Seattle Department of Transportation: Strategic Approach to Vehicle Bridge Maintenance is Warranted

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Report Highlights

Background

In this audit we analyzed 77 vehicle bridges that are owned and maintained by the Seattle Department of Transportation (SDOT). SDOT is also responsible for several non-vehicle bridges, and shares maintenance responsibilities on bridges owned by other entities, such as the state of Washington. Over the past 14 years, the average amount SDOT spent on bridge maintenance was $6.6 million annually.

What We Found

The City of Seattle (City) recognizes the need for more investment in bridge maintenance, but is not spending enough on the upkeep and preservation of its bridges, and risks becoming out of compliance with federal regulations. National data show that most Seattle vehicle bridges are in fair condition (using the federal rating system of good, fair, and poor), and the condition of the City's bridges has worsened over the last ten years. We also found legacy practices that affect the use of SDOT's current maintenance funding.

Recommendations

We identified ways in which the City could better use its current bridge maintenance resources and remain in compliance with federal standards. However, to address the issue of aging bridge infrastructure, SDOT should develop a strategic bridge preservation program to make the most efficient use of current resources and to develop more effective plans for future needs.

Department Response

In their response to our report, SDOT stated that they generally concurred with the report findings (see Appendices A and B).

WHY WE DID THIS AUDIT

The unexpected closure of the West Seattle High Bridge in March of 2020 raises questions about the adequacy of the City's oversight of its bridge portfolio. Seattle City Councilmember Alex Pedersen requested this audit to assess the physical condition of and maintenance investments in vehicle bridges in Seattle.

HOW WE DID THIS AUDIT

To accomplish the audit's objectives, we reviewed requirements from the Federal Highway Administration, analyzed National Bridge Inventory (NBI) data and City of Seattle financial data, interviewed knowledgeable SDOT, state, and federal employees, and observed SDOT bridge inspections.

West Seattle High Bridge (left) and Low Bridge (right)

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INTRODUCTION

Audit Overview

The unexpected closure of the West Seattle High Bridge in March of 2020 affects the lives and livelihoods of many Seattle residents. This case raises questions about the City's oversight and upkeep of its bridge portfolio. To better understand the current inventory, spending, and practices for maintaining vehicle bridges, Seattle City Councilmember Alex Pedersen, chair of the City Council's Transportation and Utilities Committee, asked us to do an audit of bridges owned and maintained by the Seattle Department of Transportation (see Appendix C for the audit request letter).

In their response to our report, the Seattle Department of Transportation (SDOT) stated that they generally concurred with the report findings (see Appendix A). We thank SDOT's Roadway Structures Division and SDOT's Finance and Administration Division for their cooperation on this audit. We also appreciate the assistance we received from the Washington State Department of Transportation and the Federal Highway Administration. The audit team for this project included Melissa Alderson, Luiza Barbato Montesanti, Sean DeBlieck, and Jane Dunkel.

Background

Like many jurisdictions, the City of Seattle is facing a critical stage in the lifecycle of its transportation infrastructure. Many bridges throughout the United States are nearing the end of their useful lives, and the consequences of delayed maintenance have left many jurisdictions with considerable unfunded bridge maintenance needs. There are 614,000 public bridges in the United States, and the Federal Highway Administration estimates an annual investment of $24.6 billion (in 2012 dollars) is needed to eliminate the backlog of bridge maintenance by the year 2032. [1]

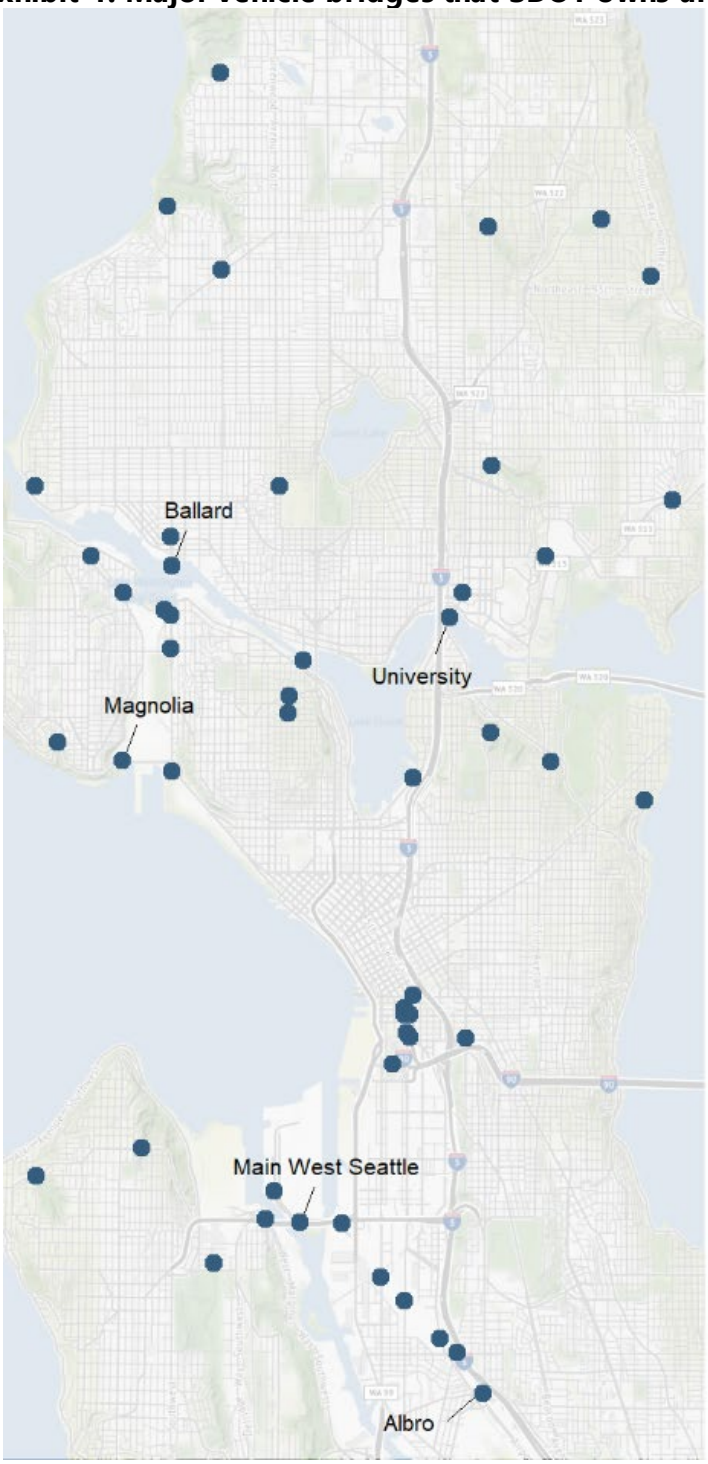
SDOT is responsible for the upkeep and maintenance of a large and diverse portfolio of bridges. We analyzed 77 vehicle bridges [2] that SDOT owns and maintains in Seattle (see Exhibit 1). SDOT is also responsible for several non-vehicle bridges, and shares maintenance responsibilities on bridges owned by other entities, such as the state

[1] In Appendix E we discuss some promising approaches other jurisdictions are using to incrementally reduce their infrastructure maintenance backlog.

[2] The bridges we analyzed in this audit included all vehicle bridges longer than 20 feet for which SDOT has sole ownership and maintenance responsibility. Some bridges in Seattle are made up of many parts that are considered separate bridges from an engineering perspective, and are inspected and rated on their own. The 77 bridges we refer to in this report uses the engineering definition of a bridge; for example, the West Seattle High Bridge counts for seven bridges within the 77.

of Washington. SDOT is also responsible for transportation assets such as paved streets, sidewalks, areaways, and retaining walls.

Exhibit 1: Major vehicle bridges that SDOT owns and maintains



Notes: Our analysis includes 77 individual vehicle bridges identified as being owned and maintained by SDOT. In some instances, we combined what SDOT classifies as individual bridges into one bridge complex. For instance, SDOT divides the West Seattle High Bridge into seven individual bridges, but we combined these and counted them as one bridge complex. The result is the 51 bridges shown on the map (though some may appear overlapping).

Source: Office of City Auditor analysis of 2019 Federal Highway Administration National Bridge Inventory data.

Keeping up with maintenance on bridges is important for controlling costs, connecting communities, and protecting life. If an entity is not keeping up with maintenance with the intent of preservation, its bridges will deteriorate earlier than expected and can significantly increase the bridges' planned lifecycle costs. The West Seattle High Bridge emergency closure provides an example of the strain imposed on the transportation network and reduced reliable transportation options for the public. Bridge failure can also pose significant risk to public safety. As shown with the Skagit Bridge collapse in 2013 and Minnesota's I-35W Bridge collapse in 2007, many people can be injured or killed when these critical pieces of infrastructure fail.

