Performance Audit of the Transportation and Stormwater Department's Street Sweeping Section

To Improve Efficiency of Operations, the Street Sweeping Section Should Use Data to Effectively Monitor and Make Timely Adjustments to Route Priorities and Sweeping Frequencies

Office of the City Auditor

City of San Diego

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September 2020

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Why OCA Did This Study

Street sweeping cleans our communities and strategically targets trash and pollution. It also helps the City comply with water quality regulations. Keeping stormwater runoff free from harmful pollutants and from reaching our waterways protects wildlife populations and preserves water quality. The City's Transportation and Storm Water Department (TSWD) Street Sweeping Section (Street Sweeping) sweeps over 2,700 miles (215 routes) of improved streets. In FY19, it removed over 25,000 cubic yards of debris and other pollutants in that can be harmful to wildlife and water quality. The overall objective of this audit was to determine whether Street Sweeping has processes in place, follows industry best practices or other established criteria, to evaluate and prioritize street sweeping routes and schedules.

What OCA Found

Finding 1: Although Street Sweeping has a comprehensive data collection process, it does not use data to analyze operations. Without data evaluation, Street Sweeping's ability to track and monitor the effectiveness of operations and make process improvements is limited. The inability to make timely adjustments to components such as sweeping priorities, frequencies, and posted routes limits Street Sweeping's potential to reduce, to the greatest extent possible, the amount of pollutants entering the City's waterways.

Finding 2: Without data analysis, we found that some routes with relatively high amounts of debris are swept less frequently than optimal, while at the same time, other routes with relatively low amounts of debris are swept at a higher than optimal frequency. This likely reduces the total amount of street sweeping debris collected. We also found that route priorities and sweeping frequencies should align with debris volume criteria and watershed pollutant priorities in accordance with best practices. Moreover, Street Sweeping should consider selectively adding posted routes to maximize the effectiveness of these routes. Lastly, Street Sweeping has not updated its street sweeping program in five years.

Finding 3: We found that Street Sweeping's current key performance indicator (KPI)—annual miles swept—does not reflect the effectiveness at achieving its purpose—removing debris and sediment from City's streets. Additionally, Street Sweeping should adjust its KPI goal to a more realistic target because it has not met this goal for the last four years. Furthermore, Street Sweeping would benefit from additional annual performance measures, such as total debris collected, and percent of miles completed. These performance measures reinforce best practices: concentrating on routes with the highest levels of debris.

Source: Transportation and Stormwater Department

What OCA Recommends

We made a total of 4 recommendations to address the issues outlined in the report. Specifically, we recommend that TSWD:

- Develop and generate an annual report in EAM to capture data necessary to analyze operations.
- Develop and document a process to review route frequencies to determine if any route sweeping priorities need adjusting.
- Perform a comprehensive reassessment of all route frequencies, priorities, posting designations, staffing for shifts, sweeper types, and debris removal to ensure that these elements correlate with one another and that they account for debris levels and watershed areas. Incorporate results from this analysis into the municipal permit cycle.
- Conduct a trend analysis with each subsequent permit cycle or as frequently as possible.
- Request budget approval to selectively add posted routes and make any other improvements.
- Adjust its key performance indicator to exclude special sweeps and account for typical operational limitations.
- Add two KPIs—percent of miles completed, and total debris collected annually.

TSWD agreed with all 4 recommendations.

For more information, contact Kyle Elser, Interim City Auditor at (619) 533-3165 or cityauditor@sandiego.gov

THE CITY OF SAN DIEGO

September 22, 2020

Honorable Mayor, City Council, and Audit Committee Members
City of San Diego, California

Transmitted herewith is a performance audit of the Transportation and Stormwater Department street sweeping program. This report was conducted in accordance with the City Auditor's Fiscal Year 2020 Audit Work Plan, and the report is presented in accordance with City Charter Section 39.2. The Results in Brief are presented on page 1. Audit Objectives, Scope, and Methodology are presented in Appendix B. Management's responses to our audit recommendations are presented after page 64 of this report.

We would like to thank staff from the Transportation and Stormwater Department. All of their valuable time and efforts spent on providing us information is greatly appreciated. The audit staff members responsible for this audit report are Danielle Kish, Megan Garth, Chris Kime, Danielle Knighten, and Andy Hanau.

Respectfully submitted,

Kyle Elser

Kyle Elser
Interim City Auditor

cc: Kris Michell, Chief Operating Officer
Jeff Sturak, Assistant Chief Operating Officer
Johnnie Perkins Jr., Deputy Chief Operating Officer, Public Works
Kris McFadden, Director, Transportation and Stormwater Department
Matthew Helm, Chief Compliance Officer
Rolando Charvel, Chief Financial Officer
Jessica Lawrence, Director of Policy and Council Affairs, Office of the Mayor
Honorable City Attorney Mara Elliott
Kenneth So, Deputy City Attorney
Andrea Tevlin, Independent Budget Analyst

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Results in Brief

Stormwater is a vital resource that replenishes the nation's waterways, including our rivers, lakes, and oceans. However, stormwater runoff also carries uncollected pollutants such as litter, trash, metals, and organic material (leaves, twigs, branches, etc.) directly to streams and rivers, where they can harm wildlife populations, kill native vegetation, and make recreational areas unsafe and unpleasant. Therefore, it is necessary to prevent pollutants from entering our waterways to the greatest extent possible.

Street sweeping is a public service that cleans our communities and strategically targets trash and pollution. It also helps the City comply with water quality regulations. The City of San Diego's (City's) Transportation and Storm Water Department (TSWD) Street Sweeping Section (Street Sweeping) sweeps over 2,700 miles of improved streets. In FY19, it removed over 25,000 cubic yards of debris and other pollutants that can be harmful to wildlife and water quality. Street Sweeping has made many improvements to its program over the years—sweeping bikeways and medians, matching routes with equipment types that are better at sweeping certain kinds of debris, and studying the benefits of posted routes. However, to increase the efficiency of operations and ensure the greatest amount of debris removal possible, Street Sweeping can use data to monitor and adjust operations.

Finding 1: Street Sweeping Should Use Data to Analyze Operations: The Process for Managing Data Has Been Manual and Prevents Timely and Consistent Monitoring of Operations

Using data to make informed decisions and achieve maximum levels of service is important to measure how well an organization performs. Therefore, data must be collected, monitored, and evaluated on an ongoing basis. Ongoing monitoring and evaluation allow for timely adjustments in operations. We found that although Street Sweeping currently uses a comprehensive data collection process, it does not use the data to analyze operations. Without data evaluation, Street Sweeping's ability to track and monitor the effectiveness of

operations and make process improvements is limited. Specifically, we found:

- Street Sweeping has not developed a plan to analyze data to monitor and adjust operations;
- The process for recording data has been manual; and
- EAM's limited reporting mechanisms hinder future data analysis.

To address these issues, we recommend that TSWD work with the Department of Information Technology to develop an annual report from EAM to capture the data necessary to analyze operations.

Finding 2: Street Sweeping Should Optimize Its Use of Best Practices When Prioritizing Routes and Sweeping Frequencies

To maximize the benefits and efficiency of street sweeping, best practices recommend that route priorities and sweeping frequencies are based on debris volume and watershed pollutant priorities. Additionally, routes should be posted with no-parking signs in the most problematic areas to increase the sweeper's access to the curb. Tying together the elements of debris volume, route priority level, and sweeping frequency, Street Sweeping's Jurisdictional Runoff Management Plan designates routes by three priority levels—high, medium, low—that are based on debris volume; each priority level has a corresponding sweeping frequency. Street Sweeping has categorized its 215 routes into these three priority levels. Therefore, to collect the greatest debris possible, all of these elements should align. However, we found:

- Street Sweeping's priority levels could be better aligned with debris volume criteria.
- Route priority levels and sweeping frequencies do not necessarily correlate with debris volume.
- Enhanced sweeping in some watershed areas with high priority pollutants does not appear to be prioritized.

- Street Sweeping needs to maximize the effectiveness of its posted routes and should consider selectively adding posted routes.

We also found that route priorities and sweeping frequencies have not been updated in approximately five years. To address these issues, we recommend that TSWD perform a comprehensive reassessment of all route frequencies, priorities, posting designations, staffing for shifts, sweeper types, and debris removal to ensure that these elements correlate with one another and that they account for debris levels and watershed areas. We also recommend that TSWD incorporate results from this assessment into the municipal permit cycle. A trend analysis should be conducted with each subsequent permit cycle or as frequently as possible. Lastly, we recommend that TSWD should request budget approval to selectively add posted routes and make any other operational changes.

