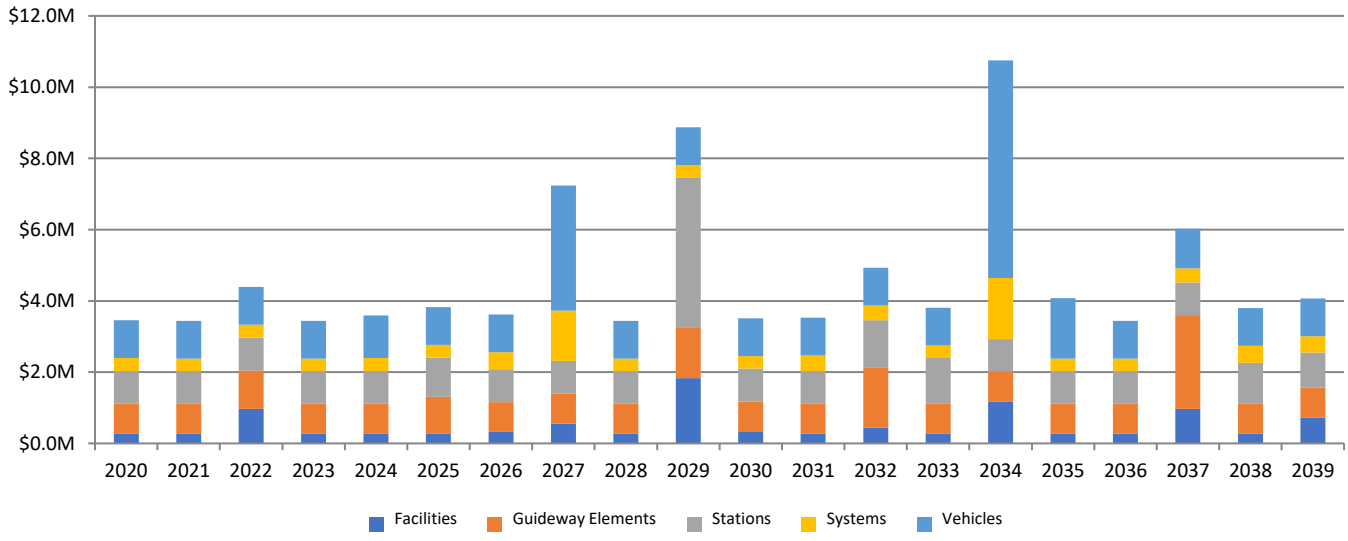


Figure 12.1: Transit Assets Long-term Cost / Needs Forecast (2020 dollars)

For the Transit Asset Management Plan, SDOT utilized TERM-Lite to perform an analysis on transit assets. The analysis used component-based data sourced from capital projects, streetcar facilities, and 2018 facility condition assessments performed by an independent contractor. For the incorporation of SDOT's data into the TERM-Lite model, each recorded asset is accompanied by its year built, quantity, unit cost, cost year, useful life, and rehabilitation information. TERM-Lite determines cost values in base year dollars (2018 $) and scales the

cost year with an assumed yearly inflation value of 3.43%. Assumptions used for the long-term forecasting graph in Figure 12.1 include:

- Each asset will be rehabilitated at 50% of its useful life.
- A rehabilitation will cost 15% of the asset's replacement cost.
- Each asset will require 2% of its replacement cost for annual maintenance.
- When an asset comes up for rehabilitation or replacement, this will occur in one year. This differs from a real-life scenario where spending and construction would be spread out over more time.
- The budget is unconstrained and will always be capable of rehabilitating or replacing an asset at full cost.
- Asset rehabilitation and replacement values are approximate based on constructed values or industry unit pricing and may not accurately reflect the Seattle region pricing including markups for equipment, labor, or materials.

SDOT comprehensively defines and catalogues the transit asset hierarchy to facilitate use of the FTA industry standards. The asset types are mapped to the FTA five-digit asset type code structure and then broken down into categories, subcategories, and elements to better define maintenance activities and life cycles. Using a cross-referenced FTA code allows the Department to input this data into the TERM-lite long-term forecasting model. SDOT has defined sets of standard and unique attributes by asset, including location, to enable mapping functionality. Every effort has been made to align the inventory with 49 CFR Part 625 – Transit Asset Management. The condition rating of the rail system elements is assessed using American Public Transportation Association (APTA) rail industry standards.

Since SDOT manages the right of way in which the Streetcar is sited, there are assets under SDOT's responsibility that support streetcar operations along with other modes of traffic. For the purposes of this report, assets that specifically support streetcar functionality are mentioned in this section though it is indicated where they are valued in other classes. All replacement values are in 2018 figures and reflect the published 2019 – 2023 Transit Asset Management Plan.

SDOT maintains an inter-local agreement with King Country Metro for operation and maintenance of the streetcar systems. King County Metro performs preventive maintenance on the streetcars, the trackway, including the train-to-wayside communication system rails, track drains, track switches, the traction electrification system, containing power substations and the overhead catenary system, and the streetcar maintenance facility. A master inventory of the hierarchy is maintained along with further definition of responsibilities. SDOT's enterprise database does not duplicate assets solely maintained by King County Metro. Furthermore, service contracts provide some assets. These assets are not inventoried but defined under the hierarchy as a service.

12.1 GUIDEWAY ELEMENT

The **Guideway Element** includes all assets related to the guideway including track and associated structures. SDOT maintains separate inventories for pavement and structures that support trackwork. For the purposes of replacement, the surrounding pavement or structure is included to reflect a comprehensive cost.

Trackwork is the dedicated railway track and associated equipment streetcars use to provide transit service. SDOT categorizes trackwork based on different replacement costs and useful lives. These include standard embedded track, tangent embedded, special turnouts, and different types of switches. Embedded track includes both the track embedded in in the right-of-way pavement and yard portion of the facility.

The Seattle Streetcar system is supported by five bridges and one retaining wall. These assets are cataloged in the Bridge and Structures asset class, Section 4, and called out here for congruency with the Transit Asset Management Plan report.

Asset	Quantity	Unit of Measure	Average Age	FTA Condition Rating	Replacement Value (2018 $)[30]
Bridge	1	Each	90	4	-
Bridge	3	Each	43.3	3	-
Bridge	1	Each	108	2	-
Retaining Wall	1	Each	118	1	-
Trackwork	6,511	Track Feet	5.3	4.3	$8,135,751
Tangent Trackwork	33,153	Track Feet	6.8	4.5	$27,696,940
Turnout and Track Switches	17	Each	6.1	4.1	$6,176,410
Total:				**3.1**	**$42,009,101**

12.2 FACILITIES ELEMENT

The **Facilities** Asset Element includes the maintenance buildings for both lines. Components for those facilities are broken into manageable units based on warranty, depreciation, and maintenance schedules. Property used for operations is either under the jurisdiction of SDOT or is located on leased land. SDOT or King County Facility Operations provide maintenance and management of the operational facilities discussed in this section. SDOT hired EMG, Corporation to perform condition assessments during Summer 2018. Facilities data from as-builts provided updated condition assessment information.

SDOT includes streetcar **Equipment** over $50,000 that is permanently housed in our facilities in the Facilities Asset class. This includes floor jacks, wheel truing machines, and cranes.

Facilities replacement values are estimated with RS Means unit pricing. A markup and location factor of 1.087 is included in unit costs. Markup of 34.5% includes a 7.5% for design and permits, 12% for general contractor fees, bond, profit, insurance, 5% for client administration, and 10% estimating contingency factors applied to the location to provide an adjusted unit cost. This amount differs from the original facility construction costs due to factors such as site demolition and preparation for new construction.

[30] For the purposes of this report, the Bridge and Retaining Wall replacement value and condition is included in the Bridges and Structures Asset Class.

The lifecycle cost of routine maintenance on buildings has a large range depending on the size, material, and complexity of the building. Operational costs are funded by a general budget and are not always tracked by building. Buildings are repaired on a priority basis up to the level of available funding.

Asset	Building SF / Yard SF	Average Age	FTA Condition Rating	Replacement Value
SLU Maintenance Facility	9,428 / 10,707	13	3.91 / 4	$3,823,468
First Hill Maintenance Facility	20,993 / 10,000	6	3.99 / 4	$9,763,753
Total:	**30,421/21,780**		**4**	**$13,587,221**

12.3 SYSTEMS ELEMENT

The **Systems** Asset Element includes all assets related to major systems that support the streetcar functions including:

- ✓ Traffic signals that support the streetcar
- ✓ Safety elements including plaza lighting
- ✓ Power: overhead catenary system (OCS) lines are supplied by traction power substations (TPSS) which include AC power inverters, transformers, rectifiers, and DC feeder breakers. Pole mounted switching is used to control on/off function from the TPSS to the OCS.
- ✓ Ticket vending fare collection for revenue collection
- ✓ Surface water drainage (track drains) located adjacent to streetcar tracks
- ✓ Automated vehicle location system determines and transmits the geographic location of the streetcars using GPS including real time data readouts at platforms.
- ✓ Non-streetcar Real Time Transit Information Signs (Dynamic Message Signs): Provide transit users with real time transit information including alerts or warnings. Signs can be pre-programmed, as well as accessed remotely to update messages with current up-to-the-minute information. We installed these signs starting in 2010.

When a dynamic message sign reaches half its useful life, it generally degrades to fair condition. If it degrades to poor condition, the sign will typically require replacement in three years or less.

Asset	Quantity	Unit of Measure	Average Age	FTA Condition Rating	Replacement Value ($2018)
Train and Traffic Signals	22	Each Intersection	7.5	4.1	$382,809
Electrification Systems (OCS, Catenary Poles, Feeders)	352 / 29,899	Each/linear feet	7.1	4.2	$14,467,789
Traction Power Substations	8	Each	6.7	4.2	$1,487,748
Revenue Collection	23	Each	7.3	3.9	$304,416
Realtime Information Signs	49	Each			$2,682,699
Utilities	72	Each	7.2	4.3	$709,541
Automated vehicle location system – ITS	22	Each	6.9	3.2	$214,007
Total:				**4.2**	**$20,249,009**

12.4 STATIONS ELEMENT

Seattle Streetcar Stations are considered Transit Island Platforms which are free-standing paved areas usually with entrance ramps and canopy shelters designated for streetcar passenger waiting and loading. Shelters protect passengers from adverse weather conditions.

King Street Station is a rail passenger station and serves as a transit hub. Station components are broken into manageable units based on warranty, depreciation, and maintenance schedules. SDOT contracts for the maintenance and management of the King Street Station. SDOT hired EMG, Corporation to perform condition assessments during Summer 2018. Facilities data from as-built plan sets was used for these assessments.

King Street Station replacement values are estimated with RS Means unit pricing and a 2.243% multiplier for historic finishes. The 2010 and 2013 renovation cost of $50 million included significant seismic strengthening to the existing structure which represented approximately two thirds of the renovation costs. Facilities replacement values are estimated with RS Means unit pricing. A markup and location factor of 1.087 is included in unit costs. Markup of 34.5% includes a 7.5% for design and permits, 12% for general contractor fees, bond, profit, insurance, 5% for client administration, and 10% estimating contingency factors applied to the location to provide an adjusted unit cost. This amount differs from the original facility construction costs due to factors such as site demolition and preparation for new construction.

Equipment, including floor jacks, wheel truing machines, and cranes, which have an estimated worth of over $50,000 are included in the Transit Asset Management Plan. The equipment is permanently housed in the Streetcar Maintenance Facilities.

Historic Transit Shelters

The former Seattle Transit Department originally owned the historic transit shelters. When King County Metro took ownership of the transit system in 1973, those shelters were not included in the transfer and remained under the City's ownership. Shelters are the maintenance responsibility of the Roadway Structures section at the direction of the Transit & Mobility Division.

SDOT's two historic transit shelters both recently received substantial upgrades. Since these historic transit shelters are relatively new assets to SDOT and received the aforementioned upgrades, very little maintenance has been required in the recent past. Maintenance on these shelters are performed in response to a customer request. No maintenance program and funding requirements have yet been established.

Transit Island Platforms are paved areas within the street that are designated for bus passenger waiting and loading and may also allow the buses to stop in lane. The island is a free-standing paved area usually with entrance ramps. These assets encourage the use of public transit by providing a designated area for bus passenger loading and unloading, and by allowing more efficient transit operations.

Transit island platforms are the maintenance responsibility of the Maintenance Operations Division at the direction of the Transit & Mobility Division. Since these platforms are relatively new assets, very little maintenance has been required, and, hence, the limited recorded and tracked information. Typically,

maintenance of transit island platforms is undertaken in response to a customer request. There is no established maintenance program or funding requirements for transit island platforms to date.

Asset	Quantity	Unit of Measure	Average Age	FTA Condition Rating	Replacement Value (2018/2020* $)
Historic King St Station	67,755	Building SF	Built 1906 / major rehab 2009, 2013	3.8/4	$41,378,784
Streetcar Platform & Shelters	23 / 34,906	Each	8.5	4.4	$4,723,303
Transit Platforms	35 / 33,760	EA / SF		4	$3,511,622*
Historic Shelters	2	Each		4	$220,000*
Total:				**4**	**$49,833,709**

12.5 ROLLING STOCK ELEMENT

The **Rolling Stock** (Vehicles in TERM-Lite) Element consists of revenue producing, electrically powered streetcar vehicles. SDOT purchased non-revenue vehicles from the capital project that support Streetcar operations. Titles for these vehicles were transferred to King County Metro, who is responsible for maintenance and FTA's National Transit Database (NTD) reporting. Since King County Metro owns the non-revenue vehicles and work equipment, they are not included in SDOT's TAMP.

SDOT purchases capital spares of streetcar **Parts and Equipment** to ensure ongoing, uninterrupted streetcar operations. A valuation of these assets as of July 31, 2018 is included in the inventory.

Asset	Quantity	Unit of Measure	Average Age	FTA Condition Rating	Replacement Value (2018 $)
300 series streetcar Vehicles	3	Each	11	3.8	$15,449,693
400 series streetcar Vehicles	7	Each	3.9	4.5	$35,878,501
Capital Spares	2	Total Stock on hand	6.1	4	$1,510,955
Total:				**4.2**	**$52,839,149**

12.6 TRANSIT ASSET CLASS - Life Cycle Costs, Maintenance Approach, and Funding

SDOT utilizes planned outcomes, legislative requirements, technical constraints, and community input to establish its transit service levels. SDOT and the streetcar operator King County Metro are committed to achieving and maintaining a State of Good Repair (SGR) for its transit capital assets to support safe, efficient, and reliable transit in Seattle. The 2018 Transit Asset Management Plan assigns roles and responsibilities for meeting those objectives consistent with the SGR policy and current federal regulations (49 U.S.C. 5326.) Furthermore, it sets the direction for establishing and maintaining transit asset management strategies and plans that are achievable with available funds.

SDOT's Center City Connector (C3) Project is on pause for the 2021-2022 budget due to COVID-19 financial impacts. Figure 12.2 below shows the existing lines and planned connector project.