SDOT is required to follow federal bridge inspection standards. The Federal Highway Administration (FHWA) sets standards for bridge inspection through National Bridge Inspection Standards (NBIS). SDOT rates the condition of the City's bridges using these standards and reports this data to FHWA for an inventory of national bridge condition data. FHWA then rates bridges as either poor, fair, or good, using a nine-point scale. In general, bridges under NBIS must be inspected at least every two years.

SEATTLE BRIDGE CONDITIONS AND BRIDGE MAINTENANCE SPENDING

Section Summary

We analyzed 77 vehicle traffic bridges that are owned and maintained by SDOT. These bridges have a median age of 70 years. According to 2019 Federal Highway Administration pavement and bridge condition performance measures, although Seattle has a high number of poor and fair bridges (based on the federal rating system of poor, fair, and good), this is comparable with peer cities around the country. Nevertheless, even bridges in fair condition, like the West Seattle High Bridge, can require major, unexpected closures. Over the last decade, a larger percentage of Seattle's bridges have gotten worse compared to those that have gotten better. Over the past 14 years, the average amount SDOT spent on bridge maintenance was $6.6 million annually.[3] However, according to knowledgeable SDOT officials, the City is not spending enough to keep its bridges in good condition and avoid costly future repairs.

The Current Condition of Seattle Bridges

Most of Seattle's bridges are in fair condition, but many of these bridges carry a lot of traffic and could require significant maintenance investments to remain in operation. We analyzed SDOT's 77 vehicle bridges and found that, in 2019, 29 percent were in good condition, 65 percent were in fair condition, and six percent were in poor condition (see Exhibit 2 and 3). The median age of these 77 SDOT bridges is 70 years.

Exhibit 2: FHWA's Bridge Condition Rating System

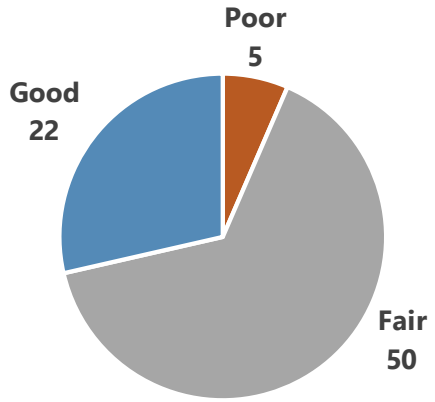
The Federal Highway Administration rates bridges as poor, fair, or good using a nine-point scale that considers the bridge's deck, superstructure, substructure, or culvert. A bridge condition rating is one look at the overall condition of a bridge; **however, given the many complex parts of a bridge, the condition rating alone does not necessarily mean a bridge is safe or unsafe**.

Poor	Fair	Good
The lowest rating of any of the four bridge elements is four or less.	The lowest rating of any of the four bridge elements is a five or a six.	The rating of all four bridge elements is a seven or above.

Source: Federal Highway Administration.

[3] In this report, we consider costs related to bridge loading, bridge painting, structures engineering and structures maintenance as routine maintenance costs. Per discussions with SDOT officials, we do not consider capital improvements, such as seismic upgrades or bridge replacement projects, part of routine maintenance costs.

Exhibit 3: Most of SDOT's 77 vehicle bridges are in fair condition



Source: Office of City Auditor analysis of National Bridge Inspection data from 2019.

SDOT bridge inspectors use federal guidelines to assign a condition rating to the parts of a bridge, and the Federal Highway Administration uses this data to calculate the total bridge condition value for inclusion in the National Bridge Inventory (see Exhibit 2). An FHWA engineer will periodically review a sample of bridge ratings during an onsite audit of SDOT's bridge maintenance program to ensure that they are accurate. A bridge rated as poor is considered structurally deficient, but it is not necessarily considered so unsafe that a closure is needed. Conversely, a bridge rated as fair is not immune to failure. For example, the Washington I-5 Skagit River Bridge was in fair condition in 2012 but collapsed a year later when a semitruck struck a critical piece of the bridge's superstructure.

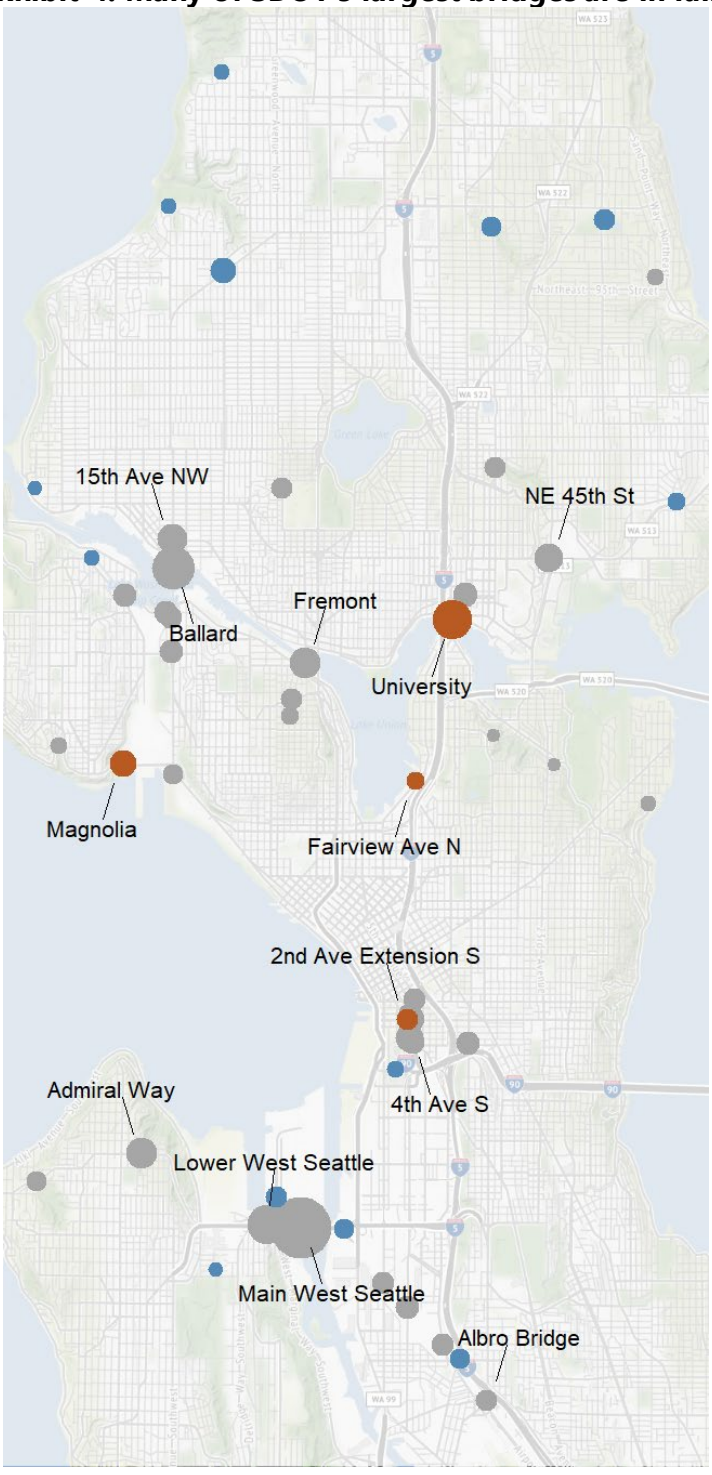
The number of Seattle's bridges that are in poor or fair condition is concerning for two reasons. First, several of the largest and busiest bridges that connect communities across Seattle are not in good condition, which means they are at an elevated risk of unexpected closures that could affect thousands of people. For example: the University Bridge on average carries 36,000 vehicles daily and is rated poor; the Magnolia Bridge on average carries 20,000 vehicles daily and is rated poor; and before it was closed this year, the West Seattle High Bridge on average carried 108,179 vehicles daily and was in fair condition. Exhibit 4 shows the location, condition, and relative size of each SDOT bridge by deck area.

Second, a rating of either poor or fair does not mean that current SDOT maintenance levels will keep these important bridges in working condition. According to SDOT, some of the City's bridges are nearing the end of their expected lifespan (which range from 50-75 years), and are in need of more costly repairs or will need to be replaced. SDOT predicts that if maintenance needs are not met on

these aging bridges, this could accelerate the bridges' deterioration, and lead to bridge closures or failures.

See Appendix D for the full list of the 77 bridges shown on the map below.

Exhibit 4: Many of SDOT's largest bridges are in fair or poor condition



Condition

- Good
- Fair
- Poor

Deck area in square meters

- 100000
- 200000
- 300000
- 400000

Notes: Our analysis includes 77 individual vehide bridges identified as being owned and maintained by SDOT. In some instances, we combined what SDOT classifies as individual bridges into one bridge complex. For instance, SDOT divides the West Seattle High Bridge into seven individual bridges, but we combined these and counted them as one bridge complex. The result is the 51 bridges shown on the map (some may appear overlapping). The condition of the bridge complex corresponds to the poorest condition of each of its individual bridges. As of 2019, SDOT has five vehicle bridges in poor condition: Magnolia, University (counted as two bridges), 2nd Ave Ext S, and Fairview Ave N (which is in the process of being replaced).