Finding 3: Street Sweeping Should Establish More Meaningful Performance Measures to Monitor and Evaluate Operations Over Time

Performance measures help guide and gauge an organization's success, especially in relation to meeting the organization's goals, mission, and purpose. Street Sweeping's current key performance indicator—annual miles swept—does not reflect the effectiveness at achieving its purpose, removing debris and sediment from City streets. Additionally, Street Sweeping has kept the same target number of annual miles swept, even though this goal has not been met in the past four fiscal years.

To reinforce best practices—concentrating on routes with the highest levels of debris—Street Sweeping would benefit from additional annual performance measures, such as total debris collected and percent of miles completed, as used by other California jurisdictions. These measures would also better reflect TSWD's primary goals.

To address these issues, we recommend that TSWD adjust its current performance measure to create a target for planned annual miles swept that excludes special sweeps and anticipated typical operational limitations (such as winter or

seasonal restrictions). We also recommend that TSWD add two performance measures that reinforce best practices: percent of miles completed and annual debris volume collected.

Background

In accordance with the Office of the City Auditor's Fiscal Year (FY) 2020 Audit Work Plan, we conducted a performance audit of the City of San Diego's (City) Transportation and Stormwater Department's (TSWD) Street Sweeping Section (Street Sweeping). The overall objective of this audit was to determine whether Street Sweeping has processes in place, follows industry best practices or other established criteria, to evaluate and prioritize street sweeping routes and schedules.

Stormwater Pollution Prevention Is Essential to Keeping Our Waterways Clean

Stormwater is a vital resource that replenishes the nation's waterways, including our rivers, lakes, and oceans. However, Contaminants found in stormwater can have dangerous impacts, such as killing aquatic organisms and causing illness in humans. In urban and suburban areas impervious surfaces, such as buildings and pavement, cover much of the land. These surfaces do not allow rain and other water discharges to soak into the ground. With no place to go, this water (along with any debris in its path) flows into the City's stormwater system. While the impact of runoff pollution may not be immediately realized, the cumulative effects can be dramatic. Sediment containing pesticides and cleaning solvents, debris, and litter can contaminate stormwater causing harm to aquatic organisms, native vegetation and even humans. **Exhibit 1** shows examples of pollutants in waterways caused by stormwater runoff.

Exhibit 1:

Examples of Stormwater Pollutants

Source: US EPA. "EPA: The Scoop on Stormwater"

Source: City of San Diego, "Stormwater News You Can Use (Staff Training Video)" Think Blue Videos

Stormwater Division Overview

One of TSWD's primary goals is to protect and improve water quality and to reduce flood risk through efficient stormwater management. Its Stormwater Division leads the City in implementing activities to prevent pollutants from entering our waterways. These activities include, but are not limited to, public education, employee training, water quality monitoring, source identification, code enforcement, watershed management, and development and implementation of best management practices within the City's jurisdictional boundaries.

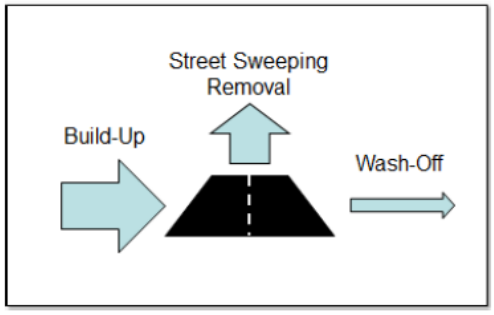
Street sweeping is one of the Stormwater Division's tools to protect the City's waterways and infrastructure. Sweeping provides cleaner streets to residents and tourists alike. It also prevents pollutants from entering waterways and removes debris that could be harmful to pedestrians, bicyclists, and motorists. The process reduces the accumulation of sediment

and larger debris that could clog storm drains that lead to ponding and flooding.

Exhibit 2 demonstrates the stage at which street sweeping removes sediment from City streets.

Exhibit 2:

Example of Debris Build-Up and Removal by Street Sweeping

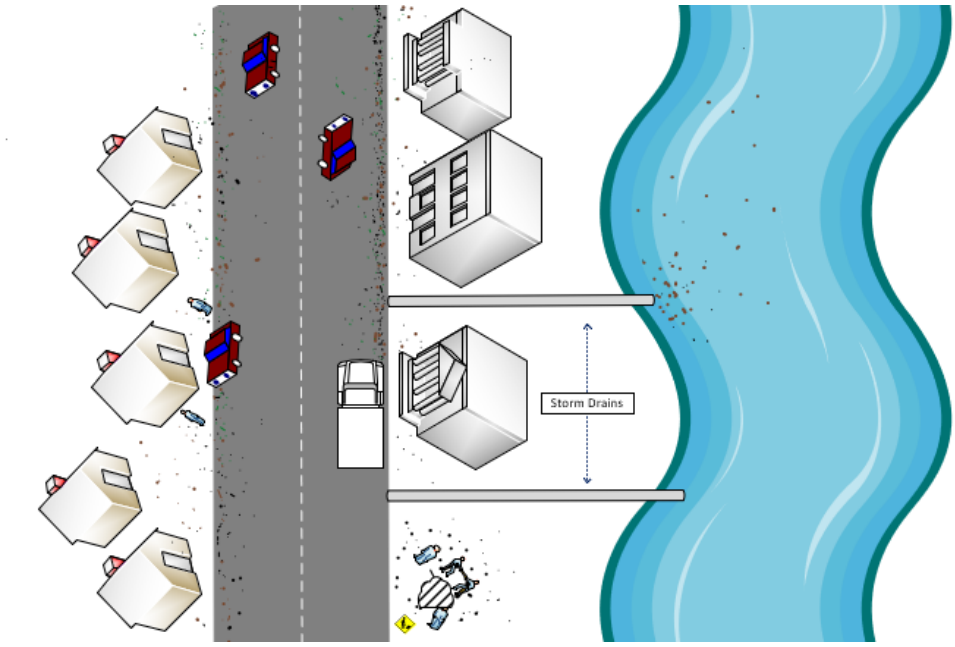


Source: Tecolote Watershed Comprehensive Load Reduction Plan

Exhibit 3 shows how street sweeping picks up debris that has accumulated on streets, and reduces the amount of debris entering the stormwater system.

Exhibit 3:

Example of How a Sweeper Removes Debris before the Debris Travels Through the Storm Drain to Waterways



Source: OCA generated based on Tecolote Watershed Comprehensive Load Reduction Plan

Street Sweeping Is a Cost-Effective Approach for Reducing Stormwater Runoff

Street sweeping, a nonstructural strategy, is one of the more cost-effective approaches the City employs to prevent toxic pollutants and debris from entering San Diego's waterways. Nonstructural strategies tend to be more cost effective than structural strategies such as permeable pavement, because they do not require construction, or the purchase of land and they focus on controlling the source of pollutants before entering the stormwater system.

Street sweeping can result in significant cost savings. For example, TSWD's water quality improvement plan strategies costing tool identified that street sweeping in the San Diego Bay watershed costs approximately $10,000 to $20,000 per pound of heavy metals reduced each year; this is five to ten times more cost effective than structural strategies, with estimated cost savings of approximately $100,000 per pound of metals reduced per year.

Street Sweeping Helps the City Comply with Water Quality Regulations

The Stormwater Division is responsible for ensuring the City's compliance with water quality regulations. Designed to protect the quality of regional bodies of water, water quality regulations govern the quantity of discharges of pollutants that flow into waterways. Most water quality regulations are promulgated by the federal Clean Water Act of 1972, which introduced the municipal permit program, an effluent permit system for regulating point source (e.g., pipe, ditch, and sewer) discharges into the waters of the United States. The National Pollutant Discharge Elimination System permit program (municipal permit) requires municipalities, communities, construction companies, industries, and others to use stormwater controls known as best management practices. Street sweeping is one of many best management practices that helps the City comply with water quality regulations.

The City obtains its municipal permit from the California Regional Water Quality Control Board, San Diego Region (Board). This permit, typically renewed every five years, requires the City and the other 20 municipal agencies subject to the permit to prepare both jurisdictional and watershed scale plans that detail how they will comply with the new requirements. Each agency, including the City, prepares its own Jurisdictional Runoff Management Plan (JRMP). The JRMP encompasses citywide programs, activities, and goals designed to prevent and reduce stormwater pollution within City boundaries. Goals for street sweeping are also detailed in the JRMP. This plan is updated approximately every five to six years corresponding with the permit renewal.