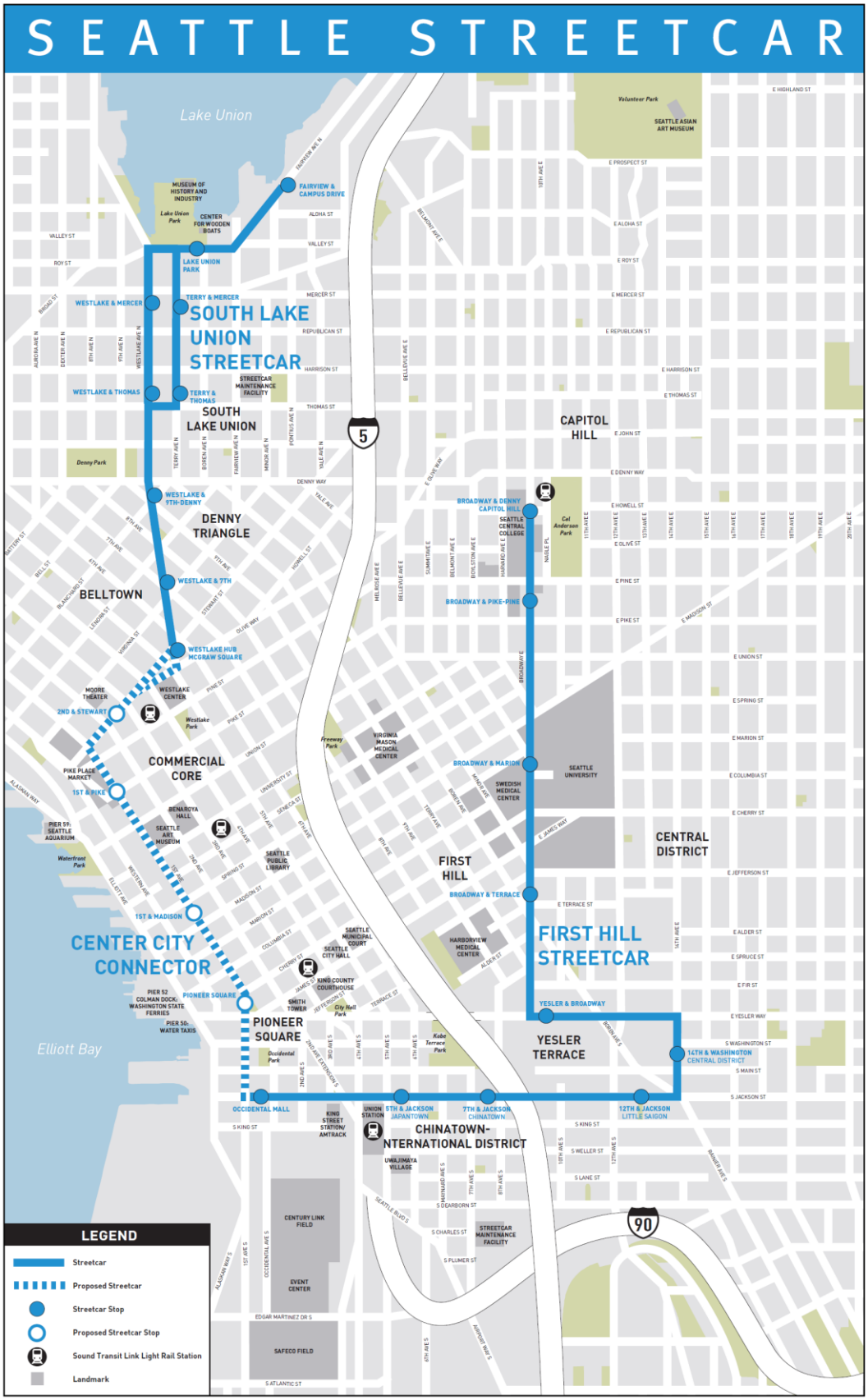


Figure 12.2 - Seattle Streetcar System & Facility Map

13 - URBAN FOREST ASSET CLASS

The City defines the Urban Forest as publicly and privately owned and maintained vegetation that is growing within the designated street Right-of-Way (ROW) within the corporate limits of the City of Seattle. SDOT has jurisdiction over the entire Urban Forest that exists in the ROW, however the Department only owns a small portion of this Urban Forest. The remainder of the Urban Forest is privately owned and maintained. SDOT's responsibility for privately owned areas primarily entails permitting, administration of land use and/or other municipal code requirements and abating imminent hazards to life and property.

Asset	Replacement Value	Condition				Data Confidence
		Good	Fair	Poor	Unk	
Irrigation	Unknown	-	-	-	100%	Med-Low
Landscape Complexes[31]	$109,320,000	25%	0%	75%	0%	Medium
Trees	$64,600,000	75%	17%	5%	3%	Medium
Total:	$173,920,000					

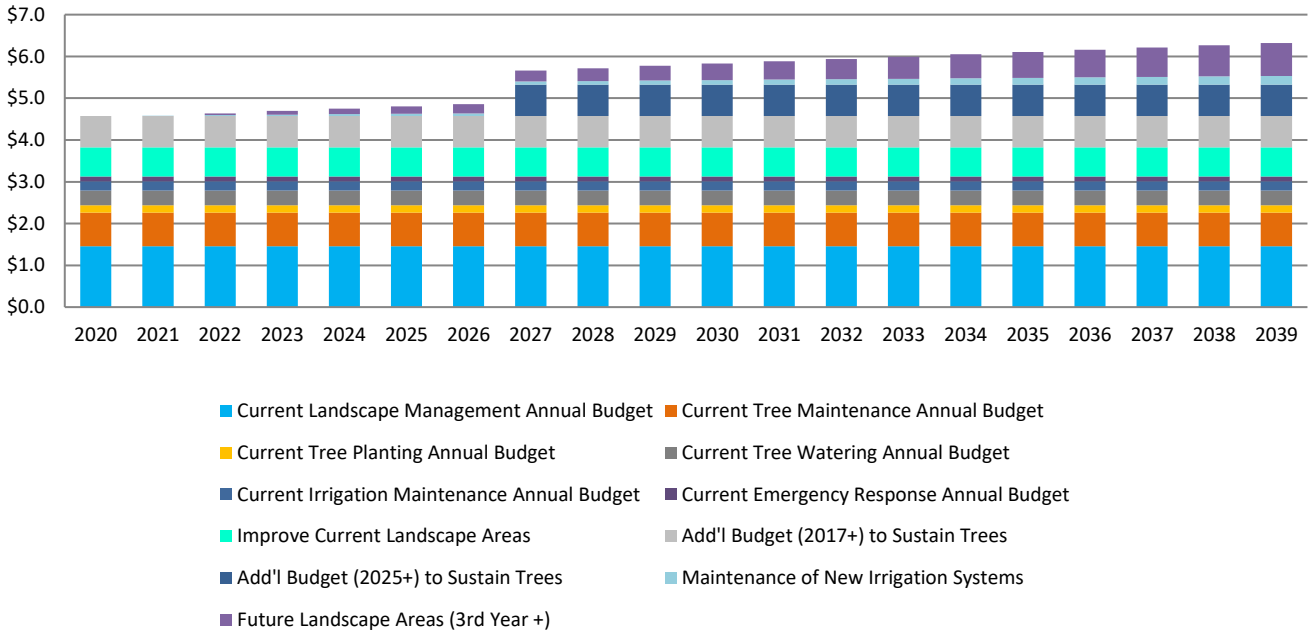


Figure 13.1: Urban Forest Assets Long-Term Cost / Needs Forecast (2020 Dollars)

SDOT funds all Urban Forest assets through a single combined budget, and the funding requirements discussed in this section are based on an approximation of the percentage of the budget allocated to each asset. The total

[31] Landscape Complex condition represents a maintenance management strategy on what activities we employ to elevate the asset to a defined condition rather than a strict assessment of the asset. At least once a year, the good condition assets are maintained to that condition.

budget for maintenance and operation of the SDOT Urban Forest in 2020 is $6.31 million. The Urban Forestry group in the ROW Maintenance and Urban Forestry Division manages these assets.

13.1 IRRIGATION

Irrigation systems provide water to landscaping and trees through underground pipes. New capital projects install irrigation systems in SDOT landscapes. SDOT then assumes ownership and maintenance of these systems, although some are intentionally abandoned after the establishment period for new plantings. New irrigation systems are being built with technology upgrades that allow staff to program irrigation systems remotely through cellular connections to controllers and advanced software. A full analysis of the irrigation assets has not been conducted as of this report update. The Urban Forestry program will need to train and invest in its maintenance team to ensure that SDOT can stay abreast of technological advancements.

13.1.1 Irrigation Inventory Status and Anticipated Annual Growth

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Anticipated Annual Growth
Irrigation	156 systems	Med-Low	Unknown	15	Unknown	2-4 per year

13.1.2 Irrigation Life Cycle Costs, Maintenance Approach, and Funding

Crews maintain irrigation systems annually as a seasonal activity. The condition of these irrigation systems is unknown. Maintenance costs are tracked at the landscape complex level, so life cycle costs are not available. Funding is generally considered to be inadequate based on the level of deterioration in the system. Urban Forestry estimates a budget of $1 million would adequately fund a preventive maintenance program for irrigation systems.

SDOT adjusts irrigation systems to match vegetation needs in a manner consistent with water conservation policies to minimize water usage. Crews make system adjustments during scheduled maintenance at spring start-up, in response to gardener field observation, or in response to a customer request.

SDOT may abandon irrigation systems in place because of inadequate staffing resources to perform the work and due to high water use. Currently two people perform maintenance on all SDOT irrigation systems and respond to private irrigation system damage from SDOT crews or contractors. Older systems have been removed such as Beacon Ave medians, where we have just grass. This practice reduces labor and water use costs. Many systems needed substantial repairs and replacement to upgrade sprinklers and controllers.

In some cases, SDOT upgrades systems when issues arise. SDOT has seven remote flow water meters to monitor water usage and identify malfunctioning systems. SDOT recommends completely upgrading irrigation systems with new technology to reduce water usage and for ease of maintenance. A system-wide prioritized maintenance program to upgrade these systems would be more efficient than piecemeal replacement especially since replacement costs have increased by 25 – 30%. As the Waterfront or Mercer project landscapes are brought in, it is necessary to abandon older systems like Beacon Ave.

13.2 LANDSCAPE COMPLEXES

Landscape complexes include the land and landscape-related improvements within the street ROW. They are an integral component of the transportation system and are also typically installed as part of larger capital investments. Neighborhood grant matching funds add some landscapes. Appropriately designed and maintained landscapes to increase visibility for all users in a manner that preserves and protects the environment, promotes non-motorized modes of transportation, and enhances the economic viability of neighborhoods and business districts throughout the city.

13.2.1 Landscape Complexes Inventory Status and Anticipated Annual Growth

The inventory of landscaped complexes is maintained in Infor and displays it as a map layer in GIS. The complexes are an assembly of landscape areas that serve as the asset unit for maintenance purposes. A complex may have one large, landscaped area, or several areas that are in proximity to each other, for ease of maintenance scheduling. Approximately 4.4% of the total plantable land base in the ROW, or 123 acres, is actively planted and maintained by SDOT.

SDOT has condition data on the landscape inventory dating back to 1992. At that time, it was judged that approximately 50% of the inventory was in good condition. In the intervening years, 23% more land area has been added to the inventory, without a corresponding increase in resources for maintenance. SDOT Urban Forestry now concentrates on maintaining the most critical 25% of the landscape complexes in good condition with the remaining 75% of the inventory being maintained on a reactive basis for maintenance and accessibility. This reduction from 2015, where a third (33%) of the landscapes were considered in good condition, is due to crew availability and the increase of higher maintenance needs from newly installed landscapes.

Weeding is one of the highest labor-intensive activities performed on landscape complexes. Pesticides are rated and assigned to a tiered schedule. Glyphosate was converted to a Tier I and restricted in 2019, which has provided weed control for decades, and now requires exception request. Other chemicals in the Tier II are available, but SDOT tries not to use them due to environmental and safety reasons. These are currently used only for noxious weed control. Hand weeding and mulching has become the primary mode of maintaining landscapes. As a city, we may have to change the types of landscapes we install so that it reduces ornamental pruning and weeding activities. The division requires at least quadruple its existing maintenance budget to manage these assets. Organizing the city into quadrants with dedicated gardening crews would allow for a more efficient and sustainable maintenance approach. The landscaped areas are comprised of:

Type of Landscaped Area	Square Feet	% Total SDOT Landscape	Replacement Cost per SF	Replacement Value
Landscape Complex	5,050,000	72%	$16	$80,800,000
Under Structure Area	500,000	7%	$10	$5,000,000
Traffic Circle Area	20,000	~0%	$16	$320,000
Tree Pit Area	1,450,000	21%	$16	$23,200,000
Total:	**7,020,000**	**72%**		**$109,320,000**

Additionally, SDOT has jurisdiction over approximately 16,200,000 square feet of privately owned landscaped areas within the ROW.

13.2.2 Landscape Complexes Life Cycle Costs, Maintenance Approach, and Funding

SDOT performs maintenance on all landscape areas in good condition several times per year to maintain this condition. When a landscaped area is downgraded to poor condition, it is no longer part of a routine maintenance plan. Landscape areas in poor condition are maintained as needed on an incident-response basis. Given the expanding volume of area where planned maintenance has been deferred, emergency and safety responses efforts have increased. This has reduced SDOTs ability to visit landscapes in good condition as frequently, resulting in a declining percentage of landscape areas that are classified as "good".

Landscape Condition	Maintenance Approach	Estimated SF Cost to Maintain (2019)
Good	▪ Minimal Litter – picked up weekly, bi-weekly, or monthly as needed ▪ Minimal weeds ▪ Adequate mulch – restored annually or twice annually as required to maintain 2-3" depth ▪ Trees and shrubs both healthy and properly pruned or trimmed	$0.50
Poor	▪ Litter - removal only to mitigate public safety concerns in response to complaint(s) ▪ Weed control – only to mitigate a noxious weed infestation or if considered to be a public safety concerns ▪ Mulch – only as necessary to cover bare soil as a means of temporary erosion control ▪ Pruning – only to mitigate a public safety concerns	$0.30

Urban Forestry has established a maintenance approach according to the following priorities:

- ✓ Public safety
- ✓ Maintain vegetation by controlling weeds adequately so that the desired plant material can thrive
- ✓ Aesthetics

Urban Forestry requires additional funding to address the following maintenance objectives:

- ✓ Ensure that critical sight lines are maintained in landscaped areas. Crews address this only during regular scheduled maintenance of the landscaped areas or in response to a customer request.
- ✓ Control noxious weeds in the ROW in areas other than landscaped areas. SDOT bases control on citation by King County Weed Control Board for which mitigation is required within a two-week period, or in response to a customer request.
- ✓ Ensure that hazardous waste (primarily contaminated litter) is mitigated in all landscaped areas owned by SDOT. Approximately 25% of the landscaped areas that exist in highly urban portions of the city, such as the Central Business District, which is visited twice monthly, are considered compliant, and the remaining 75% are placed on a watch list.