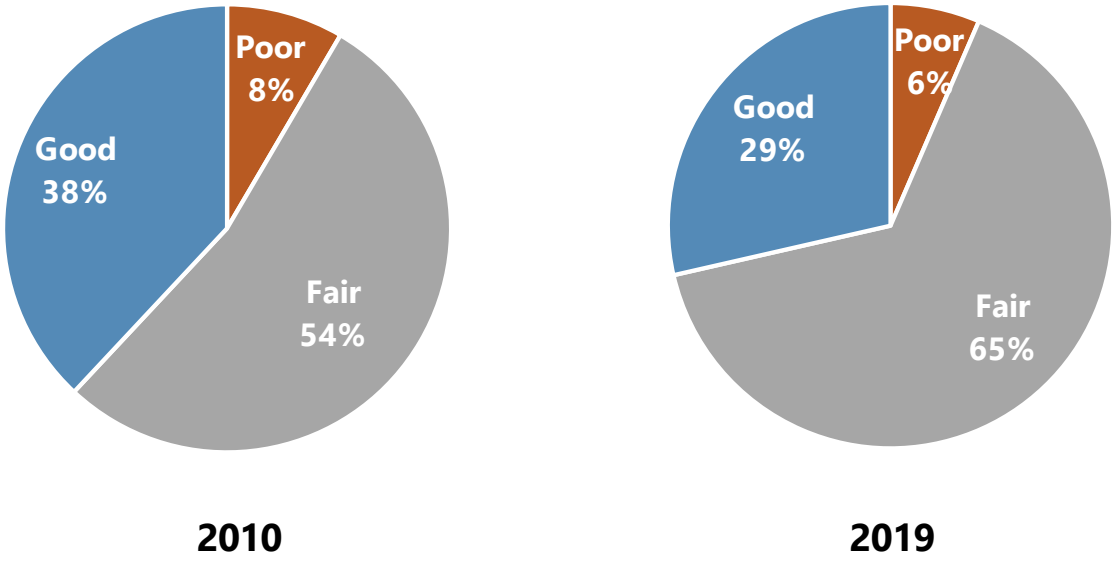
Source: Office of City Auditor analysis of 2019 Federal Highway Administration National Bridge Inventory data.

Most of SDOT's bridges are in fair condition but, over time, the condition of the overall bridge portfolio has gotten worse. Since 2010, the percent of total bridges in good condition has declined from 38 percent to 29 percent (see Exhibit 5). According to federal guidance, SDOT should be working to preserve good bridges in good condition to maintain the structural reliability of bridges and avoid future costly repairs. SDOT is not meeting this goal and only 22 out of its 77 bridges are in good condition.

Twenty-one bridges changed condition between 2010 and 2019:

- six bridges improved (three from poor to fair, one from fair to good, two from poor to good)
- 15 bridges worsened (12 from good to fair, three from fair to poor)

Exhibit 5: The overall condition of SDOT's 2019 vehicle bridge portfolio has declined since 2010



Note: There were 77 vehicle bridges longer than 20 feet owned and maintained by SDOT in 2019, and 71 of these bridges were in the National Bridge Inventory in 2010.

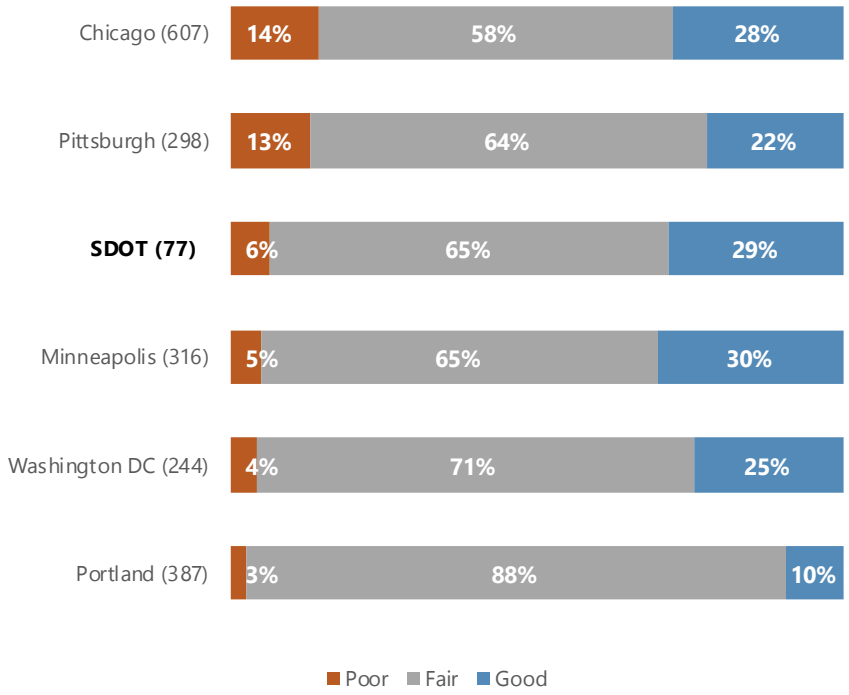
Source: Office of City Auditor analysis of Federal Highway Administration National Bridge Inventory.

Other Jurisdictions Have Similar Bridge Condition Data

Like Seattle, major cities across the country have a high share of bridges in poor and fair condition. We compared the condition of Seattle's bridges to the bridges in a sample of five cities that have a similar bridge inventory to Seattle. For all these cities, including Seattle, the majority of bridges are in poor or fair condition (see Exhibit 6). With 29 percent of its bridges in good condition, Seattle is similar to Chicago (28 percent good) and Minneapolis (30 percent good). The similarity of bridge conditions across these cities makes sense for two reasons. First, funding for bridge maintenance and upkeep is a challenge at all levels of government, and particularly for

local governments. According to SDOT, state departments of transportation get funding from FHWA, and then disperse this funding to local jurisdictions through a competitive process. As a result, cities must compete for FHWA funding or seek funding from other sources. Second, about 40 percent of U.S. bridges were built more than 50 years ago, which means that many of the bridges in the country are aging out at the same time.

Exhibit 6. SDOT and peer cities' number of bridges by condition, 2019



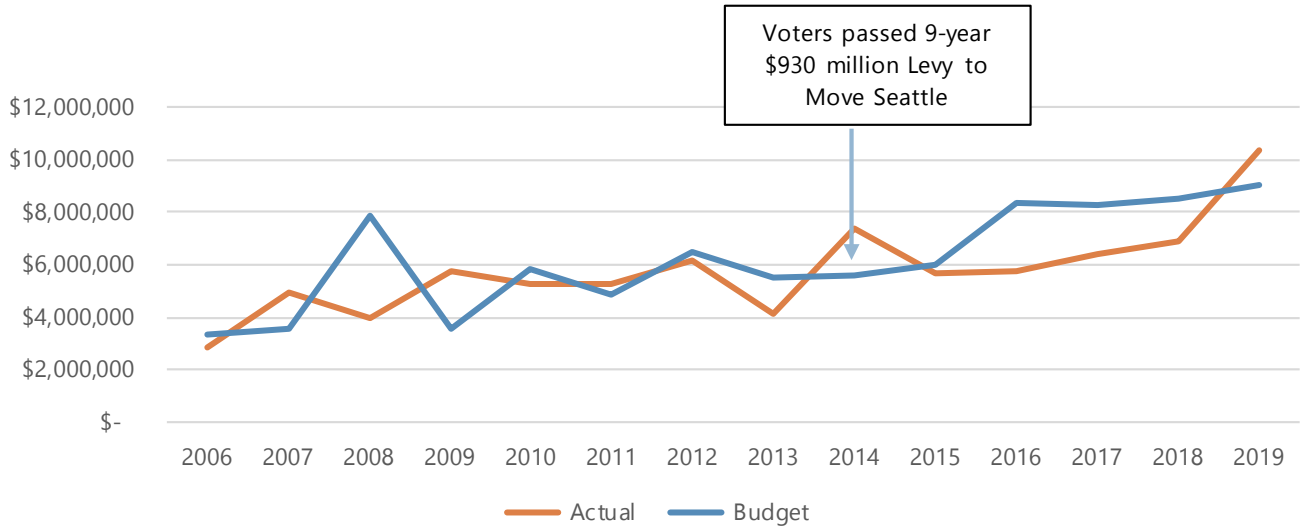
Note: Data labels indicate the percent of bridges in each condition category. These figures are based on reported data. There are an additional 364 bridges in Portland, 431 bridges in Pittsburgh, 259 bridges in Washington, DC, 646 bridges in Chicago, and 346 bridges in Minneapolis with missing condition values, and were not included in this analysis. Note that this graph compares a list of bridges specifically identified as being owned and maintained by SDOT with bridges located in peer cities, without accounting for the agency that owns or maintains each of them. This analysis excludes bridges that were labeled as "pedestrian-bicycle."