The watershed plans, known as Water Quality Improvement Plans (WQIPs), are collaboratively prepared by the municipal agencies and focus on a particular watershed. The City has a WQIP for each of the six watersheds within its jurisdiction: Los Peñasquitos, Mission Bay, San Diego Bay, San Diego River, San Dieguito, and Tijuana Watersheds.[1]

[1] Many regional watersheds extend beyond City limits and often cover more than one municipality.

Together, the JRMP and WQIPs include specific guidelines and goals for stormwater best management practices, such as street sweeping. **Exhibit 4** portrays the six watershed management areas that fall within the City's jurisdiction.

Exhibit 4

Watershed Management Areas Where the City Has Jurisdiction

Source: City of San Diego JRMP 2019

The permit requires the City to submit an annual JRMP report detailing its activities and compliance with the permit to the Board by October 31 of each year for each JRMP reporting period (i.e., July 1 to June 30). If the City fails to demonstrate compliance with the municipal permit, the Board may assess penalties which can amount to $10,000 per day per violation.

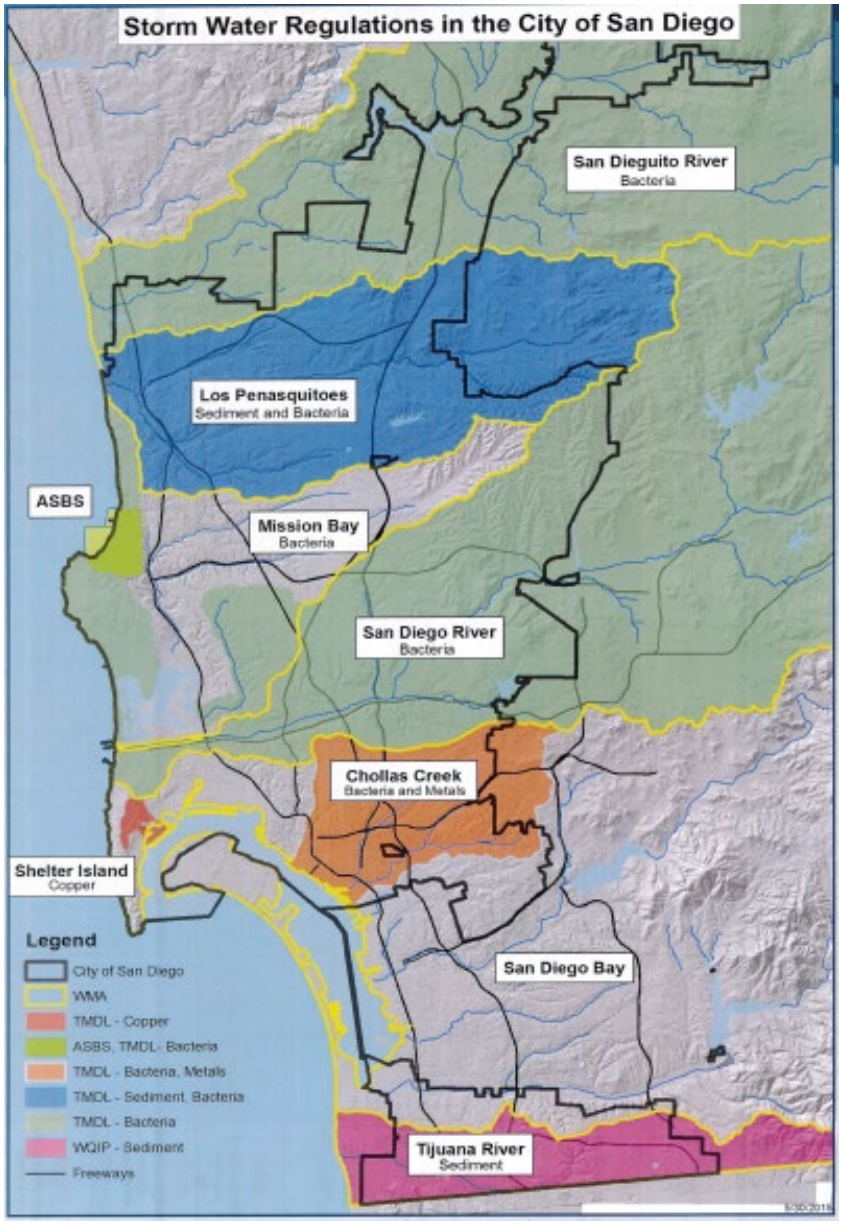
The Stormwater Division Has Identified Ways to Improve Street Sweeping Operations

In an effort to identify projects and funding levels needed to comply with stormwater regulations, the City developed comprehensive load reduction plans. These plans have identified specific sediment/pollutant reduction goals within the City's six watershed areas and other priority areas. These plans, in conjunction with the WQIPs, have identified areas where enhanced street sweeping would be most effective in removing high priority pollutants – sediment and metals – in specific watershed areas. Enhanced sweeping includes type of equipment used and frequency of sweeping. Because street sweeping is more effective at removing metals (i.e., copper, zinc) and sediment than bacteria, the Stormwater Division has identified three watershed areas with these pollutant types where enhanced sweeping is recommended—Los Peñasquitos, Tijuana River, and San Diego Bay-Chollas Creek.[2] **Exhibit 5** below shows the specific types of sediment/pollution that are targeted for reduction in each watershed area.

[2] Chollas Creek is part of San Diego Bay. However, TSWD splits up San Diego Bay into two watershed areas: San Diego Bay and San Diego Bay-Chollas Creek.

Exhibit 5

High Priority Pollutants within the City's Watersheds



Source: Water Quality Improvement Plan goals.

The Stormwater Division has also invested in five local studies, with the intention to optimize the use of street sweeping equipment and current practices. Over eight years, these five studies examined: 1) street sweeping frequencies, 2) machine

technology, 3) median sweeping, 4) speed efficiency, and 5) posted routes with limited parking.

Street Sweeping has taken steps to incorporate the results of these studies into their sweeping operations. For example, the first and second pilot study results demonstrated a specific type of sweeper machine can increase the removal of metals (such as copper, lead and zinc) from street surfaces. Vacuum sweepers removed a greater percentage of metals from street surfaces compared to mechanical sweepers. As such, Street Sweeping has used its regenerative-air (vacuum) sweepers in its watershed areas. Additionally, results from the third pilot study indicated that median sweeping has the potential to remove significant amounts of debris. Street Sweeping has included median sweeping as part of their scheduled sweeps within its six watershed areas.

Stormwater Division's Street Sweeping Section

The Stormwater Division's Street Sweeping Section (Street Sweeping) sweeps 2,700 miles of improved streets within the City. In FY19, there were 215 routes varying in length between 1 and 62 miles, with an average route length of 24 miles. There are additional center median routes that are not captured in the 215 routes but are also swept on a schedule. Each route is assigned a priority and a planned sweeping frequency. In FY19, Street Sweeping planned to complete a total of 107,006 miles (not including Get It Done requests or service level agreements). [3]

Street Sweeping has 17 motor sweeper operator positions and has the support of truck drivers, utility workers, and parking enforcement officers. Street Sweeping operates with a morning shift and an evening shift. Motor sweeper operators follow set schedules of specific routes, which are either posted or non-posted.

Two types of machines, mechanical sweepers and regenerative-air sweepers make up Street Sweeping's fleet of 27 sweepers. Mechanical sweepers are equipped with water tanks and sprayers used to loosen particles and reduce dust.

[3] Get It Done is the City's online portal for residents to make service requests.

The brooms gather debris underneath the sweeper and the vacuum system pumps debris into the storage receptacle (hopper). Regenerative-air sweepers use forced air to create a swirling and knifing effect within a contained area beneath the machine. This effect generates negative pressure, which transfers debris into the hopper. These machines are significantly better at removing total solids, biological materials, and metals than standard mechanical sweepers. The surplus of sweepers ensures the availability of a sweeping machine, when a mechanical issue arises. **Exhibit 6** shows examples of the City's mechanical and regenerative-air sweepers.