The level of investment required to maintain SDOT's landscapes in good condition is unknown. In 2019, the Department spent approximately $1.86 million on landscape maintenance. It is estimated that approximately $2-3 million is needed to properly maintain landscapes in good condition and to respond to emergent incidents.

Over the next reporting period, SDOT plans to develop landscape specific maintenance plans as a management tool to inform budget needs. The plans will cover:

- ✓ Activity specific industry maintenance standards to establish a level of service for each landscape
- ✓ Maintenance schedule including frequency and time required

The Department conducts maintenance methods for landscaped areas according to progressively higher safety and environmental standards. Meeting higher standards generally means less time available for performing actual maintenance work on the landscaped area and additional unit cost to maintain.

13.3 TREES

SDOT exercises a regulatory responsibility for all street trees regardless of ownership. Urban Forestry maintains SDOT owned trees. Trees not owned by SDOT are maintained by private or other public entities. The BTG levy program provided funding for SDOT to plant an average of 800 trees per year from 2007 thru 2015. Under the Move Seattle Levy, the program is funded to install 400 – 600 annually through 2024. Trees are also planted because of capital projects, some of which are undertaken by other City departments and private developments. The Seattle Municipal Code mandates that maintenance for trees planted by SDOT are the responsibility of SDOT.

According to extensive industry research, street trees provide many benefits to the urban environment and are a critical part of the transportation system:

- ✓ From a transportation perspective, street trees serve as traffic calming devices along arterial corridors and serve as a buffer between pedestrian and vehicular traffic. A tree-lined street is more attractive to bicyclists and pedestrians and promotes these modes of transportation.
- ✓ From an environmental perspective, street trees provide storm water attenuation, remove particulate matter from the air, sequester carbon dioxide, produce oxygen, provide wildlife habitat, and provide shade and reduces urban heat island effects. This provides energy savings to homes and businesses while improving air quality.
- ✓ From a social perspective, street trees aid in the reduction of crime, improve the physical and mental health of the general public, and contribute significantly to quality of life in the city.

13.3.1 Tree Inventory Status and Anticipated Annual Growth

Due to the high number of trees and historical complexity of Infor data entry, the inventory of SDOT trees is estimated to be approximately 3,000 less than the actual count in Infor. In 2016, Urban Forestry began a system-wide validation of its existing tree inventory using a field application. The validation is expected to conclude by 2024 when the Move Seattle Levy ends. As of the publishing of this report, 21 management units of SDOT trees

are complete and 12 out or 27 management units pertaining to private or other maintained trees are complete. SDOT has verified the presence of nearly 160,000 trees in the right-of-way. Urban Forestry reports a higher data confidence level of known SDOT owned street trees versus privately or publicly owned trees.

In-kind replacement of an established tree is generally not possible because new trees (2" dia.) are much smaller than established trees (10-24" dia.) and bring reduced canopy benefit. This report employs an estimate of tree appraised value. A single 10" diameter tree is valued at approximately $5,000 and the appraised value of an average 24" diameter tree is approximately $29,000. On a "trunk area" basis, the replacement of one 20" diameter tree would require the planting of 100 2" caliper trees.

Asset	Inventory Count	Data Confidence	Replacement Value	Useful Life (Years)	System Replacement Value	Assessed Value	Anticipated Annual Growth
SDOT Trees	38,000 (e)	Medium	$1,700[32]	50-100	$64,600,000	$146,991,700	100-700
Trees – Private/Other	200,000 (e)	Medium-low	N/A				

13.3.2 Tree Life Cycle Costs, Maintenance Approach, and Funding


Planting Strip

Trees rated in fair condition are anticipated to have a life expectancy of ten to 25 years. Poor condition rated trees are estimated to have a useful life of five to ten years. When a tree reaches very poor condition, life expectancy is five years or less. Disposal of a tree costs approximately $3,000 for removal (24" diameter at breast height (DBH), and an additional $1,000 for stump grinding and site preparation for new planting.

Before BTG began in 2007, maintenance practices were generally reactive and undertaken in response only to customer requests rather than through scheduled maintenance to promote structure and healthy tree growth. Approximately 75% of current tree maintenance is still in reaction to customer requests. However, BTG and Move Seattle Levy funding allows SDOT to transition to a more routine programmed maintenance by pursuing scheduled pruning of corridors, therein reducing the number of customer requests.

Approximately, one-third of tree response is due to an emergency. Prior to BTG, for trees in poor condition, major restoration pruning, or removal only received rapid attention when the tree represented liability due to blocked visibility to a traffic control device considered crucial to the safe operation of the intersection or street. The work typically addressed only the immediate concern and did not improve the overall condition of the tree. Lower priority maintenance work on these assets would often take up to 18 months or longer. A more desirable maintenance strategy for trees would be a proactive pruning schedule where all SDOT trees are pruned at least once every five to seven years. Some tree species need more attention than this schedule due to their growth habits and some have conflicts with electrified infrastructure. This approach would decrease overall

[32] Replacement value includes planning, design, labor to install, materials, and 3-year establishment period. It does not include removal of existing trees or stump grinding. The replacement value cited above reflects only the planting 2" caliper trees and does not include loss of canopy cover.

maintenance needs. Once a tree is removed, replacement is typically able to be scheduled within the next 18 months, if not sooner. Even with the addition of Move Seattle funding, there is currently a three to five-year backlog to replace a tree once it has been removed.

- ✓ Routine Maintenance Backlog – Urban Forestry currently has hundreds of outstanding tree service requests, a number which has risen over the last several years. Proactive corridor pruning for vehicle and pedestrian clearance is performed on a very infrequent basis. Additional resources are required to address the maintenance needs of new assets once they transition from the 3-year establishment period where they require irrigation.
- ✓ Operations Backlog – Urban Forestry receives an average of 40-60 maintenance requests per day generated by customer calls, service requests from the City's "Find It Fix It" app, and email requests. This results in most field staff crews having a continual backlog of approximately 40 inspection requests, some of which they convert to work orders which add to the routine maintenance backlog.

In 2019, the actual costs for maintenance and operations of trees totaled $1.54 million ($1.23 million for tree pruning and $0.31 million for tree planting). To a large degree Move Seattle-funded pruning has addressed public safety concerns and reduced conflicts with other infrastructure assets. However, additional funding is needed to allow Urban Forestry to address structural anomalies of many trees which, if not attended to, will allow them to degrade over time. If SDOT were to maintain all trees, including newly planted trees, at their current condition ratings and to prevent or slow down, the deterioration rate it would require two additional tree crews at an annual cost approximating $750,000 plus equipment.

The Society of Municipal Arborists recommends a seven-year pruning cycle for mature trees (minimum 21" DBH), and a three to five-year pruning cycle for small trees. The addition of two additional tree crews and a tree crew supervisor would allow SDOT to align with national standards.

Trees decline due to age and environmental issues. Sometimes, infrastructure conflicts require tree removal. The tree population of SDOT's urban forest is younger than the national average. As the population ages, trees will begin to decline based on age and species, increasing the number and complexity of tree-related risks. For example, programs like Forward Thrust funded the planting of approximately 23,000 trees over several years in the 1970s. Given an estimated life span of 50 years, we anticipate removal and replacement funding to be 4-5 times higher starting from the mid-2020s onwards to address the decline of trees planted under large scale installation programs like Forward Thrust.

Street Tree: Tupelo

14 – SUMMARY & CONCLUSION

14.1 SUMMARY & RECOMMENDATIONS

This report is considered a living document and helps us to better understand the assets we own, maintain, operate, permit, and install in the right-of-way. It outlines how we manage, count, value, and fund the various assets that we own. For some assets with better information, the report provides more definitive statements regarding needs and funding requirements.

The proposed improvement strategies summarized in Table 14.1 will bolster the return we receive on our capital investments by identifying where to plan and fund asset maintenance and system improvements. As covered in the multimodal and strategic plans, there are economic, environmental, and health benefits for investing and nurturing Seattle's bicycle, pedestrian, transit, ITS, and freight infrastructure. In return we are increasing access and mobility while making streets safer for all users. We are efficiently using our limited available space and providing options for people living, working, and visiting Seattle to access other modes of transportation. Implementation of our multi-modal plans is further enhanced by using an equity lens that examines existing asset availability and conditions across Seattle.

We support and promote safety, mobility, accessibility, and fiscal accountability through strategic decision-making. As we install new assets and continue to modernize our infrastructure, it is also important to ensure sustainability for future generations. By implementing proactive asset management strategies such as setting the right investment levels in asset maintenance and tracking our asset inventory status through improved data management, we can improve asset conditions and extend asset service life – increasing the safety, livability, and other transportation benefits our community receives – while ensuring efficient and effective use of taxpayer resources.

We rely on asset owners and data maintainers to be the stewards who are responsible for the completeness and quality of their asset data. However, in recent years, our asset inventory has experienced a high volume of asset additions, modifications, and removals due to new capital projects and private developments. This decentralized model of asset data maintenance may result in inconsistent asset data quantity and quality, contributing to improper on-boarding of assets into the central asset data repository. We continue to evaluate various models of asset on-boarding and data maintenance improvements for possible future implementation. One example of a model that has worked and is currently working well pertains to the centralizing of sidewalk and curb ramp asset data maintenance. This data has been maintained under the Asset & Performance Management group since 2015 with the primary purpose of supporting the ADA Consent Decree. Centralization has improved the efficiency of our tracking and reporting because the supporting processes funnel all planned and constructed assets to one team thereby consolidating the asset management and on-boarding processes and leading to higher data quality and increased efficiency.

What gets measured, gets managed! Research clearly shows that well-defined and well-tracked assets are better funded to support proactive maintenance approaches. Moreover, when performance targets are clearly established with buy-in from asset owners then maintenance crews can be reliably budgeted, and their collective resources allocated to perform maintenance and preservation activities that increase our performance and the assets' service lives. Two recent examples of this are the Move Seattle Levy performance target of remarking crosswalks every four years and the 2017 Sidewalk Assessment that proactively prioritized sidewalk repair and

mitigation activities to utilize economies of scale in addressing height differences and other sidewalk issues citywide. In 2019, the sidewalk repair and maintenance budgets were tripled, allowing us to increase our spot improvements over tenfold from previous years and replace almost 30 blocks of failing sidewalk. The Sidewalk Safety Repair Program (SSRP) now implements a proactive and holistic repair program using grids rather than reacting solely to customer requests.

The City can realize more effective use of its financial resources, reduce risk, and provide increased safety, environmental, and health benefits for all by implementing the following actionable improvements. The list below organizes the proposed improvements by the asset lifecycle phase: planning, design, construction, and maintenance. The numbers inside the brackets after each bulleted item corresponds to the item number in the Proposed Improvement Plan and Monitoring Schedule shown in Table 14.1.

Planning

- ✓ Develop a Transportation Asset Management Plan [6]. Assemble information on asset status and condition, levels of service, performance measures, business risk exposure, and trade-off and lifecycle cost analyses to inform our financial asset investment strategies. This plan will help establish reliable and accurate estimates for our long-term cost forecasted needs for our highest value asset classes.

- ✓ Strategic Asset Management Implementation [7]. Incorporate strategic considerations into our planning activities. As our asset management processes are further refined, our teams will have the tools to manage assets at a more strategic level, such as considering travel corridors and neighborhoods, rather than on an asset-by-asset basis. Moving forward we will consider incorporating the directives of the Complete Streets Ordinance and the administration roadmap established by Streets Illustrated.

- ✓ Include maintenance plans in interagency, private, and capital projects [7]. Institute standard operating procedures that (1) establish cost accounting activities to track expenditures across assets including cyclical and condition-based asset preservation activities; and (2) develop preventative maintenance plans for non-standard construction items.

- ✓ Develop asset-based long-term operational cost forecasting [12, 14]. Continue to refine data and information related to the routine maintenance, preservation, and replacement costs over the expected life of each of our assets so that we can continue to make strategic investments and inform future budget exercises.

- ✓ Secure maintenance funds for new assets [13]. Generate estimates correlated with project scope to secure new funding for asset maintenance to minimize increases in backlog and to ensure achievement of the desired service life.

Design

- ✓ Include maintenance staff input during project development [4]. Incorporate field reviews in the project development schedule before design documents reach 30% and include maintenance staff in the Complete Streets Checklist (CSC) circulations.

- ✓ Replicate standards that work [4]. Use standard designs when possible so that maintenance processes can be consistent throughout the city. Verify that our design standards are compatible with maintenance means and methods and minimize deviations from accepted standards. Avoid specialty treatments where possible; this often creates more difficult and costly maintenance. Provide recommendations to protect the value of project investments. Evaluate the Performance Standards work break down structure document developed in 2002 for applicability to today's maintenance practices.

Construction

- ✓ Employ lessons learned [4]. Use information and knowledge derived from recent capital projects so that future projects can be designed for easier maintenance and coexist with adjacent uses such as streetcar tracks. Include maintenance staff in lessons learned meetings so that future projects can be better designed resulting in reduced maintenance costs.

Maintenance

- ✓ Establishing meaningful performance measures [3]. Provide a framework to establish clear, goal-oriented performance measures that communicate an agreed upon level of service and/or condition level for selected assets.

- ✓ Manage assets in the right-of-way [4]. Establish clear ownership for assets in the ROW and develop a customized management approach for those that we do not own but for which we may have jurisdiction and legal responsibility. This covers new assets installed via private development, utility projects, and Capital Improvement Program projects that are turned over into our care.

- ✓ Document maintenance costs [4]. Create procedures for documenting maintenance costs for asset types and use this to inform future project designs. Incorporate maintenance planning and asset lifecycle costs early in project development. Document and communicate full asset maintenance costs and best practices internally and externally.

- ✓ Communicate maintenance needs to public [5]. During project development, hold public engagement events to explain new project maintenance needs and funding availability to garner public support, ensure cost effective designs, and advocate for sustainable funding citywide. Include maintenance strategies in the modal plans and other long-range planning documents. Maintenance plans and costs become part of standard operating procedures for project development, design processes, and private development reviews.

- ✓ Centralize and modernize asset data maintenance and onboarding [8]. Investigate and research the creation of a centralized, adequately staffed asset data management group that could onboard, modify, and retire assets in our Infor and GIS databases regardless of the entity responsible for constructing the assets. This would enhance and support activities such as data governance, risk assessment, asset inventories, and reporting. Asset onboarding would be further enhanced by modernizing and automating asset onboarding through technological improvements to the Infor and GIS systems.

- ✓ Establish clear responsibility for maintenance [10]. Continue to work diligently to define maintenance responsibilities within our department and across other city departments and with other agencies. While the maintenance responsibilities for most of our assets are clear, these obligations can be ambiguous for assets that cross organizational lines.

Table 14.1 outlines strategies to advance our asset and performance management maturity over the next three-to-five-year reporting period. The strategies are assigned an implementation level: enterprise, program, or asset. Enterprise implementations have departmentwide impacts and rely on cross-divisional team engagement. Program and asset implementations focus on the specific programmatic or asset-based improvements and involve fewer collaborative efforts to implement. The table details the key actions, gaps, improvements, associated known cost implications, and the monitoring period in alignment with current expectations and guidance. Impact ranges from high to low, where high represents the most significant improvements to advancing our asset management maturity. Costs for executing these strategies have not yet been validated, thus implementation costs may require additional budget or internal budget tradeoffs or have yet to be determined. The ability to secure funds for specific strategies may impact the assumed timeline for implementation.