Source: Office of City Auditor analysis of Federal Highway Administration National Bridge Inventory.

Seattle Budgeted $98.5 Million for Bridge Maintenance and Spent $91.9 Million Since 2006

Since 2006, SDOT has spent 93 percent of its budget for bridge maintenance. From 2006 to 2019, Seattle budgeted $98.5 million for bridge maintenance and spent $91.9 million (see Exhibit 7, dollar amounts have been adjusted for inflation). As Exhibit 7 shows, the budget did not always align with actual expenditures on a year-by-year basis. Some of this is to be expected. For example, in 2008 SDOT underspent their bridge maintenance budget because they were saving funds for a large bridge painting project. This large painting project, the University Bridge, was completed in 2009. This use of funds that carryover from one year to the next occurs when the funding for these projects comes from the City's Capital Improvement Program budget. SDOT officials told us the reason for the underspend between 2016 and 2018 was primarily because they did not have enough staff to perform planned maintenance activities.

Exhibit 7: SDOT bridge maintenance budget and actual spending 2006-2019 (adjusted for inflation)



Note: This chart includes budget and actual expenditure data for SDOT bridge maintenance projects. The projects used in our analysis capture the majority of SDOT's bridge maintenance spending. Based on input from SDOT, we include costs charged to the following project codes as bridge maintenance: bridge loading, bridge painting, structures engineering and structures maintenance. We do not include costs related to bridge replacement, bridge seismic work, retaining walls, or the Elliott Bay Seawall, as these costs are related to preservation work, not routine maintenance or are not directly related to bridges.

Source: Office of City Auditor analysis of City of Seattle financial data.

SDOT Estimates its Annual Spending is Far Below What is Needed to Maintain its Bridges

SDOT estimates its annual spending is tens of millions of dollars less than what is needed to maintain its bridges. SDOT's interim Roadway Structures Division Director told us that, based on 1) the rate at which the condition of Seattle's bridges deteriorate, 2) the age of the bridges, and 3) the bridge's current replacement value, SDOT estimates the City's annual budget is far below what is needed to maintain all bridges in a state of good repair.[4] According to SDOT's Capital Projects and Roadway Structures 2018 Annual Report, the total replacement value for all bridges over 60 years old serviced by Roadway Structures is $3.4 billion.[5] SDOT estimates annual maintenance expenditures should be equivalent to one to three percent of the total replacement cost for the fixed assets being maintained, or, for bridges over 60 years old, a minimum of $34 million per year. SDOT notes that, ideally, bridges that are nearing the end of their anticipated design life should receive increased maintenance funding, and bridges that have exceeded their anticipated design life should be scheduled for capital replacement.

According to our analysis, SDOT spent on average $6.6 million per year on bridge maintenance since 2006. This is far below SDOT's most conservative estimate of what is needed - $34 million. Clearly, the City is not spending enough to maintain all bridges in a state of good repair. However, to accurately estimate bridge maintenance needs and strategically prioritize work, SDOT needs better data on the condition of its bridges. This would require a detailed assessment of the condition data of each bridge's individual components, which SDOT does not currently have. On page 17 of this report, we recommend that SDOT undertake this work.

[4] A capital asset is in a state of good repair if it is in a condition sufficient for the asset to operate at a full level of performance. 49 CFR § 625.17

[5] These figures include bridges in addition to the 77 bridges that we focus on in this report.

OPPORTUNITIES TO IMPROVE SDOT'S MANAGEMENT OF BRIDGES

Section Summary

SDOT has been working to transition from a reactive to a more strategic and proactive approach to bridge maintenance and preservation since 2018. However, some legacy practices and information gaps hinder its ability to properly keep the bridge portfolio in a state of good repair. SDOT lacks critical information for developing a strategic bridge preservation program, including an assessment of the level and mix of staffing resources needed to maintain their bridges. The City should improve their approach to bridge maintenance to slow further deterioration of its bridges, avoid costly fixes and replacements, and to remain in compliance with federal regulations.

SDOT Recognizes the Need for a More Proactive Approach to Bridge Maintenance

SDOT officials recognize the need for a more proactive approach to bridge, and other roadway structures infrastructure maintenance, and the department has started to make positive steps to address issues. SDOT officials informed us that, for several years, the location of inspection and maintenance work within SDOT's organizational structure did not elevate bridge-related issues to the level of attention they deserved. In 2019, SDOT elevated the Roadway Structure group into its own division; this group is responsible for the maintenance and inspection of bridges as well as other major assets. This organizational change was made to elevate the priorities of bridges and other structures within SDOT. Staff in the Roadway Structures Division stated that they believe the division's creation led to improved communication to City leaders about the bridge program's needs.

Creating the Roadway Structures Division was a positive change because it demonstrated a positive tone at the top of the organization, a necessary element of a proactive bridge preservation program.[6] It has also led to proactive and positive efforts to improve the division. For example, to help identify and correct deficiencies in SDOT's bridge program, the Roadway Structures Division invited the FHWA to conduct an informal review of its bridge program in 2019. Additionally, SDOT is implementing two changes in the bridges program that should improve asset management:

1. As a result of the informal 2019 FHWA audit, SDOT will start reporting condition assessments of bridges on a much more

[6] The Committee of Sponsoring Organizations of the Treadway Commission (COSO) recommends that senior management establish a strong tone at the top in communicating and reinforcing the importance of internal controls.

granular, component-by-component, basis. SDOT officials suggest that component-based replacement has the potential to extend the useful life of bridges more efficiently than the current practices.

2. In 2020 SDOT will create a three-year Strategic Advisor position dedicated to producing a strategic, long-term capital replacement, preservation, and maintenance plan for bridges based on the results of the new component-based condition assessment. Additionally, this position will also assist with addressing administrative bridge inspection processes found during the informal 2019 FHWA audit.

Finally, SDOT is working on its first ever Transportation Asset Management Plan, which they expect to publish later in 2020. Proactive efforts such as these demonstrate SDOT's recognition of the need to improve their asset management program.

The Federal Highway Administration recommends that entities like SDOT adopt a strategic approach to bridge maintenance called a bridge preservation program. These experts note that governments need to change the way they approach bridge maintenance because bridges have aged, and bridge use has changed over time. For example, vehicles have increased in number and weight, which puts more stress on structures than may have been envisioned by their designers.

SDOT Needs to Take Steps to Ensure Compliance with next Federal Review

SDOT needs to take steps to ensure compliance with its next formal federal review in 2022. In late 2019, SDOT invited the Federal Highway Administration (FHWA) to conduct an informal review of SDOT's bridge program. SDOT requested the review because it wanted to ensure that any issues in the City's bridge program would be addressed before the FHWA's next formal review, which is scheduled for 2022.

During the 2019 review, FHWA assessed SDOT's compliance with the National Bridge Inspection Program's metrics. These metrics include things like inspection frequency, inspection procedures, and qualifications of personnel. Passing the formal FHWA review is important as failure can make an entity ineligible for tens of millions of dollars in federal funding and put the agency on a costly and burdensome corrective action plan.

In 2019 the FHWA found that SDOT's bridge program had several items that needed to be corrected before the 2022 review. We spoke with the federal and state officials who conducted the review, and while they told us that detailed results of FHWA's review were still in draft form and not publicly available, they mentioned several areas

that the City needs to rectify before it can pass the next review, such as improving the documentation of bridge condition and inspection data. In July 2020, FHWA provided SDOT with a document summarizing the findings.

Recommendation 1

The Seattle Department of Transportation should take immediate steps to resolve all the issues identified in the 2019 Federal Highway Administration review.

Using SDOT's Bridge Maintenance Resources for Reimbursable Activities May Make Maintenance Work on Seattle's Bridges More Costly

SDOT is engaged in legacy practices that limit its ability to get bridge maintenance work done with its current resources. One such practice is using bridge maintenance workers to perform reimbursable work, unrelated to SDOT bridges, for other agencies. SDOT estimates that 20 percent of their bridge maintenance staff capacity is dedicated to performing reimbursable work for other divisions within SDOT, other City departments, or other local governments. This means that two out of every ten hours of SDOT's bridge inspection and maintenance crew work are not being used on the upkeep of Seattle's bridges, but to help supplement the department's budget. SDOT told us they lack the money to fully fund their bridge maintenance staff without the revenue from reimbursable work, which means they would need to make reductions to stay within budget.

According to the SDOT staff we spoke with, this focus on reimbursable work has affected the type of projects that bridge maintenance crews do. For example, instead of taking on a complex, multi-day SDOT bridge maintenance project, the crews may instead choose to focus on only smaller SDOT bridge maintenance projects to reserve capacity to perform reimbursable work. This approach to prioritization could mean that SDOT is missing opportunities to undertake projects that could have a significant impact on the useful life of an SDOT bridge.