Exhibit 6

Mechanical Sweeper (Left) and Regenerative-Air Sweeper (Right)

Source: Transportation and Stormwater Department

In FY19, Street Sweeping collected 25,723 cubic yards of debris from San Diego's streets, equivalent to 1,837 standard-sized dump trucks of debris. Once the hopper is full, the motor sweeper operators unload the debris into nearby bins placed by the Street Sweeping's truck drivers, who dump the bins into the landfill within the same day. Organic material (leaves, twigs, branches, etc.) make up a large portion of the debris collected. However, the sweepers also pick up fine sediments that contain levels of pollutants such as metals, pesticides, and other organic chemicals. **Exhibit 7** shows examples of debris on a street in North Park.

Exhibit 7

Examples of Debris on a Street in North Park

Example of Glass Debris

Example of Organic Debris

Source: OCA

Route Priority Levels Determine Sweeping Frequencies

The City's Jurisdictional Runoff Management Plan (JRMP) specifies the minimum required sweeping frequency for routes based on a route's priority level. Per the JRMP, the priorities are based on debris volume. Exhibit X shows the minimum frequencies in the JRMP (marked with an asterisk). Street Sweeping has categorized their 215 routes into three priority levels—high, medium and low. As **Exhibit 8** also shows, Street Sweeping plans to sweep most of its routes over the required JRMP frequencies. For instance, 59 high priority routes have a planned sweeping frequency above the JRMP's minimum frequency for high priority routes (24 times per year), while all 114 low priority routes have a planned sweeping frequency above the JRMP's minimum frequency of once per year.

Exhibit 8

Route Priority Levels and Sweeping Frequencies

Route Priority Levels (Based on Debris Volume)	Planned Sweeping Frequency	# of Routes
HIGH	Up to 3x Weekly - 130x	2
	2x Weekly - 104x	4
	Weekly - 52x	53
	Up to 2x Month - 24x*	2
MEDIUM	Weekly - 52x	1
	Up to 2x Month - 24x	1
	Monthly - 12x*	38
LOW	6x Yearly - 6x	114
	1x Yearly - 1x*	0
Total Routes		**215**

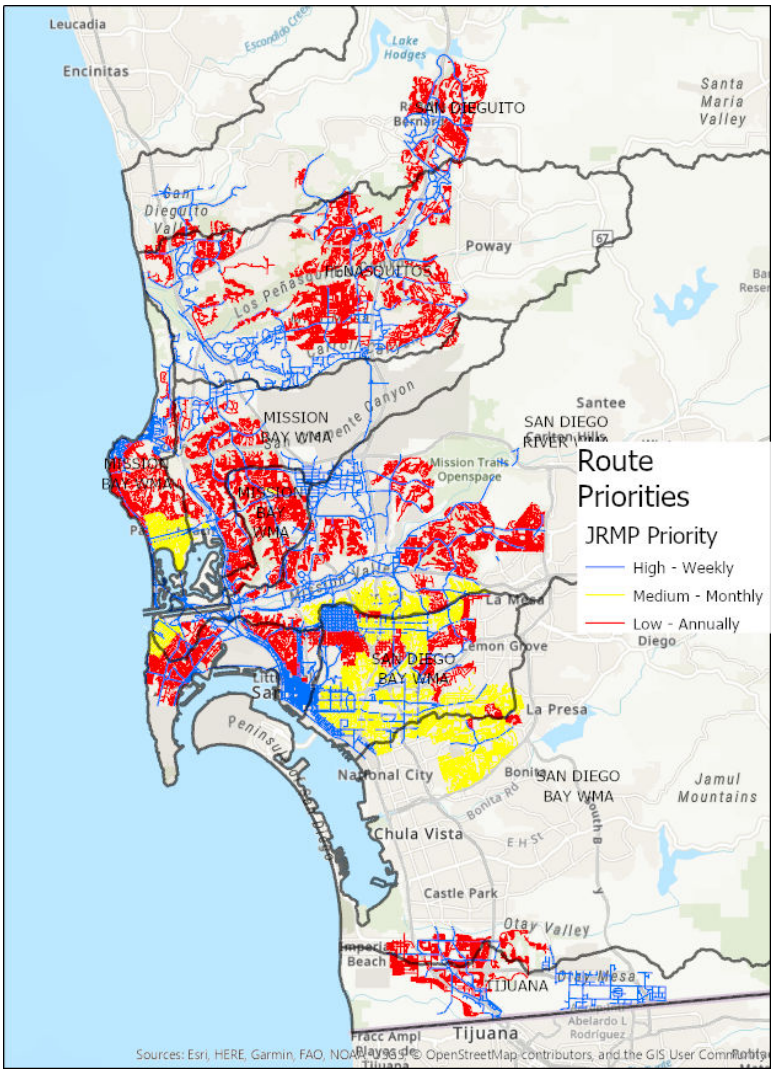
* Note: These frequencies are listed in the Jurisdictional Runoff Management Plan (JRMP). Highlighted frequencies are not in the JRMP.

Source: TSWD Street Sweeping FY19 Data

Exhibit 9 below shows the location of all 215 routes by priority level and minimum sweeping frequency in the JRMP. Watershed areas with the most frequently planned sweeping include the Chollas Creek area (downtown and surrounding neighborhoods) of San Diego Bay, beach areas of Mission Bay (Pacific Beach and La Jolla), and some parts of Los Peñasquitos. Infrequently swept watershed areas include most of Los Peñasquitos, Mission Bay, and Tijuana River.

Exhibit 9

All Routes by Priority Level and Frequency



Source: OCA generated based on FY19 data from TSWD. Image generated from ArcGIS.

Routes have been assigned priorities and frequencies since the 1990s. Street Sweeping states that priority levels and frequencies were primarily based on regulatory conditions in the area, staff knowledge, and the potential for flooding. A City manager's report from 2000 states that high sweeping frequencies for commercial routes and some residential routes were already in place since the street sweeping program's inception in 1997. Commercial routes in downtown and in beach areas, for example, were already being swept almost daily.

Street Sweeping Uses Posted Routes to Improve the Effectiveness of Operations

Posting routes with no-parking signs increases sweeper access to the curb, results in higher debris removal, is more cost efficient, and has a significant positive impact on water quality. In fact, according to a pilot study conducted by Street Sweeping, sweeping a posted route resulted in 50 percent more debris removal compared to a non-posted route. Street Sweeping's parking enforcement operators enforce the no-parking routes by writing parking citations for cars parked during street sweeping hours on posted streets. **Exhibit 10** shows an example of the City's no-parking signs for street sweeping. Of the City's 215 planned sweeping routes, 51 routes are posted.

Exhibit 10

Example of a No-Parking Sign on a Posted Route

Source: OCA

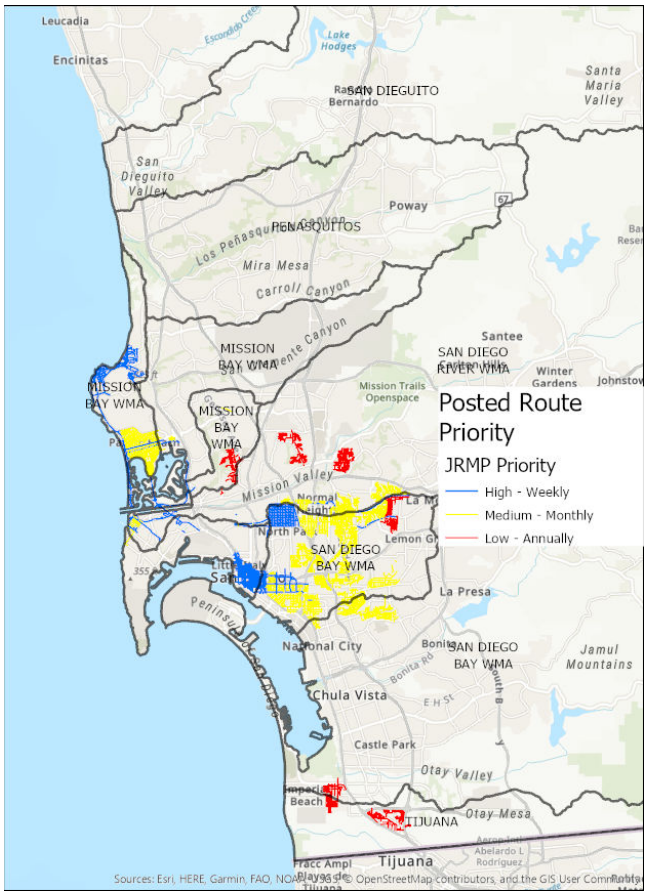
According to Street Sweeping, there are three ways routes can become posted:

1) A petition of over 75 percent of property owners in the neighborhood;
2) Councilmember request; or
3) Motor sweeper operator request based on observations.