No.	*Strategy*	*Implementation Level*	*Impact*	*Timeline*
1	Asset Management (AM) Governance team to meet regularly to provide program oversight	Enterprise	High	Ongoing
2	Attend AM training and develop AM training for team members	Enterprise	High	Annually
3	Adopt policies on the definition of the backlog specific to asset type, risks presented, and maintenance needs	Enterprise	High	Q2 2022
4	Develop capital project business processes to include maintenance staff in project reviews, evaluate non-standard designs, add/update standard designs, document and review lessons learned, document projected maintenance costs from new projects	Enterprise	High	Ongoing
5	Develop and implement an Asset Management public education strategy	Enterprise	High	By Q1 2023
6	Develop a systemwide Transportation Asset Management Plan which covers asset backlog, performance scenarios, investment strategies and lifecycle planning, performance outcomes tied to customer satisfaction, and growth in transportation demand	Enterprise	High	2022
7	Facilitate sessions to determine next levy and funding strategies using AM decision-making tools	Enterprise	High	By Q4 2022
8	Investigate piloting options for centralizing asset data maintenance and modernizing asset onboarding through technology improvements	Enterprise	High	TBD
9	Adopt asset condition performance targets for critical assets	Enterprise	Medium	TBD
10	Determine and document responsibilities to establish jurisdictional versus private or other agency ownership and maintenance responsibilities	Enterprise	Medium	TBD
11	Identify gaps in condition data using risk management techniques and update condition assessments	Program	High	Annually or As Required

No.	Strategy	Implementation Level	Impact	Timeline
12	Follow up on the Bridge Audit Report recommendations, as part of the Business Practice Upgrades (BPU), including resolving data discrepancies in roadway structures inventories	Program	High	By December 2023
13	Evaluate existing asset maintenance backlog and new asset types from capital to right size maintenance budgets	Program	High	TBD
14	Update asset inventories	Asset	High	Annually or As Required
15	Maintain a bi-annual inspection program of each areaway and request annual funding for repair and mitigation	Asset	Medium	Annually
16	Perform a landscape and irrigation study to determine a preventive maintenance and replacement program using RSJI principles	Asset	Medium	By December 2022
17	Apply surface treatment to areaway sidewalks to preserve from water intrusion	Asset	Medium	TBD
18	Perform an inventory of alleys and add to the Infor database	Asset	Medium	TBD
19	Develop a signs onboarding tool for permitted / CIP projects	Asset	Medium	Q4 2022
20	Develop a bicycle facilities maintenance plan to support proactive sweeping, delineator post replacement, landscape maintenance, and striping. Add bicycle facilities to the Infor database as assets.	Asset	Medium	Q4 2021
21	Evaluate and implement sidewalk repair policy recommendations as outlined in Seattle City Council Resolution 31908	Asset	Medium	Q4 2024
22	Develop a replacement program for the communications network	Asset	Medium	Q4 2023
23	Develop a maintenance plan for the radio towers asset	Asset	Medium	Q4 2024
24	Replace all rockery retaining walls	Asset	Low	TBD
25	Update channelization inventory to reflect the asset categorization data for better lifecycle planning	Asset	Low	TBD

Table 14.1: Proposed Improvement Plan and Monitoring Schedule

14.2 IMPLEMENTATION CHALLENGES

We currently face many different challenges in implementing the suggested improvements from the previous section. The challenges are varied but include financial, asset condition and service life, transportation service impacts, project delivery, and maintenance and operations workforce capacity.

Financial Considerations

While our project teams, crews, and contractors made meaningful progress on capital projects and asset maintenance in 2020, as a department we have had to adjust to the financial challenges resulting from the COVID-19 pandemic starting in early March 2020. The statewide "Stay Home, Stay Healthy" order and social distancing requirements were vitally important for public health and simultaneously impacted our city's

transportation patterns, tax revenues, streetcar fare recovery, and crew capacity. COVID-19 and the resulting economic recession ultimately impacted our business processes and operations in unforeseeable ways and focused our resources in unanticipated areas.

Asset Condition-Based Issues

On March 23, 2020, the City closed the West Seattle High-Rise Bridge due to accelerated concrete cracking. The decision was necessary for public safety, but at the same time brought immediate challenges to communities in West Seattle and the Duwamish Valley. While work to stabilize the bridge was performed, the City carefully evaluated options to restore bridge access with close consultation and analysis from our structural team, members of the West Seattle Bridge Community Task Force, our Technical Advisory Panel composed of leading experts in their fields, and countless others. In mid- November 2020, Mayor Jenny A. Durkan instructed us to repair the West Seattle High-Rise Bridge, the pathway that provides the highest degree of certainty for a safe and rapid restoration of travel with the lowest level of impact to communities in and around the Duwamish Valley, the city, region, and state. This repair work is currently underway, and the bridge remains on schedule to reopen in 2022. Furthermore, we are making asset improvements to mitigate access to and from West Seattle and surrounding neighborhoods through established detours. This incident has reinforced the critical role that asset management serves and underscored the importance of a risk-based approach to inform strategic investment decisions.

Transportation Services Impacts

In the face of unprecedented events in 2020, we responded quickly to address the many emerging needs of travelers and essential workers, and to support neighborhoods and small businesses. We played an invaluable role in the City's COVID-19 response, establishing over 20 miles of Stay Healthy Streets, creating new curbside pickup locations to help vital small businesses stay open, installing COVID-19 testing site traffic control, and more. Our crews have also been responding to the West Seattle High-Rise Bridge closure – including through bridge inspections, traffic mitigation, paving, detour signage, and installing safer walkways and bike lanes.

Maintenance & Operations Workforce Capacity

As noted in the 2020 Bridge Audit Report[33] , the department's skilled bridge workforce is currently under-resourced to deliver the level of service necessary to maintain our bridge assets in fair or better condition. This theme resonates across our maintenance and operations teams, regardless of the asset class. When developing and implementing maintenance plans and securing dedicated maintenance funds, adding critical maintenance crew positions will help to proactively address asset preservation needs. Further, pressures of COVID-19 citywide outlined above affected our ability to deliver the full extent of planned accomplishments in 2020, which has resulted in increased maintenance backlog, particularly for the pavement asset.

Project Delivery Impacts

With revenue declines forecasted to continue into 2021, our executive team took immediate action to pause work – including projects within the Move Seattle Levy portfolio and the Center City Connector Streetcar. During the pause, we worked to better understand our fiscal constraints, identify immediate cost savings to address budget shortfalls, and establish a thoughtful, equity-first set of criteria to guide decision-making around what work will be paused indefinitely and what will continue while prioritizing racial and social justice. During this past

[33] seattle.gov/Documents/Departments/CityAuditor/auditreports/2020_03_SeattleBridges_FinalReport.pdf

year, we also passed the midpoint of the Levy, which provided an opportunity to evaluate progress towards commitments to Seattle voters. The overall level of decreased funding may have a limited effect on our ability to meet the original levy performance targets[34].

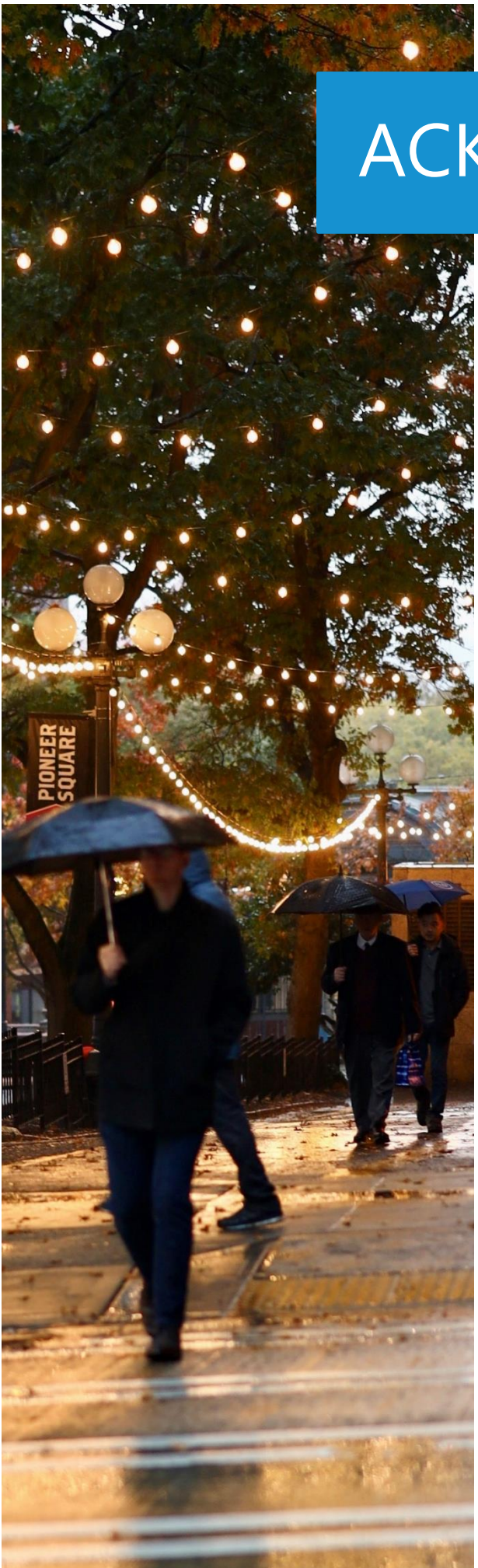
14.3 CONCLUDING REMARKS

We at SDOT are committed to managing our assets in a cost-effective manner for current and future Seattleites. To achieve this reality, we are guiding the management of our assets to ensure that the right fix is made on the right asset and at the right time. Holistic asset management defines our approach to solving our asset management challenges. And in doing so, we want to maximize the benefits we provide back to our community, in an equitable manner, by investing strategically in communities that have been underserved by public investment. We recognize the urgent call to action to center anti-racism and racial equity in our work and will hold this in the forefront for the department as we update our asset investment portfolio. We will support and promote asset and performance objectives that assist our collective efforts in delivering a racially equitable and socially just transportation system that meets the needs of communities of color and those of all incomes, abilities, and ages.

In addition, we remain committed to meeting the challenges we face amidst the current climate crisis. Supporting proactive and meaningful asset and performance management strategies will help the city reinforce its commitment towards combating climate change. We are taking steps to reduce our carbon footprint and aspire towards becoming a leading and early adopting transportation department, measuring how our performance and transportation decisions impact our climate change progress. Our capital, operating, and maintenance activities contribute to greenhouse gas (GHG) emissions and we are taking proactive steps towards positive change through prioritizing asset replacements, efficiently localizing maintenance activities, protecting right-of-way trees and natural landscapes, reducing fleet fuel consumption, and providing alternative travel and commuting options.

We commit and dedicate ourselves to continuous development by improving our asset conditions, maintenance, and operations processes, and utilizing performance data to support condition and consistency-based decision-making. Moving forward with the proposals provided within this report will require an organizational commitment to change. However, we are nimble, agile, strong, and resilient and together we will confidently rise to meet these challenges as a collaborative and united team.

[34] www.durkan.seattle.gov/wp-content/uploads/sites/9/2020/11/November-2020-Update-2020-21-Revenue-Forecast.pdf



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- Top photos are Denny Regrade from Denny Ave and 8th (1929) and Alaska Way Viaduct N Portal (2019) - photo by Chun Kwan.
- Bottom photos are Jose Rizal Bridge construction (Dearborn St Bridge, 1917) and I-5 traffic during the Seattle Squeeze (2019) - photo by Chun Kwan.

APPENDIX A - SDOT ASSET MANAGEMENT OVERVIEW

Asset Management (AM) is the business model for informing all strategic investment decisions related to the transportation infrastructure. SDOT's statement of principles describes the mature Asset Management environment it is working toward.

The objective of SDOT Asset Management is to:

- ✓ Build, preserve, and operate transportation infrastructure services more cost effectively with improved asset performance;
- ✓ Deliver to customers the best value for the public tax dollar spent; and
- ✓ Enhance the credibility and accountability of SDOT to the Mayor, City Council, and general public.

A.1 BACKGROUND

In 2007, the Seattle Department of Transportation began implementation of asset management, a strategic and systematic process that guides decisions about construction, maintenance, and operation of SDOT infrastructure. Best practice asset management requires an enterprise-wide approach that guides investment decisions and priority-setting to strengthen management of transportation assets. SDOT recognizes that we are embarking on a long-term effort to achieve that end state through a process of continuous improvement. The original asset management principles were updated in 2015 to reflect eight years of progress and the Department's future direction in asset management:

Asset Inventory. SDOT will develop information on our asset inventories that will include all those assets that we are responsible for and order them according to a hierarchy that reflects SDOT's business responsibilities and advanced asset management practices.

Condition Assessment. SDOT will collect information on the condition of our assets that will be consistent and easily understood across all the categories of our assets. We will use this information to develop asset management plans for the maintenance and operation of our assets that will achieve sustainable service levels. Condition assessments will occur on a frequency that meets all business and reporting needs.

Maintenance. SDOT will develop and adopt a maintenance and preservation policy for our assets that moves us toward an operation that achieves sustainable and high levels of performance based on agreed upon service levels. We will assist this policy in its implementation by the development and use of a work management system that will work in cooperation with AM practices to retain necessary maintenance and condition information.

Levels of Service (LOS). SDOT will develop level of service information that reflects and includes, to the extent feasible, our customer and stakeholder input. We will use this information to report on our performance in meeting, or failing to meet, the LOS and the implications thereof.

Financial Planning. SDOT will incorporate full life-cycle costing into our financial planning to achieve cost-effective asset management planning and operation to minimize full life-cycle costs. Our financial reporting will reflect full lifecycle costing, and will include the implications of meeting, or failing to meet the funding requirements indicated by full life-cycle costing.