Also, according to SDOT officials, the volume of reimbursable work varies from year to year, which may affect SDOT's ability to plan and schedule bridge maintenance work activities. Therefore, since the bridge maintenance crews must find a way to fit the reimbursable work into their work program, the work on SDOT bridge maintenance can sometimes be delayed. This delay of SDOT bridge maintenance work can lead to more costly future repairs.

The SDOT officials we spoke with said that the practice of maintenance staff performing reimbursable work preceded their time with the City and may have been appropriate when SDOT's bridges were younger and in better condition. With the rising need for bridge work in Seattle and recent complications with the West Seattle High

Bridge and the City's movable bridges, SDOT personnel are no longer as available as they were in the past for completing SDOT's work orders as well as the work of other departments. Delaying maintenance on Seattle bridges to get reimbursable work for entities outside of the Roadway Structures Division is likely to result in faster deterioration of bridges and could lead to more expensive emergency repairs.

Recommendation 2

The Seattle Department of Transportation (SDOT) should reduce the share of the department's maintenance workload that is currently dedicated to reimbursable projects unrelated to SDOT bridge maintenance. Such a change could be done incrementally.

SDOT Inspections of Private Bridges May Delay Important Work on Public Bridges, Leading to Cost Increases

The Helix Pedestrian Bridge is a private bridge inspected by SDOT.

Source: Seattle Department of Transportation.

Another long-standing practice that limits SDOTs ability to do more with its current bridge maintenance dollars is safety inspections of private bridges. While the safety of private bridges is important, SDOT's current practices reduce the already limited capacity of SDOT's bridge inspection crews. A 1968 Seattle Municipal Ordinance requires SDOT to perform a safety inspection of privately owned bridges annually. Some of these privately-owned bridges are pedestrian bridges, such as the Helix Pedestrian Bridge at West Prospect Street in Seattle. Having SDOT inspect private bridges may delay important work on public bridges, leading to future cost increases. SDOT estimates that this work occupies one half of one employee's worth (0.5 FTE)[7] of work per year.

There are ways the City could reclaim this staffing resource for bridge inspections and maintenance. For example, SDOT could conduct desk reviews of the inspection reports completed by private inspectors. SDOT officials told us that a revised approach could still provide a comfortable level of safety assurance, while refocusing SDOT bridge inspection staff on critical City-owned assets.

Recommendation 3

The Seattle Department of Transportation should develop draft legislation to replace Ordinance 96715 to address current City of Seattle bridge maintenance priorities and ensure adequate oversight of private bridges.

Recommendation 4

The Seattle Department of Transportation should develop policies and procedures to adequately oversee private bridges that align with a revised version of Ordinance 96715, as mentioned in Recommendation 3.

[7] According to SDOT, as of September 2020, they have a maintenance staff of 51 employees, including the interim Director, supervisors, managers, and administrative staff. In addition to bridges, these employees are responsible for retaining walls, stairways, areaways, review of construction permits that affect transportation assets, and assisting with transportation related emergency response. The Roadway Structures Division also includes 22 bridge operators.

Misalignment Between Staff and Work Creates Inefficiencies

SDOT does not have information on what staffing levels are needed to support essential bridge maintenance, making it difficult to plan for and complete this work. According to SDOT officials, crew assignments are not consistently aligned with bridge inspector expertise, meaning less experienced staff can be assigned to more complicated work. Additionally, inspection and maintenance crews have in-office administrative responsibilities that take them away from critical work on the assets themselves. Due to technology limitations and issues with file organization and management, some of this work involves duplicative data entry and other inefficiencies. This reduces SDOT's capacity to perform critical bridge maintenance work.

Workforce planning helps ensure that an organization has employees with the necessary skills, in the correct job classification, performing their work efficiently and effectively. SDOT could use guidance from the federal government in their report, Steps in Analyzing Staffing Requirements to conduct such planning for bridge maintenance work. A strategic approach to workforce planning could also help ensure an efficient mix of the use of internal staff and contracting out work, and help with succession planning.

SDOT's interim Roadway Structures Division Director told us that a staffing analysis is needed, but that since creating the Division in late 2019, other work related to the West Seattle High Bridge has been a higher priority. SDOT also told us that staffing deficiencies resulting from safe work practices around COVID-19 has further reduced staff availability. Staffing needs for bridge inspections and maintenance may have changed over time with the aging of Seattle's bridges, and more inspectors and maintenance staff may be needed. Without a staffing analysis, SDOT lacks sufficient data to achieve the correct staffing level or assign employees to work that correctly matches their skillset.

SDOT should use this opportunity to assess the technology tools the bridge inspectors and maintenance staff use. In interviews, SDOT staff shared examples of how technology improvements could help improve the efficiency of their work. For example, providing laptops for staff could reduce the amount of time they have to travel from bridge inspection sites to City offices downtown. Another issue staff described is that SDOT's internal workorder system is not linked to the Washington state bridge management system that SDOT is required to use. This means that SDOT staff must enter the same bridge information into two different systems. Other jurisdictions have addressed this issue by applying a technology solution to link both systems, so that data needs to be entered only once. As part of a workforce planning analysis, SDOT should explore opportunities to

leverage technology improvements that would make better use of bridge staff resources.

Developing a staffing plan could provide an opportunity for SDOT to help promote the City's Race and Social Justice Initiative goal of increasing workforce and contracting equity.

Recommendation 5

The Seattle Department of Transportation should conduct a staffing analysis to determine the number and type of staff required for the implementation of a bridge preservation program.

Recommendation 6

The Seattle Department of Transportation should incorporate the City's Race and Social Justice Initiative values into the staffing analysis of its bridge program.

Recommendation 7

The Seattle Department of Transportation should conduct a cost benefit analysis of technology upgrades needed to improve staff efficiency as part of their staffing analysis.

Estimates for Expected Useful Bridge Lives Are Outdated

SDOT does not currently calculate the useful life of its bridges in a precise way, which hinders its ability to efficiently respond to bridge maintenance needs. Several factors have changed since most of Seattle's bridges were built, such as the size of vehicles, traffic volume, and environmental effects due to climate change. These factors were not foreseen when the bridge life estimates were created at the time of bridge construction, which is why agencies need to periodically update the expected useful life of each bridge.

Historically, SDOT used sufficiency ratings to annually rank bridges and prioritize replacement needs. Sufficiency ratings [8] are calculated for each bridge based on several condition factors and are also weighted with local impact factors to determine the bridge's importance to the overall transportation system. However, the FHWA now considers condition data for each individual bridge component a more useful and accurate way to plan for bridge maintenance work.

SDOT has not conducted a full analysis to determine the current useful lives of their bridges based on component condition data, which means SDOT does not have this information to inform and prioritize bridge maintenance activities. However, SDOT indicated that they will start reporting condition assessment on a much more

[8] FHWA describes sufficiency rating as "a method of evaluating highway bridge data by calculating four separate factors to obtain a numeric value which is indicative of bridge sufficiency to remain in service. The result of this method is a percentage in which 100 percent would represent an entirely sufficient bridge and zero percent would represent an entirely insufficient or deficient bridge."

granular, component-by-component basis, which could be helpful in developing a more precise estimate of the useful lives of their bridges.

According to the Government Finance Officers Association, the estimated useful lives for bridges should be periodically reviewed to adjust for changing conditions. For example, if the intended use of the bridge has changed because of increased vehicle load, then the bridge will deteriorate at a faster rate, thus decreasing its useful life. SDOT should consider the costs incurred through a bridge's entire lifecycle and use this information to inform design decisions and prioritize maintenance needs.

Without a precise and nuanced understanding the estimated useful life of its bridges, SDOT cannot develop an effective and well-informed strategic capital preservation program. This means that SDOT will continue to spend money on issues that, if addressed earlier when they were low priority, may have been resolved with less money.

Recommendation 8 **The Seattle Department of Transportation should update the estimated useful life of their bridges using the condition data of individual bridge components.**

Recommendation 9 **The Seattle Department of Transportation should use the updated useful life estimates of its bridges to plan for preservation work and lifecycle costs.**

Recommendation 10 **After the Seattle Department of Transportation (SDOT) has accurate condition data, updated estimated useful life calculations, and lifecycle cost data, SDOT should develop a strategic asset management plan for its bridges and the City should develop and implement strategies to fill the bridge maintenance funding gap.**

OBJECTIVES, SCOPE, AND METHODOLOGY

Objectives

Seattle City Councilmember Alex Pedersen, chair of the City Council's Transportation and Utilities Committee, asked us to do an audit of bridges owned and maintained by the Seattle Department of Transportation (SDOT). The audit objectives were to answer the following questions:

- How much money has SDOT budgeted and spent for bridge maintenance?
- To what extent have expenditures on preventive maintenance aligned with national best practices?
- What measures and practices does SDOT use to assess the condition of Seattle's major bridges?
- How have the conditions of Seattle's major bridges changed over time, and which bridges are at highest risk of failure?
- To what extent do the conditions of Seattle's major bridges compare to similar jurisdictions?