Exhibit 11 displays the City's posted street sweeping routes by their JRMP priority level.

Exhibit 11

Posted Street Sweeping Routes, by JRMP Priority Level



Source: OCA generated based on FY19 data from TSWD. Image generated from ArcGIS.

Street Sweeping Tracks Miles Swept to Monitor Performance

Along with the set sweeping schedules, Street Sweeping also conducts special sweeps throughout the year. Special sweeps encompass sweeping in response to Get It Done requests as well as sweeping City facilities as requested at the beginning of each fiscal year. Motor sweeper operators sweep bikeways, center medians, and City facilities' parking lots, as well as before and after community events.

To gauge performance, Street Sweeping uses the key performance indicator: miles swept annually. For the past eight years, Street Sweeping has used this metric as a key performance indicator, and for the past four fiscal years Street Sweeping has kept the same target of 117,000 curb miles.

Exhibit 12 details FY17–FY20 target annual curb miles swept and actual annual curb miles swept.

Exhibit 12

Street Sweeping's Key Performance Indicator, FY17–FY20

	FY2017	FY2018	FY2019	FY2020
Target Miles Swept Annually	117,000	117,000	117,000	117,000
Actual Miles Swept	106,172	112,500	91,836[4]	93,028

Source: OCA generated from TSWD's FY19 and FY20 Adopted Budgets

Parking Enforcement Generates Revenue from Street Sweeping's Operations

The General Fund provides the funding for Street Sweeping, with an average cost of $6.4 million from FY17–FY20. As Street Sweeping encompasses a parking enforcement team, General Fund revenue generated from street sweeping activities includes parking citation revenue collected during street sweeping. See **Exhibit 13**.

[4] Street Sweeping's FY20 budget explains that more intense and frequent rain events during the 2018–2019 winter rainy season reduced the number of days when sweeping could be performed and affected the performance indicator.

Exhibit 13

Annual Street Sweeping Budget to Annual Parking Citation Revenue

	FY2017	FY2018	FY2019	FY2020
Street Sweeping Full Time Employees	38	38	38	38
Street Sweeping Budget	$6,128,542	$6,274,727	$6,567,363	$6,608,418
Parking Enforcement Citation Revenue-Actual	$5,136,785	$4,631,564	$4,149,958	$3,434,203
Difference	**$(991,757)**	**$(1,643,163)**	**$(2,417,405)**	**$(3,174,215)[5]**
Citation Revenue as % of Budget	**84%**	**74%**	**63%**	**52%**

Source: TSWD budgets for FY17–FY20

Street Sweeping Is Transitioning to the Enterprise Asset Management System for Record Keeping

Street Sweeping has predominantly used manual systems to monitor and record operations; however, they are transitioning away from manual record keeping. According to Street Sweeping, it began using the City's enhanced maintenance management system, Enterprise Asset Management (EAM), in April 2018 for work order management and data tracking. EAM contains schedules of the daily sweeping activities while motor sweeper operators enter measuring points (odometer readings, water usage, amount of debris unloaded, etc.) on the manual forms as well as into tablets that sync the information to EAM. For the past two fiscal years, consultants compiled these measuring points from the manual activity logs to produce the data necessary for annual reporting. According to Street Sweeping, it has transitioned to full tablet integration as of July 1, 2020 and no longer uses the paper worklogs.

[5] FY20 citation revenue will likely be significantly impacted by the COVID-19 pandemic. The City stopped distributing parking citations from the middle of March FY20 into FY21; therefore, the Stormwater Division only collected citation revenue during the first three quarters of the fiscal year.

Audit Results

Finding 1: Street Sweeping Should Use Data to Analyze Operations: The Process for Managing Data Has Been Manual and Prevents Timely and Consistent Monitoring of Operations

Finding Summary

The City of San Diego (City) is measured by how it delivers services. According to the City's Performance and Analytics Department, one of the ways to achieve maximum levels of service is to apply data to make informed decisions. Although the Transportation and Stormwater Department's Street Sweeping Section (Street Sweeping) currently uses a comprehensive data collection process, it does not use the data to analyze operations. Without data evaluation, Street Sweeping's ability to track and monitor the effectiveness of operations and make process improvements is limited. The inability to make timely adjustments to components such as sweeping priorities, frequencies, and posted routes limits Street Sweeping's potential to reduce, to the greatest extent possible, the amount of pollutants entering the City's waterways. Stormwater runoff carries uncollected pollutants such as litter, trash, metals, and organic material (leaves, twigs, branches, etc.) directly to streams and rivers, where they can harm wildlife populations, kill native vegetation, and make recreational areas unsafe and unpleasant.

Street Sweeping captures data using a manual record keeping process; this data is reported in the annual Jurisdictional Runoff Management Plan (JRMP) report, a requirement of state water regulations. However, the manual record keeping prohibits timely monitoring and analysis of operations. Although Street Sweeping states it has transitioned in FY21 to using the City's Enterprise Asset Management (EAM) system to track sweeping data, EAM's limited reporting mechanisms hinder future data analysis. However, the Department of

Information Technology and the Performance and Analytics Department can assist Street Sweeping to extract and analyze its data that will ultimately allow management to assess the effectiveness of operations and make improvements.

We recommend that Street Sweeping develop a plan to appropriately capture data necessary to analyze operations and work with the assistance of the Department of IT to extract data from EAM and analyze it, respectively.

Data Analysis Helps the City Determine Its Level of Service and Adjust Operations Accordingly

One of the City's values in its Strategic Plan is to measure results and seek improvement in everything it does. The City's Performance and Analytics Department explains that in order to achieve maximum levels of service, it is necessary to apply data to make informed decisions. According to the Government Accountability Office's Green Book, organizations should establish baseline understanding of operations and have processes in place to evaluate changes in activities.[6] Organizations should make changes in activities based on assessment of results. In effect, monitoring and evaluation are essential elements for City departments to excel at service delivery.

More specifically, an organization should evaluate and document the results of ongoing monitoring and use this evaluation to determine the effectiveness of current operations. Differences between the results of monitoring activities and the previously established baseline may indicate internal issues or deficiencies. Through data analytics, an organization can learn how to create efficiencies and adjust operations to improve the quality of service.

Street Sweeping's Manual Recording Process Prevents Timely Data Analysis

The process for recording street sweeping data has been manual and that prevents timely review and adjustments of operations. At the end of each sweep, motor sweeper operators manually recorded information on daily worklogs for scheduled routes and special sweeps per shift. They recorded metrics such as: equipment number; date; route

[6] The GAO's *Standards for Internal Control in the Federal Government*, known as the "Green Book," sets the standards for an effective internal control system for federal agencies.

number; total miles driven; total miles swept; dump location; water usage; and estimated amount of debris collected.[7] They also noted whether the route was completed and reasons why a route was not completed. Street Sweeping stores these activity logs in a file cabinet for three years.

Once a year a contracted consultant has compiled the street sweeping metrics for the annual JRMP report. The consultant creates a spreadsheet using the information culled from the manual worklogs. The consultant and Street Sweeping management verify the dataset through a quality assurance process. Using the compiled information from this spreadsheet, Street Sweeping reports the City's sweeping activities for the annual JRMP report. The City's National Pollutant Discharge Elimination System municipal permit requires the Transportation and Stormwater Department (TSWD) to report specific metrics, such as total miles swept in each watershed area and total debris collected per watershed. According to TSWD, it used their engineering stormwater professional service contracts as needed to support this work.

Using manual worklogs hinders Street Sweeping's ability to efficiently monitor the effectiveness of operations and make timely adjustments to routes and schedules. As the data from the manual worklogs is only compiled once a year, Street Sweeping cannot easily track trends in debris collection. Limiting the review of metrics prevents Street Sweeping from making necessary improvements or adjustments to routes and schedules on a more frequent basis. The limited ability to make timely adjustments affects Street Sweeping's potential to reduce the maximum amount pollutants possible from entering San Diego's waterways, thus increasing potential harm to wildlife, native vegetation, as well as recreation areas.

According to Street Sweeping, it has not used data to analyze operations because of limitations in technical and personnel resources. However, with the transition to EAM, Street

[7] Total miles swept is also known as total broom miles. This differs from total miles driven because total miles driven includes miles covered between route locations, or to dump sites (which are not necessarily sweeping routes), for example.