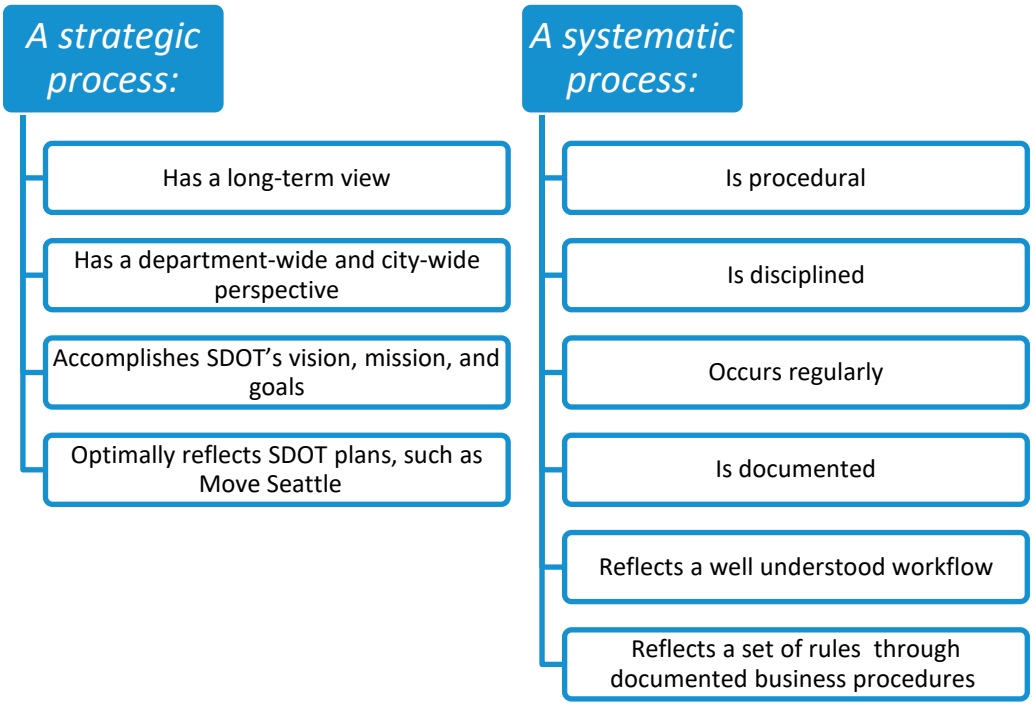
CIP and Annual Budget Funding Processes and Procedures. SDOT will incorporate asset management principles into budgeting and CIP decision-making, across the Department so that decisions are based on critical asset needs, conditions, and levels of service.

Capital Improvement Planning. SDOT capital planning for replacement, renewal, or new infrastructure will include asset management principles related to LOS, full life-cycle costing and an understanding of the criticality of the asset and its sustainable service levels.

Information Technologies, Analysis, and Management. SDOT will adhere to its integrated systems strategy in developing information systems that support the business and user needs of asset management; be they inventory, condition, inspection, work management, financial, or project planning systems. Asset information is an essential but expensive foundation for effective asset management decisions. Our information management practices will ensure that we collect and actively maintain only the critical minimum information at the level of quality needed by the business, and that this information is accessible from authoritative sources (for example, pavement management, structures database, Bridge Works, and the Infor system). SDOT will follow knowledge management practices to standardize and disseminate asset management data and practices across the organization.

Reporting. SDOT will ultimately report on its performance in relation to an annual Strategic Asset Management Plan (SAMP) and report, and in periodic asset status and condition reports.

Triple-bottom line. SDOT will align the financial, environmental, and social costs and impacts of asset decisions with the City's policy as embodied in its Race and Social Justice Initiative (RSJI). For more on SDOT's RSJI program, see section A.2 below.



A.2 RACIAL EQUITY & SOCIAL JUSTICE

We believe transportation must meet the needs of communities of color and those of all incomes, abilities, and ages. Our goal is to partner with our communities to build a racially equitable and socially just transportation system. We seek to address historic disparities in Black, Indigenous, and People of Color (BIPOC) communities by directing resources to underserved communities and supporting authentic engagement.

In Seattle, transportation is the second highest household cost for all households after housing, disproportionately affecting low-income households in outcomes such as higher costs, greater wait times, and limited access to transit options. Safe, environmentally sustainable, accessible, and affordable transportation is a key contributor to households accessing and retaining housing and employment.

Communities of color, low-income communities, immigrant and refugee communities, people with disabilities, and people experiencing homelessness or housing insecurity tend to live, work, play, and learn in concentrated areas, including often formerly redlined neighborhoods, or have been displaced to areas where barriers to safe, environmentally sustainable, accessible, and affordable transportation and housing among other race-based socio-economic disparities persist.

Additionally, when customer requests are the primary driver for new assets and maintenance, wealthier parts of Seattle may have more assets, and they may be in better condition due to these historical inequities in service. As one of the country's fastest growing large cities over the past decade, Seattle has experienced rapidly escalating rents and housing prices. This has placed low-income households and BIPOC communities at increasing risk of displacement.

Fundamentally we must ensure that our transportation system meets the needs of communities of color and those of all incomes, abilities, and ages. The City commits to work with community-based organizations, service providers, affordable housing providers and other partners to build a racially equitable and socially just transportation system. Some of these efforts are summarized below:

Race and Social Justice Initiative

Seattle's Race and Social Justice Initiative (RSJI) is a citywide effort to end institutionalized racism and race-based disparities in city government. To incorporate a racial equity lens and achieve coordinated planning and equitable growth, we use our Racial Equity Toolkit (RET) to conduct an evaluation that we apply to the development, implementation, and evaluation of our policies, initiatives, programs, and budget decisions. During the development of this report we conducted a RET evaluation. The RET analysis included the following elements:

1) SDOT's interactive Racial Equity Tool;
2) SDOT's report on bicycle facility maintenance planning versus reactive customer request-based service;
3) The Sidewalk Assessment and resulting proactive maintenance program; and
4) Move Seattle marked crosswalk remarking maintenance program.

Equitable Development Monitoring Program

Seattle's Equity Development Monitoring Program (EDMP) measures Seattle's progress toward becoming a more equitable city and provides an ongoing tool for informing the City's work to advance equitable development. The EDMP also provides data that the City, community-based organizations, and members of the public can use to foster racial and social equity, including community indicators and displacement risk indicators such as the Race

and Social Equity Index. Displacement Risk Indicators are a set of core indicators focusing on residential displacement and offer a greater understanding of who is most affected by displacement and where these pressures are currently concentrated, providing community members and policymakers with an important tool in Seattle's fight against displacement.

Transportation Equity Program

The Transportation Equity Program provides safe, environmentally sustainable, accessible, and affordable transportation options that support communities of color, low-income communities, immigrant and refugee communities, people living with disabilities, people experiencing homelessness or housing insecurity, LGBTQ people, women and girls, youth, and older adults to thrive in place in vibrant and healthy communities, and mitigate racial disparities and the effects of displacement. The program supports the Transportation Equity Workgroup, a body made up of 10 members from marginalized communities that provides a set of community-guided recommendations to the City.

Economic Inclusion and Contracting Equity

Our Women and Minority Owned Businesses (WMBE) program seeks to achieve and sustain equitable participation by businesses that have been historically underutilized. The program fosters participation in City contracting opportunities and facilitates outreach within the community to advance and grow opportunities. We consistently strive to meet and exceed inclusion targets outlined in our annual WMBE Outreach Plans. In 2020, our voluntary WMBE targets were 19% for purchasing and 34% for consulting. Our actual WMBE performance levels were 17.3% for purchasing and 38.4% for consulting.

Equity evaluation requires rich contextual information about the people and places that are impacted historically, at the time of analysis, and in the future. We leverage our data infrastructure to provide our teams with the analytical tools needed to identify disparities in infrastructure and services, prioritize investments with an equity lens, and to improve the deployment of ongoing maintenance activities.

Our information systems and GIS databases include asset condition, attributes, and other regularly updated information that supports equity analysis by location. We use asset data attributes such as type, size, age, condition, and planned infrastructure to analyze asset condition over time, performance, risk implications, and level of service to distribute repair and replacement strategies more equitably. For example, the data can show locations where infrastructure condition ratings are low, but equity priority is high or how investments are broken down by different parts of the city. Asset information is regularly updated (typically weekly) in our public facing maps for transparency and public information.

Informed by demographic information and travel patterns, this type of overlay can easily be applied to infrastructure such as roads, bridges, sidewalks, and bicycle facilities; services such as maintenance requests, pothole repair, and transit access; and outcomes such as traffic safety and travel reliability. This work supports our modal plan implementation, capital project selection, and proactive crew work activities.

To conduct these analyses, we can use demographic data and indicators supported by the EDMP. Community Indicators of Equitable Development provide baseline information on twenty-one indicators spanning four broad themes: home, community, transportation, and education and economic opportunity by race and ethnicity and by neighborhood, with a special focus on Race and Social Equity Priority Areas.

Figure A.1 below is from the Data Equity Tool and Approach that we use to evaluate spatial distribution and correlation of transportation and equity data across Seattle. The Race and Social Equity Index ranks Census Tracts by priority and is correlated with percentages of people of color, income, and adults living with disabilities. Highlighted areas in orange and brick depict the Race and Social Equity Index Priority Areas.

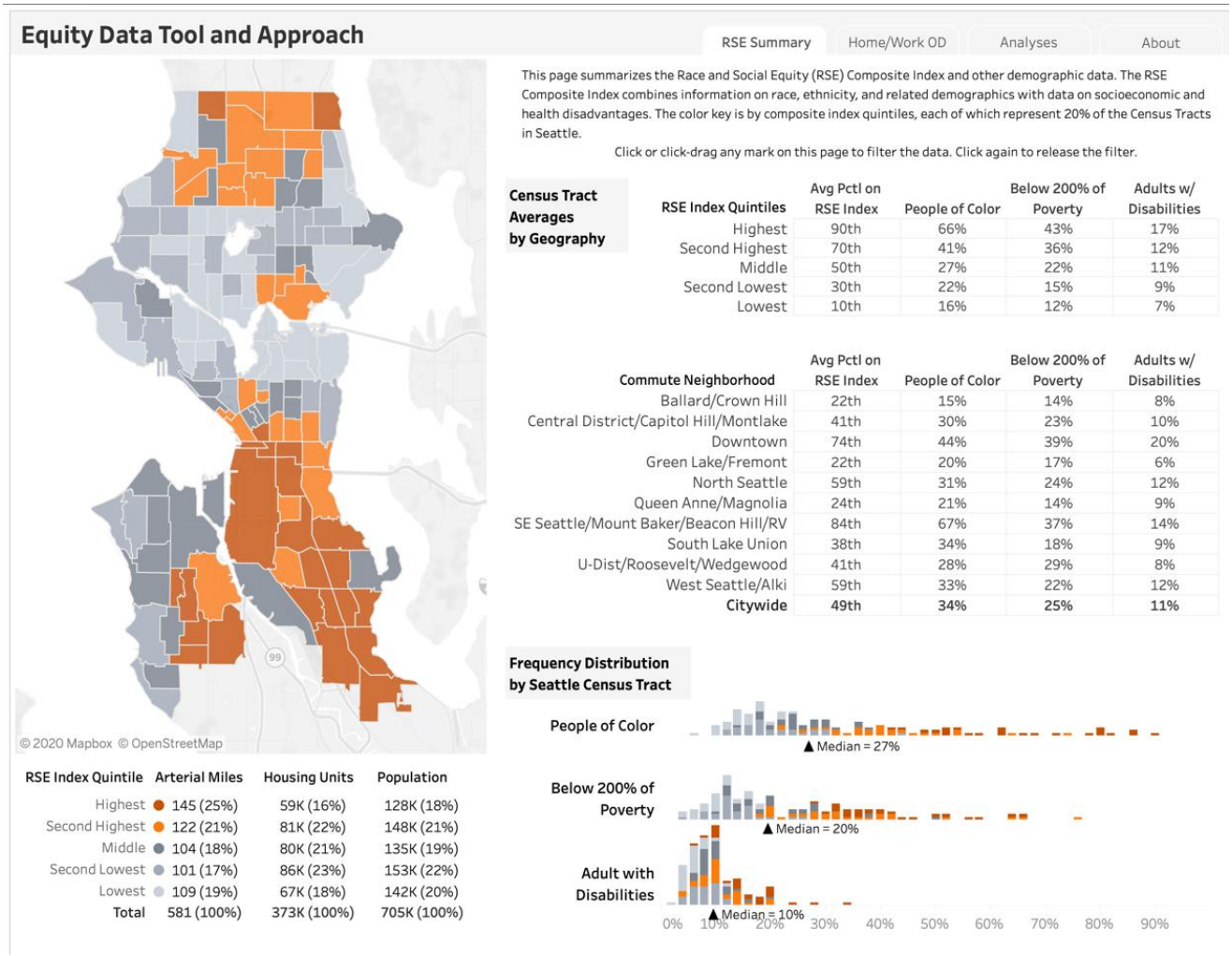


Figure A.1: Race and Social Equity Index

A.3 SDOT ASSET HIERARCHY

SDOT organizes its transportation infrastructure components into a hierarchy to enable more effective management and communication about its assets. This table depicts the hierarchy down to the Level 2 assets and their categories. We can further disaggregate many of these level 1 assets to even lower levels.

Asset Class	Level 1 Assets	Level 2 Assets	Asset Categories
Bicycle & Pedestrian System	Bicycle Facility	Post, planters, curb, curb stops, landscaping, raised median, and concrete barriers	Protected bicycle lanes, buffered bike lanes, sharrows / painted bike lanes, neighborhood greenways
	Bicycle Rack		On-Street, On-Sidewalk
	Kiosk	Maps, Structure	Pedestrian Wayfinding
	Marked Crosswalk		Raised, Painted, Torch-down, Thermoplastic
	Sidewalks	Walkway	Unimproved, Improved Corner, Block, Median Island, Transit Island Platform
		Curb, Curb Bulb, Curb Ramp, Improved Filler	
	Stairways	Rail, Post, Tread, Riser, Landing, Stringer / Support, Cleat, Pedestrian Viewing Platform	
	Street Furnishings		Rail, Bench, Chair, Table, Wall
	Trails	Trail Surface, Bollard	Paved, Gravel/Dirt
Bridges & Structures	Air Raid Siren Tower		
Asset Class	Level 1 Assets	Level 2 Assets	Asset Categories
Bridges & Structures	Areaway Street Walls	Sidewalk Support/Surface, Building/Partition/End/Street Walls, Deck/Sidewalk, Floor, Skylights	Regulated, Unregulated
	Bridges	Deck, Superstructure, Substructure, Approach Slab, Machinery, Control System, Protection Pier, viewing platforms	Moveable, over water, railroad, others (including pedestrian)
	Bridge Hydrant Vaults		Deluge systems, Fire systems
	Elevators		
	Retaining Walls	Railing, Drainage, Tie Back, Lagging, Pile, Expansion Joint, Whaler, Structural Face	Rock wall, Gravity wall, Cantilever, Soldier Pile, Seawall, Bulkhead
	Tunnel		Pedestrian Crossing Underpass, Vehicle, Utility, Traffic Information
Channelization	Pavement Marking		Bus Boxes, Bike Boxes, Painted Curb Bulbs, Legends, Pavement Delineators, Legends, Hatchings, Stop Lines, Parking Space, Curb Markings, Pavement to Parks
Intelligent Transportation System	Beacon		
	Cameras		
	Communication Network		
	Counters		
	Dynamic Message Signs	Display Panel	Standard, e-Park Building, e-Park On-Street
		Controller, Support	
	Network Hubs		
	Radar Speed Signs	Sign, Solar Panel	
	Transportation Operations Center	Modems, Video Multiplexor, Port Server. File Server. Workstation, Video Wall Screen, Video Switch, Video Encoder/Decoder, Switch, Firewall, Software Applications/ Licenses, Rack, Monitor	
	Traffic Signal Assemblies	Pole, Mast Arm, Span, Vehicle Signal Head Assembly. Pedestrian Signal Head Assembly, Cabinet, Controller/MMU (Malfunction Management Unit)	Fully Actuated, No Signal, Pre-Timed, Semi-Actuated
Intelligent Transportation System	Traffic Signal Assemblies	Detection Device	Pavement Loop, Video Detection, Pedestrian Pushbutton, Magnetometer, Infrared, Emergency Pre-empt, Railroad
Parking Payment Devices	Pay Station	Display, Sign, Trolley	