Scope

The scope for the condition analysis included vehicle bridges in Seattle that are owned and maintained by SDOT, that are longer than 20 feet and are included in the National Bridge Inspection (NBI) database. The condition data we obtained was for 2010-2019. The original scope for the budget to actual analysis was from 2000-2019 on bridge maintenance expenses, but adjusted to cover a shorter time frame due to data limitations. We reviewed relevant internal controls by interviewing knowledgeable officials, conducting a data reliability analysis for quantitative data sets, and reviewing federal criteria related to the audit objectives.

Methodology

To accomplish the audit's objectives, we performed the following:

- Reviewed bridge maintenance requirements from the Federal Highway Administration (FHWA).
- Analyzed National Bridge Inspection (NBI) bridge condition data from 2010 to 2019 for Seattle, in addition to 2019 data for Washington DC, Chicago, Pittsburg, Minneapolis, and Portland. We chose these peer jurisdictions to help understand how Seattle compares to cities with similar populations, bridge issues, and geographic challenges. States submit bridge condition data on an annual basis for inclusion in the NBI database. FWHA conducts quality reviews of the data

before publishing them on its website, including logic and error checks, and also looking back over time for anomalies.

- Analyzed SDOT budget and actual financial data, from 2000 to 2019, for the project codes that SDOT uses for bridge maintenance. We obtained this data from SDOT, who gathered it from a query of the City of Seattle's citywide accounting systems of record. No budget data was available for the year 2000, and no budget or expense data was available for one of the project code cost categories from 2000 – 2005. Accordingly, we limited our analysis of budget and actual financial data to the years 2006 to 2019.
- Researched financial policies from a judgmental sample of jurisdictions, including Pittsburgh, Minneapolis, Portland, Scottsdale, King County, Denver, and Winnipeg. For each of these jurisdictions, we reviewed relevant ordinances, policies and reports, and interviewed city officials.
- Interviewed knowledgeable SDOT, state, and federal employees, and observed SDOT bridge inspections

We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

APPENDIX A

Department Response

Seattle Department of Transportation

September 10, 2020

Sean DeBlieck, Deputy City Auditor
David G. Jones, City Auditor
Seattle Office of City Auditor
700 5th Avenue, Suite 2410
Seattle, WA 98104

Dear Messrs. DeBlieck and Jones,

Thank you for conducting this thorough and collaborative audit of the Seattle Department of Transportation's (SDOT) vehicle bridge maintenance program. We appreciate the time you and your staff took to understand the complex engineering and financial aspects of our work, and our important role in supporting safety and mobility for the traveling public, preserving public infrastructure, and stewarding public funds. SDOT is committed to developing an even more comprehensive and proactive bridge asset preservation program that further maximizes the life of our critical infrastructure. As you know, we have already begun this effort, but when it comes to maintaining public safety, we always strive to improve.

One thing we wish to clarify is that while this audit of our bridge maintenance may have been inspired by the emergency closure of the West Seattle High-Rise Bridge on March 23 of this year, the issues that led to the closure of that bridge do not appear to be the result of any deficiency in our bridge maintenance program. In fact and to the contrary, these critical issues were identified and quickly addressed as a result of our existing proactive, thorough bridge inspection program.

As the audit report points out, the lack of funding for infrastructure maintenance is a national problem and not unique to Seattle. In SDOT's opinion, it is the most critical aspect necessary for the further improvement of our bridge inspection program and overall health of our key structural assets. We have been very transparent about this, noting this challenge most recently in our 2019 Capital Projects and Roadway Structures annual report.[1] Federal transportation funding has fallen from 1% of GDP to 0.5% over the last 35 years. Congress has kept the federal gas tax, a primary source of transportation funding, at 18.4 cents per gallon since 1993, resulting in a significant loss of purchasing power while construction costs have continued to go up. As noted, Seattle is not alone. A 2017 report by the American Society of Civil Engineers found that 9.1% of America's bridges are structurally deficient, and that the nationwide backlog of bridge rehabilitation work totaled $123 billion.

In addition to diminishing federal resources, state resources have been limited in recent years, too, and Washington State has many infrastructure maintenance needs to address across the entire state. The resolution of these issues has been partially offset by the voter-approved Levy to Move Seattle, but we have a long way to go and until we work across all levels of government to find scalable, sustainable solutions, this will continue to be our primary challenge. To aid in this effort, we appreciate the report's Recommendation 10. It calls for a City-wide effort to develop and implement strategies to fill the bridge maintenance funding gap.

[1] City of Seattle, Seattle Department of Transportation (SDOT), Capital Projects and Roadway Structures, "2019 Capital Projects and Roadway Structures Annual Report for 2018", 2019, page 36.

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Further, when it comes to funding, there are seemingly contradictory headlines within the audit we wish to clarify. On the one hand, the report notes that SDOT has, on occasion, underspent our bridge maintenance budget. Then, in close proximity, it notes that SDOT's bridge maintenance program requires significant additional resources. The fact is that maintenance program delivery fluctuates based on work accrual and staff capacity. We continue to implement process improvements to help ensure SDOT's actual spending and what's budgeted are more closely aligned.

As we committed to in the report, SDOT will develop a strategic asset management plan for its bridges and the City will work with state, federal and other funding partners to develop and implement strategies to fund bridge maintenance more fully. Because it is such an important investment need, Seattle included funding for bridge work in two recent levies: Bridging the Gap (2006) and the Levy to Move Seattle (2015). As we begin planning for the next transportation levy, bridge maintenance and capital rehabilitation/replacement needs will again be an important consideration in any City-wide effort. SDOT recognizes the fact that we have important work to do in order to better understand what a fully-resourced budget looks like, in terms of total dollars and what it would take to ramp up the internal capacity needed to carry out a maintenance program at that level. We also want to note that even as we are refining our budgets to reflect declining revenues due to the global COVID-19 pandemic, bridge maintenance continues to be a top priority.

As the audit also points out, while the bridges in our inventory that were the subject of the audit are a visible and important part of our transportation infrastructure inventory, SDOT also is responsible for maintaining roadway surfaces, areaways, retaining walls, seawalls, non-vehicular bridges, and other transportation assets valued at more than $20 billion,[2] each with specific maintenance requirements, funding needs, and critical roles to play in our transportation network.

Appendix B includes our complete responses to the 10 recommendations described in the audit. Safety is our number one priority. When it comes to protecting the public, we will always welcome collaborative efforts to do better. That is why SDOT welcomed this audit and is fully committed to even more process improvement, staffing needs analysis, and specific use of bridge component condition ratings.

We have made an overall commitment to completing responses to the steps identified by this audit no later than the end of 2023, with some recommendations being addressed earlier. As part of this, SDOT will focus on developing a comprehensive workplan for the entire the roadway structures portfolio that includes schedules and cost estimates to guide investment and maintenance for a 30-year period. We will develop a model that can be adjusted by investment levels and modified condition, in order to respond in a transparent and timely manner.

We concur with 9 of the 10 recommendations, and partially concur with Recommendation 2, related to the percent of the time our maintenance and inspections staff perform bridge work versus performing reimbursable work for other entities.

On Recommendation 2, we concur with the goal of adequately staffing and funding bridge maintenance and inspection needs, but disagree that reimbursable work in and of itself represents a problem for our

[2] City of Seattle, Seattle Department of Transportation (SDOT), Asset & Performance Management, "Seattle Department of Transportation's (SDOT) Asset Status and Condition Report, 3rd Edition", December 2015, page 9, Table II.

DeBlieck and Jones, September 10, 2020
RE: Bridge Audit Report, page 3 of 3

maintenance and inspection needs. We see value in the flexibility that the current method provides by enabling us to staff higher levels than would be possible without reimbursable work; that perspective is punctuated by our consistent expenditure of the maintenance funds available to us. This also enables the department to have, within the existing constraints, a more resilient emergency response, to better manage staff training, development and succession planning, and to have the capacity to complete larger bodies of maintenance work. However, the goal should be to fully fund bridge inspection and maintenance staffing needs, and to manage reimbursable work in way that prioritizes bridges first.

We look forward to addressing these recommendations, sharing updates in the coming years, and continuing to maintain our assets for the safety and mobility of the traveling public in Seattle.

Sincerely,

Sam Zimbabwe (Sep 10, 2020 10:19 PDT)

Sam Zimbabwe
Director

APPENDIX B

List of Recommendations and Department Response

Recommendation 1: The Seattle Department of Transportation should take immediate steps to resolve all the issues identified in the 2019 Federal Highway Administration review.