Sweeping has the opportunity to improve timely record keeping.

Without Data Analysis to Optimize Operational Efficiency and Effectiveness, Excessive Debris May Be Entering San Diego's Waterways

Despite a detailed record keeping process, Street Sweeping has not developed a plan to use data to analyze operations. According to Street Sweeping, in April of FY18, it began using the City's new Enterprise Asset Management system (EAM) to assign scheduled sweeps (work orders) and record measures of operations via computer tablets. However, due to concerns about EAM's reliability in the field, motor sweeper operators continued to use paper worklogs simultaneously with EAM to record route completion information through FY20. Our audit reviewed data for FY19, when Street Sweeping staff recorded data in EAM and manually on the daily activity logs. Even with the transition to EAM, Street Sweeping has not yet established a plan to use the data in a timely manner to evaluate operations. According to Street Sweeping, they have discontinued use of the worklogs in FY21.

Not reviewing and analyzing aggregate street sweeping measures in a timely manner may result in dedicating staff and equipment to sweeping routes with less debris. Consequently, Street Sweeping may dedicate comparatively fewer resources to routes with greater debris, thereby decreasing the effectiveness of operations. Ultimately, establishing a plan to use data to monitor and adjust operations accordingly could help Street Sweeping minimize the amount of debris entering our waterways.

Street Sweeping Could Use Data to Optimize Operational Effectiveness with the Assistance of Other City Departments and Data Reliability Testing

Street Sweeping is at the onset of planning how to use EAM to collect and extract operational information for analysis. Street Sweeping uses EAM to record metrics of operations and assign scheduled sweeps (work orders) to staff via computer tablets. According to Street Sweeping, to date, all work orders are integrated into EAM and the system can generate reports for any data entered in EAM. In FY19, although Street Sweeping had the capability to pull reports in EAM, supervisors were still learning the full reporting aspects of the software.

Although capturing information in a database system is important, it is just as important to ensure that this system

has the ability to produce dependable outputs. For instance, after reviewing the FY19 consultant spreadsheet, our office found the Street Sweeping analysis for the FY19 annual Jurisdictional Runoff Management Plan (JRMP) report understated the total miles swept by 20,547 curb miles. The JRMP report's analysis includes the total miles swept within each watershed, as all sweeping activities within a watershed reduce the amount of debris that flow into the stormwater system, according to TSWD. The FY19 JRMP report states miles swept were 71,386 miles in FY19. However, after our office analyzed the consultant's data, we found that Street Sweeping swept a total of 91,933 curb miles in FY19.[8] This discrepancy indicates Street Sweeping needs to ensure that its quality control process is working with the new data collection system—EAM.

Furthermore, pulling the data from the existing EAM reports can be difficult and may require assistance from the Department of IT and other departments. For example, we found that EAM does not link the number of miles swept to a particular route; it only shows the number of miles swept that the motor sweeper operator recorded on a particular day. Without this ability, Street Sweeping will not be able to calculate the total miles swept on a particular route.

According to Street Sweeping, it is working with the Department of IT to help it link sweeping information with particular routes in EAM and to create reports showing these outputs. Street Sweeping is also working the Department of IT to create reports in EAM that will help compile metrics for the annual JRMP report. Additionally, we spoke with the Performance and Analytics Department and it is willing to help Street Sweeping extract and analyze this data for future use.

A reliability assessment is particularly important as efforts are underway to configure EAM to generate data for the FY21 annual JRMP report. Should Street Sweeping rush or skip a data reliability review of the data entered into EAM in FY21,

[8] TSWD's FY20 budget records the total miles swept at 91,836 miles.

the data may be ultimately unreliable and therefore, not useful. Street Sweeping states that it plans to review the data in the first quarter of FY21, to check data validity.

To minimize the impact on current resources, Street Sweeping could look to the Department of IT and the Performance and Analytics Department to assist with streamlining EAM data extraction and creating appropriate and useful reports to aid analyzing street sweeping metrics and evaluating current operations. Working alongside these two City departments, Street Sweeping has an opportunity to conduct timely evaluation of operations and making prompt adjustments to operations for improvements.

Recommendation 1 The Transportation and Stormwater Department Stormwater Division (SWD) should develop a periodic report, generated no less than annually (via a Business Objects report from EAM), to capture data necessary to analyze operations. SWD should work with the Department of Information Technology to create reports in EAM to extract sweeping information, such as tonnage or volume of debris and other meaningful measuring points or data which can be reported from EAM. (Priority 2)

Finding 2: Street Sweeping Should Optimize Its Use of Best Practices When Prioritizing Routes and Sweeping Frequencies

Finding Summary

As discussed in Finding 1, the Transportation and Stormwater Department's (TSWD) Street Sweeping Section's (Street Sweeping's) manual data collection process and limited reporting mechanisms in EAM have hindered Street Sweeping from analyzing the data it collects on its operations. This has resulted in Street Sweeping's inability to make timely adjustments to components such as sweeping priorities, frequencies, and posted routes, thereby limiting Street Sweeping's potential to reduce, to the greatest extent possible, the amount of pollutants entering the City of San Diego's (City's) waterways. As a result, we found that some routes with relatively high amounts of debris are swept less frequently than optimal, while at the same time, other routes with relatively low amounts of debris are swept at a higher than optimal frequency. This likely reduces the total amount of street sweeping debris collected.

To collect more debris, Street Sweeping's priority levels should be better aligned with debris volume on each route. To maximize the benefits as well as efficiency of street sweeping, best practices recommend that route priorities and sweeping frequencies are based on debris volume and proximity to water sources. Additionally, routes should be posted with no-parking signs in the most problematic areas to increase the sweeper's access to the curb. Street Sweeping's Jurisdictional Runoff Management Plan (JRMP) designates routes by three priority levels—high, medium, low—that are based on debris volume; each priority level has a corresponding sweeping frequency. However, based on our review of Street Sweeping's priority criteria, we found:

- Street Sweeping's priority levels could be better aligned with debris volume criteria. Average debris per mile is the most accurate measure of route of route debris,

but Street Sweeping does not use this measure to plan route priorities. Several routes with low debris per mile are designated as high priority while others with high debris per mile are designated as low priority.

- Route priority levels and sweeping frequencies do not necessarily correlate with debris volume.
- Enhanced sweeping in some watershed areas does not appear to be prioritized. Watershed areas with priority pollutants targeted for removal– Los Peñasquitos and Tijuana River – have several routes with high debris per mile that are designated as low priority. Additionally, regenerative-air sweepers are underused in these areas.
- Street Sweeping needs to maximize the effectiveness of its posted routes and should consider selectively adding posted routes. Furthermore, there are either few or no posted routes in the Los Peñasquitos and Tijuana River watershed areas – areas that have priority pollutants targeted for removal and several high debris routes.
- Route priorities and sweeping frequencies have not been updated in approximately five years. According to TSWD, comprehensive assessment of the street sweeping program along with all other stormwater programs occurs approximately every five years, in conjunction with municipal permit (National Pollutant Discharge Elimination System permit) renewal cycle. However, delays in the current renewal cycle may mean that routes will not be updated for nearly seven years.

Although routes changes have been made over time, likely as a result of staff observations and community input, they have not been adjusted using data that will allow for a global analysis. In fact, as TSWD stated in our exit conference, priorities were based on existing frequencies at the time of the last reassessment of the sweeping program in 2015; they were not based on debris volume data. Rather, the priorities are related to sweeping frequencies which are based on historical anecdotal knowledge of the volume and debris across the City.

Using data to analyze operations can help Street Sweeping prioritize its resources to become as effective as possible to remove debris from City's streets and to protect our waterways. With current staffing levels, Street Sweeping can use the data to shift its priorities and resources to increase the effectiveness of its operations.

We recommend that TSWD develop and document a process to review route priorities to determine if any route sweeping priorities need adjusting based on management analysis of debris collection data and staff input of results. Data should be assessed annually to determine if any operational issues need to be addressed. Comprehensive review of the street sweeping program should occur for the next permit cycle for FY22 and with each subsequent permit cycle or as frequently as possible. After completing the FY22 program assessment, the TSWD should request budget approval to selectively add posted routes and make any other operational changes.

Debris Volume Is an Important Measurement in Determining Route Sweeping Priorities

Removing the greatest amount of debris possible from the City's streets is critical to preventing pollutants from entering the City's waterways. Route debris comprises fine sediments that are known to contain elevated levels of pollutants such as metals, pesticides, and other organic chemicals of concern. Therefore, removing the most debris possible—and developing sweeping priority levels and frequencies using debris volume–is imperative.