Pavement System	Pavement		Arterials, Non-Arterials, Alleys, Excess ROW in use for access & parking, Pavement to Parks
Asset Class	Level 1 Assets	Level 2 Assets	Asset Categories
Real Property	Buildings & Yards		
	Parcel		
	Shoreline Street Ends		
Signs	Sign Assemblies	Sign	Regulatory, Parking, Guide Signs Conventional, Street Name, Warning, Recreational and Cultural Interest, Tourist Direction, Non-MUTCD, School, Overhead
		Support	
Traffic Safety Structures & Devices	Chicane		Choker, Standard
	Crash Cushion		
	Guardrails	Rail, Post	
	Median Islands	Median Island Curb, Raised Asphalt Interior, Fencing, Landscape (See Sidewalks)	Pedestrian Refuge Island, Other channelization, Transit Islands
	Railroad Crossings		
	Speed Cushions		
Asset Class	Level 1 Assets	Level 2 Assets	Asset Categories
Traffic Safety Structures & Devices	Speed Dots		
	Speed Humps		
	Traffic Circles		
Transit	Historic Transit Shelters		
	Streetcar System	Streetcar, Paved Trackway, Streetcar Station Shelter, Traction Power System, Train-to-Wayside Communication System, Passenger Information System	
	Transit Island Platforms		
Urban Forest	Irrigation System	Controller	Permanent, Seasonal, Temporary
		Water Source, Backflow Prevention, Pipes, Valves, Sensors	
	Landscaped Area		
	Trees		

APPENDIX B - ASSET CONDITION CRITERIA

Overview of Asset Condition Rating Criteria

This appendix documents the condition criteria for each Level 1 asset and is listed alphabetically by asset class. SDOT establishes a standard condition rating for transportation assets in alignment with international FTA, FHWA, ISO 55000, and MAP-21 guidance standards. As described in the Introduction, SDOT uses a consistent condition measurement system of Good, Fair, and Poor with some assets also having the ratings of Excellent and Very Poor. While these condition ratings carry the same meaning for all assets, the criteria used for establishing the condition rating may differ by asset. Assets are rated at the lowest condition rating for any of the essential characteristics, except for bridges, signs, retaining walls, areaways, landscaped areas, and trees. The corresponding tables below explain these exceptions.

Condition Rating and Current Value Methodology

Current value estimates how much assets are worth in their present state. This approximation considers the condition rating of the assets to provide an alternative measure to the replacement cost. Assuming condition ratings are reliable in reflecting each asset's remaining useful life, assets that have a higher current value (CV) to replacement value (RV) ratio are less likely to be of an investment concern compared to those that have a lower CV to RV ratio.

To calculate an asset's current value, the replacement cost is weighted using the condition distribution of the inventory and an assumed approximation of what the condition rating means in terms of the remaining useful life. The condition rating conversion is applied uniformly to all assets with the assumption that assets rated using a three-point scale of Good, Fair, and Poor still holds 80%, 50%, and 20% of their estimated useful lives, respectively. Similarly, for the few asset classes rated using a 5-point scale of Excellent to Very Poor, the same method is applied but this time the corresponding remaining values for each condition category are 90%, 80%, 50%, 20%, and 10%.

Bicycle and Pedestrian System

Bicycle Rack	Rating		
	● Good	● Fair	● Poor
Structure	Able to maintain full bike capacity	Unable to accommodate full capacity of bicycles	Unable to accommodate bicycles
Attachment to ground	Fully connected to surface	Connection to surface loose but maintained	Connection to surface lost
Age	0-15 years old	16-20 years old	> 20 years old
Marked Crosswalk (Thermoplastic)* [35]	**Rating**		
	● Good	● Fair	● Poor
Percent of original marking visible	75-100%	NA	< 75%
Age	0-4 years old	5-7 years old	> 7 years old

[35] SDOT no longer obtains condition on marked crosswalks due to the Move Seattle Levy four-year remarking schedule. If funding for the remarking is no longer available, the Department may return to a worse first remarking program.

Marked Crosswalk (Raised)	Rating		
	● Good	● Fair	● Poor
Percent of original marking visible	75-100%	NA	< 75%
Integrity of facility	As new	NA	No longer as new
Age	0-40 years old	NA	> 40 years old
Sidewalk	**Rating**		
	● Good	● Fair	● Poor
Curb Ramp	No faults or discontinuities, near original condition with no age deterioration	Minor to moderate age deterioration including curb ramp surfaces and detectable warning material (if applicable), medium severity distress	Moderate to severe age deterioration, wear and tear, curb ramp is not fully accessible/ramp is impassible

Given the improved data quality, SDOT developed a sidewalk condition assessment methodology beyond the standard condition rating system of good, fair, and poor. All sidewalk categories (Median Islands, Transit Island Platforms, and Blocks) use this methodology. This assessment used current ADA guidance[36] on holistic sidewalk conditions, width, and cross slope, along with amount of sidewalk replacement, to score each inspected sidewalk (including transit island platforms and median islands) with the following ratings:

	Excellent	Score = 100	No observable issues along the pedestrian clear zone, compliant width of ≥ 48 inches, and compliant primary cross slope of ≤ 2%
	Good	85 ≤ Score < 100	Minor issues along the pedestrian clear zone: sidewalk extends the full length of the block with no discontinuities; may have minor uplifts and ≤ 5% of the sidewalk requires slab replacement; may have a width < 48 inches to ≥ 36 inches and/or primary cross slope ≤ 4% and > 2%
	Fair	45 ≤ Score < 85	Issues are of medium severity; discontinuities exist that may impact mobility; ≤ 25% and > 5% of the sidewalk may need replacement; may have a width between < 36 and ≥ 24 inches and/or a primary cross slope ≤ 6% and > 4%
	Poor	5 ≤ Score < 45	Issues are severe; discontinuities exist that may impact mobility; ≤ 75% and > 25% of the sidewalk may need replacement; may have a width < 24 and ≥ 12 inches and/or a primary cross slope ≤ 8% and > 6%
	Very Poor	Score < 5	Widespread severe issues: discontinuities exist that impact mobility; between 100% to 76% of the sidewalk needs replacement; may have a width < 12 inches and/or a primary cross slope > 8%

[36] Although the City is not required to bring sidewalks that pre-existed current ADA guidance into compliance, the guidance provides useful metrics.

Stairway	Rating		
	Good	Fair	Poor
Structural Rating	Near original condition with no age deterioration, wear and tear or safety issues. The site condition has not changed.	Minor to moderate age deterioration, wear and tear, or safety issues may be present. Incipient site condition changes from the original condition.	Moderate to severe age deterioration, wear and tear, or safety issues are present.
Trail	**Rating**		
	Good	Fair	Poor
Pavement distress	No visible distress	Some visible distress	Significant visible distress
Bollards	Effectively deter motor vehicles from entering when enabled		Removed or unable to deter motor vehicle traffic
Age	0-7 years old if gravel 0-15 years old if asphalt	8-10 years old if gravel 16-20 years old if asphalt	> 10 years old if gravel > 20 years old if concrete

Bridges and Structures

Areaway Street Wall	Rating		
	Good	Fair	Poor
Structural face of the street wall	Near original condition with no signs of cracks and spalls. No signs of settlement or tilting.	Minor to moderate deterioration is present. Incipient cracks and spalls may be present. Wall may have small settlement or tilting.	Moderate to severe deterioration is present. Cracks and spalls are apparent. Tilting and/or settlement is apparent.
Sidewalk support (ceiling)	Near original condition with no signs of cracks, spalls, or section loss.	Minor to moderate deterioration is present. Incipient cracks, spalls, corrosion, rot with minor section loss may be present.	Moderate to severe deterioration is present. Wider cracks, spall with exposed rebar, corrosion, or rot with significant section loss.
Bridge	**Rating**		
	Good	Fair	Poor
Sufficiency rating	81-100	51-80	0-50
Structurally deficient	No		Yes
Rating summary:	Structural deficiency carries the most weight. If a bridge is structurally deficient, the overall rating is poor. If the bridge is not structurally deficient, the sufficiency rating governs the overall condition of the bridge.		
Retaining Wall	**Rating**		
	Good	Fair	Poor
Structural rating	81-100	51-80	0-50

Channelization

Pavement Marking (Pavement Delineator – Arterial)	Rating		
	Good	Fair	Poor
Percent of original marking visible	75-100%	NA	< 75%
Age	< 1 year old	NA	> 1 year old
Pavement Marking (Pavement Delineator – Other)	**Rating**		
	Good	Fair	Poor
Percent of original marking visible	75-100%	NA	< 75%
Age	1-3 years old	NA	> 4 years old
Pavement Marking (Legends – Bicycle Lane and Pedestrian)	**Rating**		
	Good	Fair	Poor
Percent of original marking visible	75-100%	NA	< 75%
Age	1-3 years	NA	> 3 years old
Pavement Marking (Legends – Channelization, Sharrows, and Stop Bar)	**Rating**		
	Good	Fair	Poor
Percent of original marking visible	75-100%	NA	< 75%
Age	1-8 years old	NA	> 9 years old

Intelligent Transportation System

Beacon	Rating		
	Good	Fair	Poor
Physical Condition	Meets current engineering design standards, has no visible damage or deterioration, has 75% or more of its useful life remaining	Meets current engineering design standards, may have some damage that does not affect its integrity, has 25-74% of its useful life remaining	Does not meet current design standards, or has substantial damage or deterioration that requires it to have major upgrade or replacement of components, has less than 25% of its useful life remaining
Operational Condition	Meets current engineering operational needs and standards, operates 100% of the scheduled time except during scheduled power outages	Is functional but has limited operational capabilities, not able to meet all the desired needs of the system	Does not meet current operational needs, is obsolete, over capacity or malfunctioning due to component failures
Camera Assembly	**Rating**		
	Good	Fair	Poor
Physical Condition	Meets current engineering design standards, has no visible damage or deterioration, has 75% or more of its useful life remaining	Meets current engineering design standards, may have some damage that does not affect its integrity, has 25-74% of its useful life remaining	Does not meet current design standards, or has substantial damage or deterioration that requires it to have major upgrade or replacement of components, has less than 25% of its useful life remaining
Operational Condition	Meets current engineering operational needs and standards	Is functional but has limited operational capabilities, not able to meet all of the desired needs of the system	Does not meet current operational needs, is obsolete, over capacity or malfunctioning due to component failures

Communication Network	Rating		
	● Good	● Fair	● Poor
Physical Condition	Meets current engineering design standards, has no visible damage or deterioration	Meets current engineering design standards, may have some damage that does not affect its integrity	Does not meet current design standards, or has substantial damage or deterioration that requires it to have major upgrade or replacement of components
Operational Condition	Meets current engineering operational needs and standards, functions 24/7 without failure except during scheduled shutdowns	Is functional 24/7 without failure but has limited operational capabilities, not able to meet all of the desired needs of the system	Does not meet current operational needs, is obsolete, over capacity or malfunctioning due to component failures
Dynamic Message Sign	**Rating**		
	● Good	● Fair	● Poor
Physical Condition	Meets current engineering design standards, has no visible damage or deterioration, has 75% or more of its useful life remaining	Meets current engineering design standards, may have some damage that does not affect its integrity, has 50-74% of its useful life remaining	Does not meet current design standards, or has substantial damage or deterioration that requires it to have major upgrade or replacement of components, has less than 20% of its useful life remaining
Operational Condition	Meets current engineering operational needs and standards, is functional 24/7 except during scheduled power outages	Is functional 24/7 but has limited operational capabilities, not able to meet all of the desired needs of the system	Does not meet current operational needs, over capacity or malfunctioning due to component failures
Radar Speed Sign	**Rating**		
	● Good	● Fair	● Poor
Physical Condition	Meets current engineering design standards, has no visible damage or deterioration, has 75% or more of its useful life remaining	Meets current engineering design standards, may have some damage that does not affect its integrity, has 50-74% of its useful life remaining	Does not meet current design standards, or has substantial damage or deterioration that requires it to have major upgrade or replacement of components, has less than 20% of its useful life remaining
Operational Condition	Meets current engineering operational needs and standards, is functional 24/7 except during scheduled power outages	Is functional 24/7 but has limited operational capabilities, not able to meet all of the desired needs of the system	Does not meet current operational needs, over capacity or malfunctioning due to component failures

Transportation Operations Center	Rating		
	Good	Fair	Poor
Physical Condition	Meets desired engineering design standards, and has room for expansion of new assets and operations	Meets current minimum engineering design standards, is limited in its expansion potential. Has some assets that have expended over half of their useful lives. Still provides the necessary functions required,	Does not meet current minimum design standards, or has substantial damage or deterioration that requires it to have major upgrade or replacement of components, has some components with less than 20% of its useful life remaining
Operational Condition	Meets current engineering operational needs and standards, has room for expansion of new operations, fully functional 24/7 or 100% of scheduled up-time	Is functional 24/7 or 100% of scheduled up-time, but has limited operational capabilities, not able to meet all of the desired needs of the Department	Does not meet current operational needs, is obsolete, over capacity or malfunctioning due to component failures
Traffic Signal Assembly	Rating		
	Good	Fair	Poor
Composite Component-Based Score	100 - 81	80 - 41	40 -0
Physical Condition	Meets current engineering design standards, has no visible damage or deterioration	Meets current engineering design standards, may have some damage that does not affect its integrity	Does not meet current design standards, or has substantial damage or deterioration that requires it to have major upgrade or replacement of components
Operational Condition	Meets current engineering operational needs and standards, operates 24/7 except during scheduled power outages	Is functional but has limited operational capabilities, not able to meet all of the desired needs of the system	Does not meet current operational needs, is obsolete, over capacity or malfunctioning due to component failures

Parking Payment Devices

Pay Station	Rating		
	● Good	● Fair	● Poor
Vendor support	All parts and systems supported by vendor at warranty standards or competitive replacement costs	NA	Parts and system no longer supported by vendor at warranty standards or competitive replacement costs
Technology condition	**Parking payment**: collects parking fees effectively and efficiently, credit cards and credit card systems are in common. **Revenue collection**: credit card processing and coin counting/deposit practices efficiently and economically support system. **Communications system**: online conductivity meets or exceeds 98.5% uptime. **Data security**: meets or exceeds annual Visa and MasterCard audit standards. **Reporting and alarms system**: meets or exceeds City requirements and vendor fully supports. **Parking rate & policy change system requirements**: fully supported by both vendor systems and City O&M budget.	NA	**Parking payment**: does not collect parking fees effectively and efficiently, parking fees exceed practical coin payment amounts, credit card technology changes require major equipment retrofit, other payment processes replace current systems. **Revenue collection**: credit card processing and coin counting/ deposit practices do not efficiently and economically support system. **Communications system**: online conductivity is less than 98.5% uptime. **Data security:** does not meet annual Visa and MasterCard audit standards. **Reporting and alarms system**: does not meet City requirements to maintain system operational efficiency and/or vendor no longer fully supports. **Parking rate & policy change system requirements**: not fully supported by vendor systems and/or City O&M budget.
Physical condition and appearance	Color and appearance are uniform and smooth with few if any dents, abrasions, scrapes or other physical deformities. Labels are legible and smooth	NA	Sun-faded and exterior plastic is cracked, or exterior is damaged to the extent that repair costs equal replacement and recondition costs

Pavement System - Pavement Condition Rating Methodology

Seattle uses the Metropolitan Transportation Commission (MTC) pavement management system software. The condition evaluation criteria used by MTC is based on the Pavement Condition Index (PCI) methodology developed by the U.S. Army Corps of Engineers and described in ASTM D 6433–03. The PCI procedure provides decision makers with a numerical value describing pavement condition. The value reflects both pavement structural integrity and operational surface condition. The rating procedure was designed to be repeatable and to correlate with the judgment of experienced pavement engineers.