SDOT Concurrence: Concur

SDOT Implementation Plan: Work towards compliance by the Roadway Structures Bridge Inspection team began in late 2019 by creating more refined work order reporting and assessment to identify maintenance needs by bridge and priority (i.e. low, medium, high). In 2020 SDOT will create a new three-year Out-of-Class Strategic Advisor Level 2 position dedicated to producing a strategic, long-term capital replacement and maintenance needs plan for bridges based on the results of the new component-based condition assessment (and other factors). Additionally, this position will also assist with addressing administrative bridge inspection issues found during the informal 2019 FHWA audit.

SDOT Estimated Completion Date: Estimated completion no later than the end of 2022.

Recommendation 2: The Seattle Department of Transportation (SDOT) should reduce the share of the department's bridge maintenance workload that is currently dedicated to reimbursable projects unrelated to SDOT bridge maintenance. Such a change could be done incrementally.

SDOT Concurrence: Partially Concur

SDOT Implementation Plan: We concur with the desired outcome, which is to have an appropriate level of staffing dedicated to this work, but believe there are multiple ways to achieve this, not all of which require reducing the amount or ratio of reimbursable work. The need for reimbursable work is related to the current funding level for structural inspection and maintenance staff at 0.8 FTE. Our implementation plan is to complete the staffing analysis mentioned elsewhere in this audit and to use it to determine the appropriate staffing and funding levels for the Roadway Structures Division as a whole.

SDOT Estimated Completion Date: Estimated completion no later than the end of 2023.

Recommendation 3: The Seattle Department of Transportation should develop draft legislation to replace Ordinance 96715 to address current City of Seattle bridge maintenance priorities and ensure adequate oversight of private bridges.

SDOT Concurrence: Concur

SDOT Implementation Plan: Work with the SDOT Street Use Division and the City Attorney's Office to draft a reworked ordinance for consideration by City Council.

SDOT Estimated Completion Date: Estimated completion no later than the end of 2023.

Recommendation 4: The Seattle Department of Transportation should develop policies and procedures to adequately oversee private bridges that align with a revised version of Ordinance 96715, as mentioned in Recommendation 3.

SDOT Concurrence: Concur

SDOT Implementation Plan: Roadway Structures will work with the SDOT Street Use Division and the City Attorney's Office to draft a reworked ordinance for consideration by City Council.

SDOT Estimated Completion Date: Estimated completion no later than the end of 2023.

Recommendation 5: The Seattle Department of Transportation should conduct a staffing analysis to determine the number and type of staff required for the implementation of a bridge preservation program.

SDOT Concurrence: Concur

SDOT Implementation Plan: SDOT will use the federal guidelines recommended in the audit to conduct a staffing analysis based on element level condition data.

SDOT Estimated Completion Date: Estimated completion no later than the end of 2023.

Recommendation 6: The Seattle Department of Transportation should incorporate the City's Race and Social Justice Initiative values into the staffing analysis of its bridge program.

SDOT Concurrence: Concur

SDOT Implementation Plan: SDOT will conduct a Racial Equity Tool Kit exercise to analyze proposed new methodologies for staffing analysis.

SDOT Estimated Completion Date: Estimated completion no later than the end of 2023.

Recommendation 7: The Seattle Department of Transportation should conduct a cost benefit analysis of technology upgrades needed to improve staff efficiency as part of their staffing analysis.

SDOT Concurrence: Concur

SDOT Implementation Plan: SDOT will identify technologies needed to conduct inspection and work order execution more efficiently along with associated costs for new technology.

SDOT Estimated Completion Date: Estimated completion no later than the end of 2022.

Recommendation 8: The Seattle Department of Transportation should update the estimated useful life of their bridges using the condition data of individual bridge components.

SDOT Concurrence: Concur

SDOT Implementation Plan: SDOT will develop an implementation plan for this based on available staffing and funding levels.

SDOT Estimated Completion Date: Estimated completion of an implementation plan no later than the end of 2023. The actual update is subject to an increase in resource levels.

Recommendation 9: The Seattle Department of Transportation should use the updated useful life estimates of its bridges to plan for preservation work and lifecycle costs.

SDOT Concurrence: Concur

SDOT Implementation Plan: SDOT will develop an implementation plan for this based on available staffing and funding levels.

SDOT Estimated Completion Date: TBD. Estimated completion of an implementation plan no later than the end of 2023. The actual update is subject to an increase in resource levels.

Recommendation 10: After the Seattle Department of Transportation (SDOT) has accurate condition data, updated estimated useful life calculations, and lifecycle cost data, SDOT should develop a strategic asset management plan for its bridges and the City should develop and implement strategies to fill the bridge maintenance funding gap.

SDOT Concurrence: Concur

SDOT Implementation Plan: SDOT will develop a strategic asset management plan for its bridges and the City will work with state, federal and other funding partners to develop and implement strategies to fund bridge maintenance more fully.

SDOT Estimated Completion Date: Estimated completion of the strategic asset management plan is no later than the end of 2023. Development and implementation of funding strategies will be ongoing.

APPENDIX C

Audit Request Letter

SEATTLE CITY COUNCIL | DISTRICT 4
COUNCILMEMBER ALEX PEDERSEN

April 23, 2020

David G. Jones, City Auditor
Office of City Auditor
700 Fifth Avenue, Suite 2410
Seattle, WA 98104

Re: request for audit assessing physical conditions and maintenance investments for Seattle bridges

Dear Auditor Jones:

The purpose of this letter is to request, as chair of the City Council's Transportation and Utilities Committee, that the Office of City Auditor complete an audit report to assess the physical conditions and maintenance investments for the major bridges owned by the Seattle Department of Transportation (SDOT) with the scope of work proposed below.

In a city surrounded by multiple waterways, bridges are a critical component of Seattle's infrastructure for its residents and local economy and vital for transit, freight, and other uses. Bridges require relatively large investments to build and maintain to ensure they remain safe for their expected useful life. The rapid deterioration of the West Seattle Bridge underscores the need for City officials and the general public to have a clear, thorough, and independent understanding of the condition of major bridges throughout Seattle, including preventative maintenance investments and practices.

This requested report is intended to provide the basic oversight we believe the general public expects, especially in light of the unfortunate physical deterioration and closure of the West Seattle Bridge. We appreciate SDOT's recent transparency, responsiveness, and proactive sharing of information regarding the West Seattle Bridge. We want SDOT to continue its focus on the immediate needs of the West Seattle Bridge and can, therefore, be flexible on the final completion date(s) for this more formal review of information regarding the other bridges. We would, however, like the Auditor to provide a brief interim summary of the maintenance investments on bridges by mid-September to inform the City Council's fall budget process.

Proposed Scope Limitations and Objectives:

- According to the City of Seattle's adopted 2020 operating budget (p. 411) and SDOT's 2019 Capital Roadway and Structures report (page 19), there are 124 bridges owned and operated by the City of Seattle. The City Auditor's report will focus on SDOT's bridge maintenance program for the major bridges in the City's portfolio and may discuss other non-bridge assets. While SDOT already obtains and monitors much of this underlying information on our City's bridges and the federal government and state government also provide important oversight, I would like your office to methodically gather, summarize, and analyze that information for use by the City Council. It should include the following focus on assessing conditions and quantifying maintenance:

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Phone (206) 684-8804 Email alex.pedersen@seattle.gov

I. **SDOT Preventive Maintenance on Major Bridges**
a. How much money does SDOT budget for bridge preventive maintenance?
b. How much of this money has been spent on bridge maintenance?
c. To what extent have expenditures on preventive maintenance aligned with national best practices?

II. **SDOT Condition Assessments of Major Bridges**
a. What measures and practices does SDOT use to assess the condition of Seattle's major bridges?
b. How have the conditions of Seattle's major bridges changed over time, and which bridges are at highest risk of failure?
c. To what extent do the conditions of Seattle's major bridges compare to similar jurisdictions?

- In addition to summarizing key information on all major bridges, the report should include a deeper analysis of a sampling of major bridges across our city including, but not limited to, the Ballard Bridge, Magnolia Bridge, Montlake Bridge, University Bridge, and West Seattle Bridge.

- The Auditor will discuss the final scope with SDOT, which could include a description of other major non-bridge infrastructure assets owned by the City to provide context for SDOT's broader asset management portfolio.

Please contact my office with any questions about this request.

Thank you.