Best practices recommend using debris volume collected as a measurement to prioritize routes that should be swept more frequently. There are three ways to measure debris: motor sweeper operators' observation, debris per route, and debris per mile.

Motor sweeper operators' feedback can identify the level and type of debris on the routes. We reviewed their worklogs and found that heavy or bulky debris was a top reason why routes were not completed, followed by equipment problems. Additionally, motor sweeper operators' feedback was used to corroborate conclusions in Street Sweeping's pilot study on machine effectiveness. Although observations from motor

sweeper operators are informative and can be used to adjust routes, their observations should be used in conjunction with data analysis to ensure an accurate picture of operations and determine the opportunities Street Sweeping has to balance operations.

Based on our analysis of debris measurements, we found that average debris per mile is a more accurate measure of route dirtiness than total debris collected per route.

Average Debris Collected Per Mile Is a More Accurate Measure of a Route's Dirtiness

Total debris volume collected per route is one measurement used to determine a route's dirtiness. However, this measurement may be misleading and does not reflect sweeping efficiency. Our observations show that routes vary in miles swept and that the number of miles swept does not necessarily correlate with the amount of debris collected. **Exhibit 14** below shows highlighted examples—routes 1B, 5C, 311, and 1A—where the route miles swept is dissimilar, but the amount of debris collected is the same or almost the same. This means that the relative efficiency of sweeping each of these routes varies widely—for example, Route 1A had to be swept for 1,839 miles to collect roughly the same amount of debris that was collected on Route 5C in less than half of that distance.

Exhibit 14

Top Ten Routes with Highest Debris Volume Collected Per Route, FY19

Route Number	Curb Miles Swept Per Route	Debris Collected Per Route ($yrds^3$)
8C	1,744	577
1C	1,921	561
2C	2,595	505
303	1,509	461
1D	1,535	442
1B	1,344	389
5C	**886**	**379**
311	1,114	378
1A	1,839	378
3J	1612	366

Source: TSWD Street Sweeping FY19 Data

Using average debris per curb mile (debris per mile) swept provides a better comparison of debris volume collected on a route, and the relative efficiency of sweeping particular routes more or less frequently.[9] Because route lengths vary from 1 mile to 62 miles, a measurement of debris per mile swept is a more accurate measurement to determine a route's dirtiness. The California Water Board supports this calculation: "One way to determine the areas that should be swept more frequently is to collect data on the total volume or weight of materials collected per mile of road swept. *Use this data to prioritize areas to be swept more frequently* [italics ours]." Indeed, Street Sweeping stated that it also supports using this measurement.

Exhibit 15 below shows the top ten routes with the highest debris per mile.[10] Comparing the routes between the exhibits, we clearly see the dirtier routes. Additionally, we see that only one route, 5C (in bold), appears in both tables.

[9] This measurement is based on curb miles swept.

[10] We calculated debris per mile by dividing the total debris collected per route by the number of miles swept per route. For all 215 routes, debris per mile ranged from 0.077 to 0.923. However, we based our analysis on routes with greater than or equal to 118 miles swept, to remove the outliers and reduce the possibility of skewing the data. The range for routes with greater than or equal to 118 miles swept was 0.142 to 0.912. This methodology is used for all further data analysis reported in this finding.

Exhibit 15

Top Ten Routes with Highest Debris Per Curb Mile, FY19

Route Number	Curb Miles Swept by Route	Debris Collected Per Route ($yrds^3$)	Debris Per Curb Mile
2R	221	202	0.91
2N	221	178	0.80
8E	604	293	0.49
608	149	68	0.45
5C	**886**	**379**	**0.43**
621	133	56	0.42
2P	216	90	0.42
606	123	51	0.41
2Q	283	117	0.41
618	124	51	0.41

Source: TSWD Street Sweeping FY19 Data

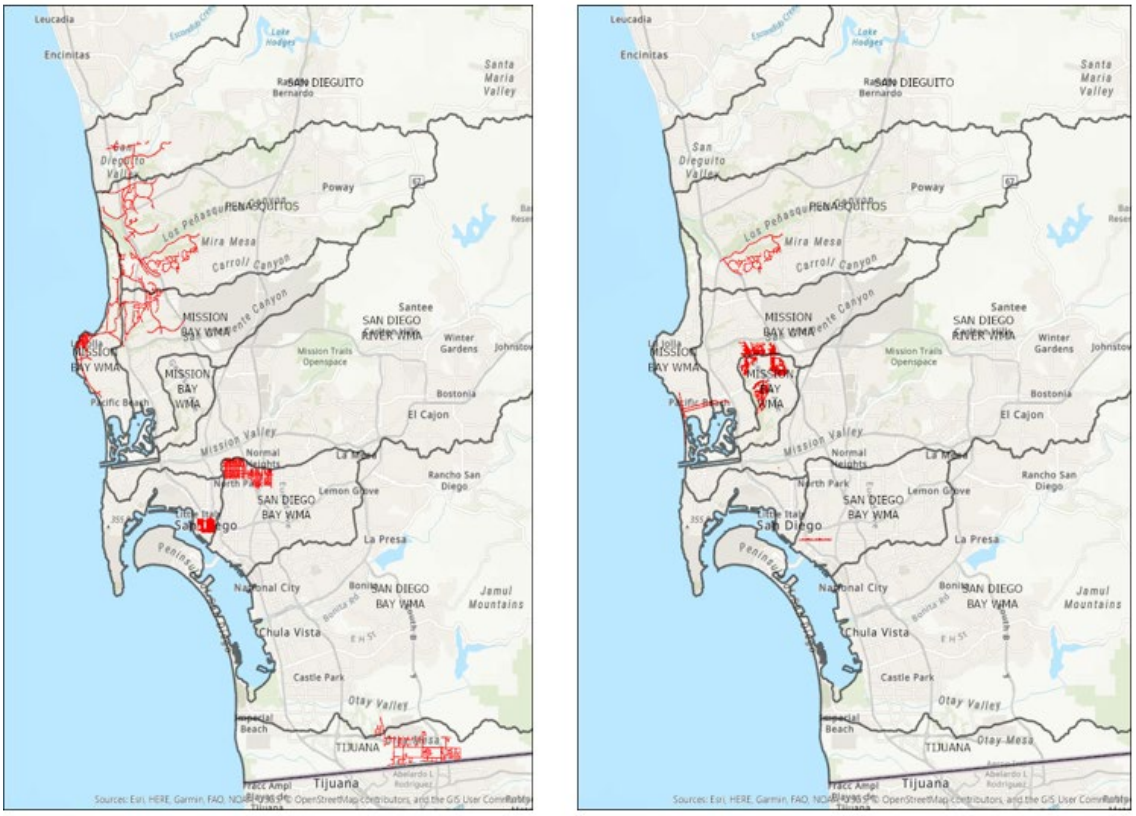
Comparing the two tables as maps in **Exhibit 16** below provides a visual idea of where these routes are located. Map A shows that the routes with the highest total debris volume per route appear scattered throughout the watershed areas (San Diego Bay-Chollas Creek, Mission Bay, Los Peñasquitos, and San Dieguito) whereas the routes with the highest average debris per mile in Map B appear to be more concentrated in the Mission Bay watershed area.[11] Together, these maps and tables show how using a different measurement to calculate debris volume is critical in deciding how to align operations to target the dirtiest areas. Therefore, we use debris per mile in our subsequent analysis.

[11] Chollas Creek is part of San Diego Bay. However, TSWD splits up San Diego Bay into two watershed areas: San Diego Bay and San Diego Bay-Chollas Creek.

Exhibit 16

Comparing Routes with Highest Debris Per Volume to Routes with Highest Debris Per Curb Mile

Map A: Top Ten Routes with Highest Debris Volume Per Route	Map B: Top Ten Routes with Highest Debris Per Curb Mile



Source: OCA generated based on FY19 sweeping data from TSWD. Image generated from ArcGIS.

Debris Volume Collected Per Mile Could Be Better Aligned with Street Sweeping's Priority Criteria

Using debris volume to assign priority levels and corresponding sweeping frequencies to manage operations is important for efficiency and to ensure that greatest removal of debris. Street Sweeping has assigned all 215 routes a priority level and a corresponding sweeping frequency, in accordance with the Jurisdictional Runoff Management Plan's (JRMP's) priority system. According to the JRMP, route priority levels are based on debris volume.