The PCI method measures the occurrence of several pavement distress types and assigns a condition index based upon the density (area affected) and severity of different distresses. The PCI is a number between 0 and 100. A

PCI of 100 represents a pavement completely free of distress; a PCI of 0 corresponds to a pavement that has failed completely and can no longer be driven safely at the designed speed. A Pavement Condition Rating (PCR) is associated with ranges of PCI as shown below. The five categories of pavement condition assessment, which differ slightly from other SDOT assets, have been re-named to simplify overall condition reporting in this report.

Pavement Condition Ratings and Pavement Condition Index Ranges

Correlated to SDOT Condition Ratings

Pavement Condition Rating (PCR)	Pavement Condition Index (PCI)	SDOT Condition Rating
Excellent	86-100	Excellent
Very Good	71-85	Good
Good	56-70	Fair
Fair	41-55	Poor
Poor	26-40	Very Poor
Very Poor	11-25	Very Poor
Failed	0-10	Very Poor

Real Property System

SDOT hired EMG Corporation to perform condition assessments on the three facilities contained in this report. The condition measure is based on FTA's TERM-Lite five-point scale, with the following values:

Condition Rating	Score	Criteria
Excellent	5	No visible defects, new or near new condition, may still be under warranty if applicable.
Good	4	Good condition, but no longer new, may be slightly defective or deteriorated, but is overall functional.
Adequate	3	Moderately deteriorated or defective; but has not exceeded useful life.
Marginal	2	Defective or deteriorated in need of replacement, exceeded useful life.
Poor	1	Critically damaged or in need or immediate repair, well past useful life.

One of the major goals of the assessment is to calculate the Facility Condition as defined by the Federal Transportation Administration (FTA). The Facility Condition is determined by using the Condition Assessment Calculation as provided in the FTA Transit Facility Performance Measure Reporting Guidebook (FTA Guidance), published in April 2017. A facility is deemed to be in good repair if it has a condition rating of 3, 4, or 5 on the FTA Transit Economic Requirement Model (TERM) Condition Rating scale. Additional information on the calculation methodology is provided in Appendix B of this report.

In accordance with the FTA Guidance to establish the overall condition of a facility, EMG assessed the Secondary Levels, assigned a TERM Scale rating to the Secondary Levels based on the observed condition and then aggregated to the Primary Levels shown below. The Primary Levels are then aggregated to the overall facility using the FTA Weighted Average Condition Methodology.

The FTA Guidance does not provide detailed definitions of the Primary Levels but does provide examples of the Secondary Level elements that make up the Primary Levels. To provide additional clarification on the Primary

Levels used in this report, EMG included references to the Uniformat codes generally corresponding to the FTA Primary Levels.

Primary Level	Criteria
Substructure	Foundations also corresponding to Uniformat Level I A codes.
Shell	The exterior building materials and structure corresponding to Uniformat Level I B codes.
Interiors	The interior finish materials and furnishings corresponding to Uniformat Level I C codes.
Conveyance	The elevators and wheelchair lifts corresponding to Uniformat Level II D1000 codes.
Plumbing	The plumbing fixtures and piping corresponding to Uniformat Level II D2000 codes.
HVAC	The heating, ventilating and air-conditioning equipment corresponding to Uniformat Level II D3000 codes.
Fire Protection	The building fire detection and extinguishing systems corresponding to Uniformat Level II D4000 codes.
Electrical	The lighting, wiring and other electricity-based equipment corresponding to Uniformat Level II D5000 codes.
Equipment	Repair and service equipment corresponding to Uniformat Level I E codes.
Site	Above and below ground site materials and systems corresponding to Uniformat Level I G codes.

Below are the Secondary Level Elements in the FTA Guidance that make up the Primary Levels described above.

Primary Level	Secondary Level
Substructure	Foundation: Walls, columns, pilings, etc. Basement: Materials, insulation, slab, floor underpinnings
Shell	Superstructure/structural frame: Columns, pillars, walls Roof: Roof surface, gutters, eaves, skylights, chimney surrounds Exterior: Windows, doors, and all finishes (paint, masonry) Shell appurtenances: Balconies, fire escapes, gutters, downspouts
Interiors	Partitions: Walls, interior doors, fittings and signage Stairs: Interior stairs and landings Finishes: Materials used on walls, floors, and ceilings Covers all interior spaces, regardless of use.
Conveyance	Elevators Escalators Lifts: Any other such fixed apparatuses for the movement of goods or people
Plumbing	Fixtures Water distribution Sanitary waste Rainwater drainage
HVAC	Energy supply Heat generation and distribution systems Cooling generation of distribution systems Testing, balancing, controls, and instrumentation Chimneys and vents
Fire Protection	Sprinklers Standpipes Hydrants and other fire protection specialties
Electrical	Electrical service and distribution Lighting and branch wiring (interior and exterior) Communications and security Other electrical system-related pieces such as lightning protection, generators, and emergency lighting

Primary Level	Secondary Level
Equipment	Equipment related to the function of the facility, including maintenance or vehicle service equipment – does not include supplies
Site	Roadways/driveways and associated signage, markings, and equipment Parking lots and associated signage, markings, and equipment Pedestrian areas and associated signage, markings, and equipment Site development such as fences, walls, and miscellaneous structures Landscaping and irrigation Site utilities

The FTA has developed a methodology for calculating an Overall Condition Rating for an entire facility based on a cost weighted average approach using the Primary and Secondary Levels discussed above. This approach utilizes the Primary Level TERM scores and their replacement cost.

EMG assessed the Secondary Levels and assigned a TERM Scale rating to each Secondary Level based on the observed condition. The Secondary Level elements are then aggregated for each Primary Level using the Weighted Average Condition formula noted below to generate a Primary Level TERM Score. The Primary Level TERM score is not rounded.

The calculation for the overall Facility Rating uses the sum of each Primary Level TERM score multiplied by its respective replacement cost, and then divides the total sum by the sum of all the replacement costs. The aggregated facility condition rating is calculated as follows:

$$FR = \frac{\sum_i CR_i CW_i}{\sum_i CW_i}$$

FR is the overall Facility Rating, CR_i is the TERM Score for each rating level, either Primary or Secondary, and CW_i is the weighting or replacement cost, of each rating level i. The resulting FR is then rounded to the next whole integer, rounding either up or down, and the numerical rating of 1 to 5 will identify whether the facility is considered from poor to excellent condition. If the fractional portion of the rating is less than 0.5 the rating is rounded down; if it is 0.5 or greater it is rounded up.

Transit

Assets that use Useful Life Benchmarks (ULB) in lieu of condition are not listed in this section. See Real Property for King St Station and maintenance facility condition scoring. Transit Island Platforms are covered under Sidewalks. Signals are under the ITS Asset Class.

Ticket Vending Machine	Rating	
	● Good	● Poor
Vendor support	All parts and systems supported by vendor at warranty standards or competitive replacement costs	Parts and system no longer supported by vendor at warranty standards or competitive replacement costs
Technology condition	**Parking payment**: collects parking fees effectively and efficiently, credit cards and credit card systems are in common **Revenue collection**: credit card processing and coin counting/deposit practices efficiently and economically support system. **Communications system**: online conductivity meets or exceeds 98.5% uptime. **Data security**: meets or exceeds annual Visa and MasterCard audit standards. **Reporting and alarm system**: meets or exceeds City requirements and vendor fully supports. **Parking rate & policy change system requirements**: fully supported by both vendor systems and City O&M budget.	**Parking payment**: Does not collect parking fees effectively and efficiently, parking fees exceed practical coin payment amounts, credit card technology changes require major equipment retrofit, other payment processes replace current systems. **Revenue collection**: Credit card processing and coin counting/deposit practices do not efficiently and economically support system. **Communications system**: Online conductivity is less than 98.5% uptime. **Data security:** Does not meet annual Visa and MasterCard audit standards. **Reporting and alarms system**: Does not meet City requirements to maintain system operational efficiency and/or vendor no longer fully supports. **Parking rate & policy change system requirements**: Not fully supported by vendor systems and/or City O&M budget.
Physical condition and appearance	Color and appearance is uniform and smooth with few if any dents, abrasions, scrapes or other physical deformities. Labels are legible and smooth	Sun-faded and exterior plastic is cracked, or exterior is damaged to the extent that repair costs equal replacement and recondition costs

Signs

Sign Assembly	Rating		
	● Good	● Fair	● Poor
Age (also a surrogate for clarity)	< 10 years old	10-12 years old	> 12 years old
Post	No visible damage		Damaged
Rating summary:	Age takes priority over post condition. If either characteristic is poor, the asset is rated as poor.		

Traffic Safety Devices & Structures

Chicane	Rating		
	● Good	● Fair	● Poor
Integrity of facility	As new		No longer as new
Age	0-15 years old	16-20 years old	> 20 years old
Crash Cushion	**Rating**		
	● Good	● Fair	● Poor
Crash history	No crash history		Suffered a vehicular impact
Age	0-7 years old	8-10 years old	> 10 years old
Guardrail	**Rating**		
	● Good	● Fair	● Poor
Crash history	No crash history		Suffered a vehicular impact
Age	0-17 years old	17-25 years old	> 25 years old
Median Island	**Rating**		
	● Good	● Fair	● Poor
Integrity of facility	As new		No longer as new
Age	0-15 years old if asphalt 0-30 years old if concrete	16-20 years old if asphalt 31-40 years old if concrete	> 20 years old if asphalt > 40 years old if concrete
Speed Cushion	**Rating**		
	● Good	● Fair	● Poor
Bolt connection	Stable connection to the surface		Bolts disconnected or visibly loosened from roadway
Age	0-7 years old	8-10 years old	> 10 years old
Speed Dot	**Rating**		
	● Good	● Fair	● Poor
Integrity of facility	As new		No longer as new
Age	1-15 years old	16-20 years old	> 20 years old
Speed Hump	**Rating**		
	● Good	● Fair	● Poor
Integrity of facility	As new		No longer as new
Age	0-15 years old if asphalt 0-30 years old if concrete	16-20 years old if asphalt 31-40 years old if concrete	> 20 years old if asphalt > 40 years old if concrete
Traffic Circle	**Rating**		
	● Good	● Fair	● Poor
Integrity of facility	As new		No longer as new
Age	0-17 years old	17-25 years old	> 25 years old

Urban Forest

Landscaped Area	Rating		
	Good	Fair	Poor
Vegetation	Appropriate for the site to provide functional and environmental benefits with low to moderate levels of maintenance (30%)	Appropriate for the site to provide functional and environmental benefits but requires medium to high levels of maintenance (15%)	Inappropriate to provide functional and/or environmental benefits (0%)
Soil	Condition appropriate to support vegetation appropriate to the site (20%)	Condition requires amendment to support vegetation appropriate to the site (10%)	Condition does not support plant growth and/or is determined to be unacceptable or contaminated based on soil testing (0%)
Weed control	Requires low to moderate levels of maintenance with Integrated Pest Management (IPM) requiring little to no use of Tier 2 pesticides (20%)	Requires medium to high levels of maintenance with IPM requiring regular use of Tier 2 pesticides and/or minimal use of Tier 1 pesticides and/or labor-intensive mechanical methods (10%)	Requires medium to high levels of maintenance with IPM requiring regular use of Tier 1 pesticides and/or exposure to erosion (0%)
Site Suitability	Appropriate to support vegetation in a manner that provides public benefit that exceeds the cost to maintain it (10%)	Requires high maintenance to support vegetation in a manner that provides public benefits in balance with the cost to maintain it (5%)	Will not support vegetation and/or cost/benefit balance is lost due to high-cost maintenance practices to ensure public and/or employee safety (0%)
Irrigation	Functions to sustain plant growth in a manner that is consistent with City water conservation policies (20%)	Functions but does not adequately sustain plant growth and/or requires regular adjustment and/or partial replacement of system components and does not warrant full rebuild (10%)	Does not function and/or requires full system rebuild to function in a manner consistent with City water conservation policies (0%)
Rating summary:	Weightings assigned: Vegetation (30%), Soil (20%), Weeds (20%), Site suitability (10%), Irrigation (20%)		

Tree	Rating		
	Good	Fair	Poor
Vigor – a measure of yearly stem elongation, leaf size, crown density, trunk integrity, and root integrity	80-100% of the standard for the species	50-79% of the standard for the species	< 50% of the standard for the species
Structure – a measure of decay, cracks or splits, deadwood, and branch attachment	0-20% of the crown involved	20-50% of the crown involved	> 50% of the crown involved
Infrastructure compatibility	Minimal conflicts with adjacent infrastructure, such as sidewalks, underground utilities and overhead conductors. Only routine maintenance of the tree is required for compatibility.	Conflicts are such that significant modifications to the tree or adjacent infrastructure are required. Not to exceed 40% root removal or 50% canopy removal.	Tree conflicts are such that other infrastructure cannot be modified and tree modifications cannot assure continued viability
Life expectancy	20+ years	5-20 years	< 5 years
Rating summary:	Weightings assigned: Vigor (30%), Structure (40%), Infrastructure compatibility (20%), Life expectancy (10%)		

APPENDIX C – REGULATIONS, POLICIES, REFERENCES

The following regulations and guidance supported the development of SDOT's TAMP:

- AASHTO online TAM Guide provides access the guidance, tools, and supporting work products under development through NCHRP Project 08-109A: Updating the AASHTO Transportation Asset Management Guide. www.tamguide.com/guide/
- AASHTO Guide for Enterprise Risk Management (2016)
- FHWA and Washington State Bridge Inspection Manual
- FTA Transit Asset Management Federal Regulation: 49 CFR Part 625 applies to all recipients and subrecipients of federal financial assistance under 49 U.S.C Chapter 53 that own, operate, or manage capital assets used for providing public transportation www.transit.dot.gov/tam/tamplans, www.transit.dot.gov/TAM/Resources/PeerLibrary, www.transit.dot.gov/TAM/Resources/PeerLibrary
- FTA TAM Facility Performance Measure Reporting Guidebook: Condition Assessment Calculation April (2017)
- FTA TERM Lite User Guide
- FTA Transit Asset Management Guide: Focusing on the Management of Our Transit Investments (2016)
- OSE Preparing for Climate Change Report (2016)
- RCW statutes for Washington's risk management governance structure and oversight functions: *Risk Management and Loss Prevention* - RCW 43.19 (760 - 783); and *Local Government Insurance Transactions* - RCW48.62.
- SDOT Semi-Annual Streetcar Report (2017-2018)
- TAM Facility Performance Measure Reporting Guidebook details the methods for public transportation agencies in measuring and reporting TAM facility condition assessments to the NTD.
- TAM Infrastructure Performance Measure Reporting Guidebook: details the methods for public transportation agencies in measuring and reporting TAM infrastructure assets under performance restrictions (slow zones) to the NTD
- TAM Pilot Program FTA-2011-004-TPM, Volume 1 – Asset Inventory and Condition Assessment Guide (2013)
- TCRP Report 172: Guidance for Developing a Transit Asset Management Plan (2014)
- Washington State Law on Transit Asset Management Regulation: The development of a TAM plan that meets the requirements of 49 CFR Part 625 fulfills state requirements for the development of a "maintenance management plan" or "maintenance and preservation management plans" as required in the following Revised Code of Washington (RCW):
    - RCW 35.84.060 Street railway extensions: City transit system TAM plan must be submitted to the Washington State Transportation Commission
    - RCW 36.56.121 Metropolitan municipal corporations TAM plan must be submitted to WSDOT
    - RCW 47.04.082 Urban transportation systems TAM plan must be submitted to WSDOT
- WSDOT A Guide to Preparing Your Transit Asset Management Plan: 2018-2020 www.wsdot.wa.gov/transit/grants/plan.htm
- WSDOT Triennial Safety & Security Reviews

In addition to the other planning documents listed in Introduction – Section 2 and links and references included in this report, SDOT follows all applicable codes, regulations and policies in planning, design, constructing, and operating its infrastructure and implementing its Asset Management Program. Some of these include:

GASB-34 • PAS 55 (British Standards Institute) • IIMM (International Infrastructure Management Manual – New Zealand Asset Management Support) • AASHTO Transportation Asset Management Guide: Volume 2 – A focus on Implementation • ISO 55000 - asset management overview • ISO 55001 - specification for an integrated, effective management system for assets and the standard terms and definitions • ISO 55002 - guidance for system implementation• AASHTO, A Current Policy on Geometric Design of Highways and Streets (2004) • AASHTO, Guide for Design of Pavement Structures, 4th Edition (with 1998 supplement) • AASHTO, Roadside Design Guide, 3rd Edition • AASHTO, Guidelines for Skid Resistant Pavement Design • AASHTO, Information Guide for Roadway Lighting • AASHTO, Guide for Development of Bicycle Facilities • American Society for Testing of Materials (ASTM) • Manual on Uniform Traffic Control Devices (MUTCD-2009) • Code of Federal Regulations (CFR) • ADA Accessibility Guidelines for Buildings and Facilities (ADAAG) • Public Rights-of-Way Accessibility Guidelines (PROWAG) • Uniform Federal Accessibility Standards (UFAS) • City of Seattle Standard Plans and Specifications • Pioneer Square Historical Preservation Board preservation • National Bridge Inspection Standard (NBIS) • ADA, and NFPA 130 chapter for transit •

GASB-34

A major initiative undertaken by the Governmental Accounting Standards Board (GASB)[37], which establishes requirements for the annual financial reports of state and local governments, may provide a significant impetus for state Departments of Transportation and local governments to deploy an asset management system.

In June 1999, GASB issued Statement No. 34, "Basic Financial Statements for State and Local Governments," which requires state and local agencies to enhance the types of information provided as part of their annual financial statements in a manner more consistent with that used by private-sector companies and governmental utilities. Annual reports in compliance with the new rule will include financial statements prepared using full accrual-based accounting practices which reflect all of the government's activities — not just those that cover costs by charging a fee for service.

This new approach will cover all capital assets and long-term liabilities, including infrastructure as well as current assets and liabilities. Accrual accounting reports all costs and revenues of providing services each year.

GASB recommends that state, city, and county government agencies, in reporting capital assets as part of their modified financial statements, use a historical-cost approach to establish transportation infrastructure values. If historical cost information is not available, GASB provides guidance for a proxy estimate using the current replacement cost.

Statement 34 indicates that governments may use any established depreciation method and identifies both straight-line depreciation and condition-based depreciation as acceptable. However, the GASB requirements indicate that infrastructure assets that are part of a network or subsystem of a network do not have to be depreciated if two distinct criteria are met — namely, if the government manages the infrastructure assets using an asset management system, and if the government documents that the infrastructure assets are being preserved at, or above, a condition level originally established for the assets. The asset management system should:

- ✓ Have an up-to-date inventory of assets;
- ✓ Perform condition assessment of the infrastructure assets at least once every three (3) years and summarize the results using a measurement scale; and
- ✓ Estimate the annual amount required to maintain and preserve the infrastructure assets at the condition level originally established for those assets.

[37] Source: United States Department of Transportation (USDOT) Asset Management Primer

APPENDIX D – GLOSSARY & ACRONYMS

Terms and acronyms used in this document:

Term/Acronym	Definition/Description
AAC	Arterial Asphalt and Concrete Program
AC	Asphalt concrete over flexible base
AC/PCC	Asphalt concrete over Portland cement concrete or other rigid base
ADA	Americans with Disabilities Act
AM	Asset Management
AMM	Arterial Major Maintenance
A&PM	SDOT's Asset & Performance Management Team
APTA	American Public Transportation Association
Asset Class	A grouping of Level 1 Assets that is based on commonality of asset function
Asset Hierarchy	The decomposition of an asset into its successive lower-level components; the overall framework into which SDOT has organized its assets
Asset Owner	A position in the SDOT organization that is recognized as the primary source of information and knowledge about capital investment needs, preservation, maintenance, and operation of an asset.
BMP	Bicycle Master Plan
Block Face	One side of a street segment
Block Face Equivalent	2000 square feet
BST	Bituminous surface treatment, commonly referred to as chip seal
BTG	Bridging the Gap levy in place from 2006 to 2015
BPU	The Business Practice Upgrades are part of SDOT's response to the City Auditor's Office Bridge Audit Report. SDOT has committed to improving its condition data, estimated useful life calculations, and lifecycle cost calculations of its entire bridge inventory which would be essential in the development of a strategic asset management plan for its bridges no later than the end of 2023
Catenary	Curve of cable; the curve adopted by a length of heavy cable, rope, or chain of uniform density, hanging between two points, or something with this shape; refers to the overhead cables associated with the streetcar system
CBD	Central Business District
CCTV	Closed-circuit television
CIP	Capital Improvement Program
Complete Streets	Seattle's Complete Streets policy is about creating and maintaining safe streets for everyone. In 2007, the Seattle City Council passed Ordinance 122386, known as the Complete Streets ordinance, which directs SDOT to design streets for pedestrians, bicyclists, transit riders, and persons of all abilities, while promoting safe operation for all users, including freight. This is the lens through which SDOT views our major maintenance and construction projects.
DBH	Diameter at Breast Height, or 4.5 feet; used as a standard measure of tree size
EAM	Enterprise Asset Management
EDMP	Equity Development Monitoring Program
Encroachment	Non-permitted private use of the public ROW
ESAL	Equivalent single axle load, this term is conceptually associated with pavements and compares the effects of axles carrying different loads with the damage impacted on the pavement. This damage can lead to increased deterioration and loss of service life.

Term/Acronym	Definition/Description
FAS	Department of Finance & Administrative Services
FAST Act	Fixing America's Surface Transportation Act
FCC	Federal Communications Commission
FHWA	Federal Highway Administration
FRA	Federal Rail Administration
FTA	Federal Transit Administration
GASB-34	Governmental Accounting Standards Board, Statement 34
GHG	Greenhouse Gas
Gore Area	The area of the roadway in-between two (2) diverging lanes before reaching a structural delineator
HHN	Heavy Haul Network
Infrastructure	Collection of assets, including the right-of-way, that together systematically supports the movement of people and goods.
IP	Internet protocol
IPM	Integrated Pest Management
ISTEA	Intermodal Surface Transportation Efficiency Act
ITD	Seattle Information Technology Department
ITS	Intelligent Transportation System
Lane-Line Mile	A measure of pavement marking that is equivalent to a 4" line of painting that extends one (1) mile in length
Level 1 Asset	The highest level of the physical Asset Hierarchy; the level at which investment decisions are most commonly considered
LID	Local Improvement District
Linear Feet (LF)	Unit of measurement in linear feet
LPR	License plate readers
Maintenance	Includes preservation
MAP-21	Moving Ahead for Progress in the Twenty-first Century
Microsurfacing Paving Program	Microsurfacing, an alternative to chip sealing, is a protective seal coat which extends the life of pavement. It is a thin, tough layer of asphalt emulsion blended with finely crushed stone for traction.
MMA	Methyl methacrylate is a polymer used in pavement markings which have a longer service life than traditional thermoplastic
MMU	Malfunction Management Unit
Movable Bridge	A bridge with one or more spans that open to allow passage of vessel traffic
MSL	Moving Seattle Levy in place from 2015 to 2024
MTC	Metropolitan Transportation Commission
MTN	Moving the Needle performance report
MUTCD	Manual on Uniform Traffic Control Devices
NHS	National Highway System
NTD	National Transit Database
OC	Overhead catenary
Operation	Includes use
PCC	Portland cement concrete
PBL	Protected Bike Lane
RC	Reinforced concrete
RCW	Revised Code of Washington

Term/Acronym	Definition/Description
Real Property Asset	An item owned by SDOT that is of indirect value to the mission of SDOT or indirectly affects the delivery of SDOT services
RPAMS	Real Property Asset Management System managed by FAS
REET	Real Estate Excise Tax
Regulated Asset	ROW that is not yet improved but is regulated by SDOT; an item that exists in the ROW that is not owned by SDOT, but for which SDOT either shares liability or for which SDOT regulates the proper use
Replacement Value	The total cost in today's dollars to replace an asset or an asset class
ROW	Right of Way
RPAMIS	Real Property Asset Management Information System: automated system operated by FAS Department that contains asset data for SDOT buildings and parcels
RS	Roadway Structures
Safe Routes to Schools Program (SRTS)	SRTS is a local, state, and national movement to make it easier and safer for students to walk and bike. The Seattle Department of Transportation supports this effort by funding engineering improvements, education, and encouragement campaigns at public and private schools throughout Seattle.
SCL	Seattle City Light
SDCI	Seattle Department of Construction and Inspections
SGR	State of Good Repair
SFD	Seattle Fire Department
SPD	Seattle Police Department
SPU	Seattle Public Utilities
Spall	A section of concrete that cracks and separates from the larger concrete structure
SSRP	Sidewalk Safety Repair Program
STBD	Seattle Transportation Benefit District
Steel "H" pile & RC	Steel "H" pile refers to the shape of the steel pile that is used as a structural member of a retaining wall; RC is reinforced concrete
TAM	Transportation Asset Management
TAMP	Transportation Asset Management Plan
TCIP	Transportation Capital Improvement Program - Published in the City of Seattle's Capital Improvement Program, it includes a six-year plan for improvement and preservation projects for SDOT assets
TEWG	Transportation Equity Workgroup
TILT	Transportation Innovation & Leadership Team
TOC	Transportation Operations Center
TPSS	Traction power substations
ULB	Useful Life Benchmark
UPS	Uninterruptible Power Source
Urban Village	Mixed-use neighborhoods designated under the City's Comprehensive Plan where conditions best support increased density.

APPENDIX E – TITLE VI, ADA, & FURTHER INFORMATION

Notice of Nondiscrimination

The Seattle Department of Transportation (SDOT) assures that no person shall be discriminated against in SDOT programs and activities based on their race, color, national origin, religion, sex, age, or disability as provided by Title VI of the Civil Rights Act of 1964, the Civil Rights Restoration Act of 1987 (P.L. 100.259), the Age Discrimination Act of 1975, as amended, and Title II of the American with Disabilities Act. SDOT further complies with additional state and municipal civil rights laws and assures that no person shall be discriminated against in its programs and activities based on their sexual orientation, gender identity, marital status, parental status, political ideology, creed, ancestry, participation in the Section 8 housing program, military status or veteran status, or due to breastfeeding in a public place, as provided by Seattle Municipal Code 14.04, 14.06 and 14.10.

Any person who feels they have been subject to discrimination that is protected under Title VI or other laws may file a complaint with the Seattle Office for Civil Rights. For more information on the City of Seattle Title VI program, or for information on how to file a complaint, call the Seattle Office for Civil Rights at (206) 684-4500, email ocr_intake@seattle.gov, visit www.seattle.gov/civilrights/file-complaint or visit in-person at 810, Third Ave, Suite 750, Seattle, WA 98104. The Seattle Office for Civil Rights is open Monday through Friday, 8am to 5pm.

Committing to an Accessible Transportation Network

The Seattle Streetcar and King St Station's accessibility aligns with Title VI of the Civil Rights Act and Title II of the Americans with Disabilities Act. No person shall be subject to discrimination based on race, color, national origin, or disability. The City of Seattle provides language translation as available and interpretation for those with limited English proficiency and provides auxiliary aids and/or alternative formats to persons with disabilities. To request an accommodation, modification, translation, interpretation or language service, visit www.seattle.gov/transportation/permits-and-services/make-an-ada-request.

Civil Rights & Accessibility

The Seattle Streetcar is accessible and easy to board for all users. Streetcar stations feature low floors and high platforms for a minimal gap between the platform and streetcar. Wheelchair ramps on the streetcar automatically deploy upon the press of a blue button from inside or outside of the car. The streetcar also features both audio and digital display stop announcements.

Accommodations for Individuals with Disabilities

Seattle Streetcar service provider King County Metro provides equal access to all its services. Whether it is taking a bus, streetcar, planning a trip, or trying out one of its many Rideshare programs, King County Metro is committed to getting you where you want to go. For more information regarding King County Metro's Accessible Services, please visit metro.kingcounty.gov/tops/accessible/index.html.

Title II of the Americans with Disabilities Act

The Americans with Disabilities Act, Title II, states, in part, that "no otherwise qualified disabled individual shall, solely by reason of such disability, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination in programs, services or activities sponsored by a public entity." Seattle is committed to complying with the requirements of Title II of the ADA in all of its programs, services, benefits and activities. For more information regarding the City of Seattle and Title II of the ADA, please visit www.seattle.gov/civilrights/civil-rights/title-ii-americans-with-disabilities-act-.

If you feel that the City of Seattle has failed to accommodate your disability or provide you with equal access to a City activity, program or service, you can file a grievance under the Americans with Disabilities Act. For information regarding this process please visit www.seattle.gov/americans-with-disabilities-act/ada-grievance-procedure.

Contact the **City of Seattle ADA Coordinator**, to resolve the issue directly with the City Department
Email: adacoordinator@seattle.gov Voice: 206-684-2489 (CITY) TTY: 7-1-1
Department of Finance and Administrative Services
700 Fifth Ave, Suite 5200, P.O. Box 94689,
Seattle, WA 98124-4689