Regards,

Alex Pedersen
City Councilmember and Chair of the Transportation & Utilities Committee

cc:
City Council President Lorena González and Seattle City Councilmembers,
City Council Central Staff Director Kirstan Arestad,
SDOT Director Sam Zimbabwe,
Budget Director Ben Noble

APPENDIX D

List of 77 SDOT Vehicle Bridges

Bridge Name	2019 Condition Rating	Year Built
15 Ave W	Fair	1959
15th Ave NE	Good	1949
15th Ave NW	Fair	1957
1st Ave S	Fair	1935
23rd Ave W	Fair	1986
2nd Ave Extension S	Poor	1928
35th Ave NE	Good	2015
45th Ave NE	Fair	1949
4th Ave S - West Half	Fair	1910
4th Ave S - East Half	Fair	1910
4th Ave St	Fair	1933
8th Ave NW	Good	1950
Admiral Way - N	Fair	1927
Admiral Way - S	Good	1949
Airport Way	Fair	1928
Albro Bridge	Fair	1931
Ballard - Bascule	Fair	1917
Ballard - Conc Appr	Fair	1940
Ballard - Steel Appr	Fair	1940
Campus Prkw	Fair	1949
Cowen Park	Fair	1936
E Boston Terrace	Fair	1948
E Interlaken Blvd	Fair	1912
E Marginal Grade	Good	2012
Fairview Ave N	Poor	1948
Fremont - Bascule	Fair	1917
Fremont - Apprs	Good	2009
Holman Rd	Good	1975
Jackson St - W	Fair	1910
Jackson St - E	Fair	1987
Jose Rizal Bridge	Fair	1917
Klickitat Ave SW	Good	2001
Lower West Seattle - E Waterway	Fair	1975
Lower West Seattle - Swing	Fair	1991
Lower West Seattle - Appr	Good	1991
Lower West Seattle - Harbor Ave Lower N	Good	1999
Lower West Seattle - Harbor Ave Lower S	Good	1998
Lower West Seattle - Harbor Ave Upper N	Fair	1999
Lower West Seattle - Harbor Ave Upper S	Good	1999

Bridge Name	2019 Condition Rating	Year Built
Lucille St	Good	1981
Magnolia	Poor	1929
Magnolia - Elliott Bay Marina N Ramp	Fair	1991
Magnolia - Elliott Bay Marina S Ramp	Fair	1991
Magnolia Extension	Fair	1957
Main West Seattle - Fauntleroy Expressway	Fair	1963
Main West Seattle - SW Spokane St Viaduct East Bound	Fair	1941
Main West Seattle - E Appr	Fair	1983
Main West Seattle - E Appr Ramp	Fair	1983
Main West Seattle - Mainspan	Fair	1983
Main West Seattle - W Appr	Fair	1983
Main West Seattle - W Appr Ramp	Fair	1983
McGilvra Blvd	Fair	1967
McGraw St	Fair	1935
N Queen Ann Dr	Fair	1935
NE 45th St - E Appr	Good	1976
NE 45th St - Main	Fair	1938
NW 57th St	Good	1986
Phinney Ave	Fair	1900
Princeton Ave NE	Good	2002
Royal Brougham	Good	2010
S Main St	Fair	1982
S Spokane St	Good	2010
Schmitz Park	Fair	1935
Seattle Blvd	Fair	1910
SW Nevada	Good	1988
University - Bascule	Fair	1915
University - N Appr C	Fair	1930
University - N Appr S	Poor	1930
University - S Appr	Poor	1930
W Dravus St	Fair	1959
W Emerson St	Fair	1949
W Fort St	Good	1985
W Galer St	Fair	2000
W Howe St	Fair	1946
Woodbine Way NW	Good	1928
Yesler Way - 4th Ave S	Good	1909
Yesler Way - 5th Ave S	Fair	1912

Source: Federal Highway Administration.

APPENDIX E

Results of Financial Policy Survey

In the city of Seattle and throughout the United States, infrastructure maintenance needs frequently compete for funding with more visible capital improvement projects, and are often underfunded. To identify whether other local governments had financial policies that enabled them to set aside and preserve annual funding for bridge maintenance, we researched a judgmental sample of seven jurisdictions. The seven jurisdictions we researched included: Pittsburgh, PA; Minneapolis, MN; Portland, OR; Scottsdale, AZ; King County, WA; Denver, CO; and Winnipeg, Canada. We reviewed relevant ordinances, policies and reports, and interviewed knowledgeable officials.

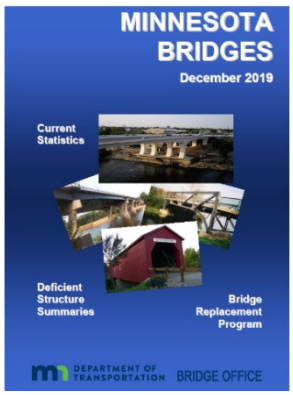
We found that four of the seven jurisdictions had financial policies to help preserve annual funding for infrastructure maintenance, including bridges. These ranged from: 1) entity-wide policy statements that were not enforced, 2) policies that were selectively implemented (based on how well the individual capital improvement project oversight committees worked), and 3) policies that reflected an entity-wide commitment to incrementally closing the deferred maintenance gap. We concluded that the following factors contribute to a jurisdiction's potential for incrementally closing their infrastructure deferred maintenance funding gap:

1. A financial policy that preserves minimum annual funding for deferred maintenance,
2. Internal controls [9] to ensure that the financial policy is being adhered to,
3. A robust asset management system (i.e., one that relies on regularly updated, sufficiently detailed condition data to set and communicate funding priorities),
4. An entity-wide commitment—including elected officials, managers, and constituents—to the importance of reducing the deferred maintenance backlog, and
5. Involvement from community members with relevant expertise in setting funding priorities and commitment to transparency and making information about the infrastructure plan available to the public.

Three of the most promising approaches we identified included:

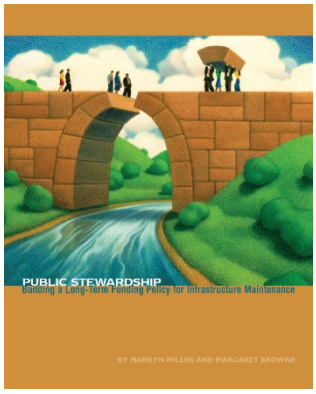
The City of Minneapolis, Minnesota

In 2016, the City of Minneapolis passed an ordinance requiring a minimum amount be spent annually for street infrastructure and neighborhood parks capital projects for the next twenty years. Funds may come from levy, cash, or bond proceeds. Minneapolis also has a Capital Long-Range Improvement Committee that developed rating guidelines used to assign point values to each capital budget project. Points are added if the capital improvements would save future maintenance costs and deducted if new projects do not have a source for ongoing maintenance funding.



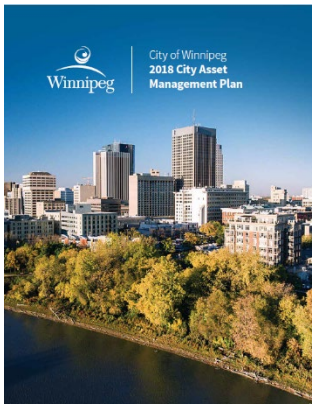
[9] For example, the City of Minneapolis' capital budget process tracks unspent funds as a check and balance system to ensure they are complying with their ordinance to spend a minimum annual amount for street infrastructure and neighborhood parks capital projects.

The City and County of Denver, Colorado



Recognizing that the existing capital planning and budgeting process was not adequately maintaining the city's infrastructure, the City and County of Denver created two task forces: 1) to assess the condition of the current infrastructure, develop maintenance standards, and establish criteria for setting priorities, and 2) to develop a capital funding policy to provide a long-term framework based on the results of the first group. Based on the hard data and practical proposals that came out of the two task forces, the City and County of Denver was able to secure voter approval of a property tax increase for capital maintenance and a major capital maintenance bond issue.

The City of Winnipeg, Manitoba, Canada



The City of Winnipeg made a commitment to strengthening asset management by approving a policy that made it a core business function, establishing a framework by requiring the development of comprehensive Asset Management Plans (AMPs), and completing its first AMP in 2018. While City officials readily admit that closing their deferred maintenance gap will take a long-term effort and further work to identify and obtain additional sources of revenue, they now have a robust system for tracking and comparing the condition of their assets citywide, calculating the deferred maintenance gap for each asset, and prioritizing projects. This information, along with their organizational structure, puts them in a better position to make the case for the importance of maintaining infrastructure.

APPENDIX F

Seattle Office of City Auditor Mission, Background, and Quality Assurance

Our Mission:
To help the City of Seattle achieve honest, efficient management and full accountability throughout City government. We serve the public interest by providing the City Council, Mayor and City department heads with accurate information, unbiased analysis, and objective recommendations on how best to use public resources in support of the well-being of Seattle residents.

Background:
Seattle voters established our office by a 1991 amendment to the City Charter. The office is an independent department within the legislative branch of City government. The City Auditor reports to the City Council and has a four-year term to ensure her/his independence in deciding what work the office should perform and reporting the results of this work. The Office of City Auditor conducts performance audits and non-audit projects covering City of Seattle programs, departments, grants, and contracts. The City Auditor's goal is to ensure that the City of Seattle is run as effectively, efficiently, and equitably as possible in compliance with applicable laws and regulations.

How We Ensure Quality:
The office's work is performed in accordance with the Government Auditing Standards issued by the Comptroller General of the United States. These standards provide guidelines for audit planning, fieldwork, quality control systems, staff training, and reporting of results. In addition, the standards require that external auditors periodically review our office's policies, procedures, and activities to ensure that we adhere to these professional standards.

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