However, we found that debris volume does not align with route priority criteria. We reviewed the 86 routes with the highest debris per curb mile and found that only 18 routes are designated as high priority routes.[12] In fact, as shown in **Exhibit 17,** the majority of these routes (47) are designated as low priority. The map in **Exhibit 18** shows the distribution of these routes throughout the City, with most concentrated in the Mission Bay and San Diego Bay-Chollas Creek watershed areas.

Exhibit 17

Majority of 86 Routes with High Debris Per Curb Mile Are Designated as Low Priority

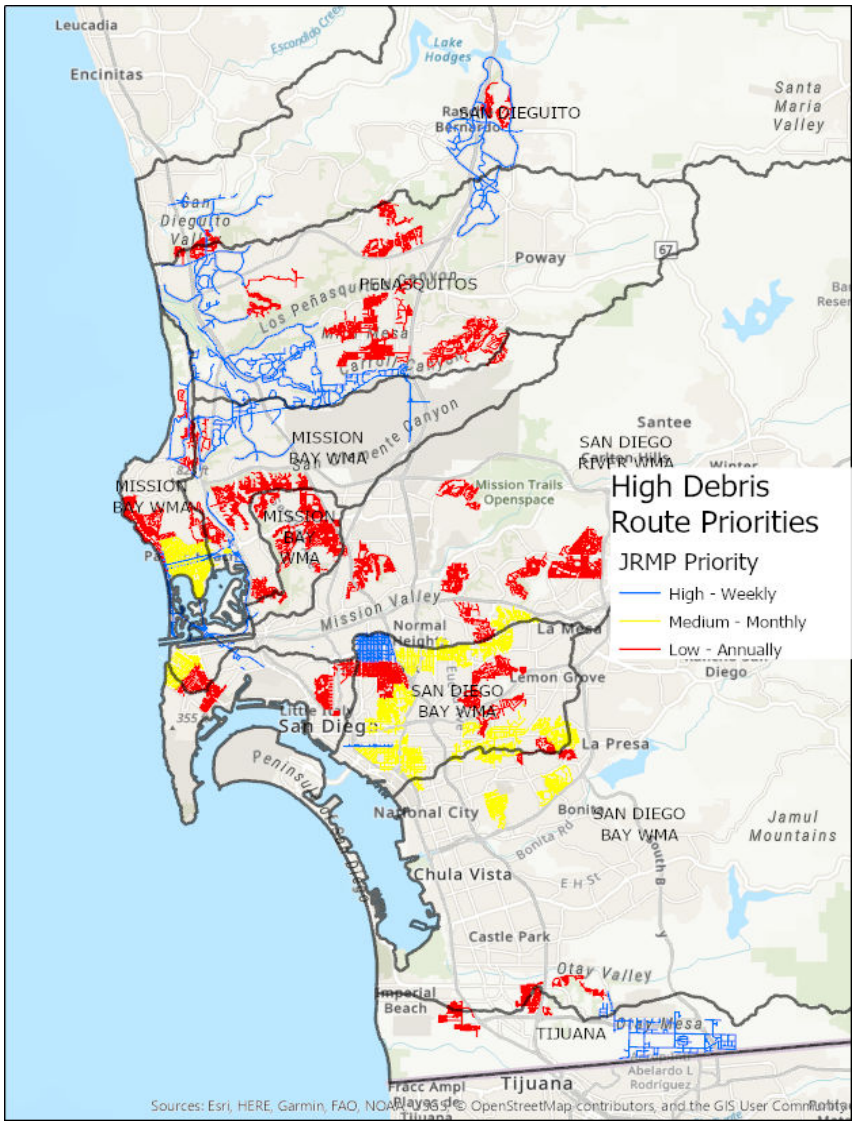
Priority Level			
High	**Medium**	**Low**	**Total**
18	21	47	86

Source: TSWD Street Sweeping FY19 Data

[12] These routes have debris levels above the median of 0.29.

Exhibit 18

A Majority of the 86 Routes with High Debris Per Mile Are Classified as Low Priority



Source: OCA generated based on FY19 data from TSWD. Image generated from ArcGIS.

Conversely, many routes with low debris per mile are classified as high priority. We reviewed the 43 routes with low debris per mile and found that the majority of the routes (34) are high priority.

Exhibit 19

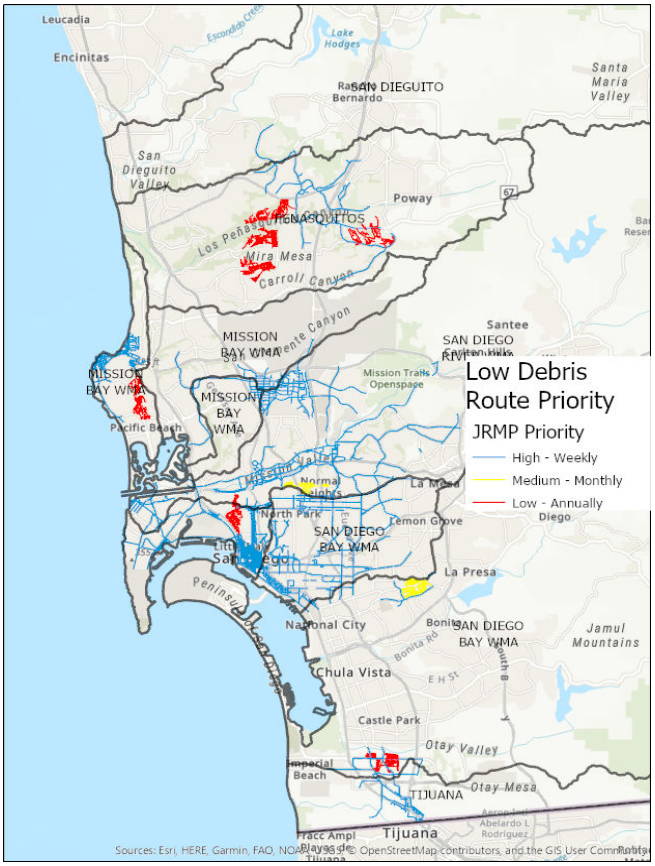
43 Routes with Low Debris Per Curb Mile Are Primarily Designated as High Priority

Priority Level			
High	**Medium**	**Low**	**Total**
34	2	7	43

Source: TSWD Street Sweeping FY19 Data

Exhibit 20

43 Routes with Low Debris Per Curb Mile Are Mostly High Priority



Source: OCA generated based on FY19 data from TSWD. Image generated from ArcGIS.

As shown in the Exhibits 19 and 20 above, many routes' debris levels do not correlate with their respective priority levels. In fact, the priority level is often opposite what it should be (i.e., high priority route with low debris). As a result, Street Sweeping may be deploying its resources inefficiently and not removing the greatest debris possible from the City's streets,

and more debris may end up in the City's waterways. This highlights the importance of aligning priority levels with average debris per mile to ensure that sweeping occurs more frequently in the dirtiest areas.

Street Sweeping Should Prioritize Sweeping in Watershed Areas with High Priority Pollutants

In addition to aligning street sweeping priorities with average debris per curb mile, Street Sweeping should also prioritize enhanced sweeping in areas where certain pollutants have been targeted for reduction. Street Sweeping has identified in its comprehensive load reduction plans that sweeping enhancements should only be considered for those watersheds with metals load reduction requirements. Enhanced sweeping includes type of equipment used and frequency of sweeping. Because street sweeping is more effective at removing metals (e.g., copper, zinc) and sediment than bacteria, Street Sweeping has identified three watershed areas with these pollutant types where enhanced sweeping is recommended—Los Peñasquitos, Tijuana River, and San Diego Bay-Chollas Creek. Best practices support prioritizing routes based on debris volume per mile; they also support increased sweeping frequencies in special problem areas or areas with high pollutant loadings.

However, we found that sweeping in Los Peñasquitos and Tijuana River watershed areas is not prioritized. Comparing debris with route priorities in these two watershed areas, many routes with high debris are designated as low priority. Specifically, of the 86 routes with high debris in our sample, 11 of 17 of Los Peñasquitos routes are designated as low priority (see **Exhibit 21** below). Two of three of Tijuana River's high debris routes are also designated as low priority. Because most of these routes are designated as low priority, they also have lower planned sweeping frequencies.

Exhibit 21

86 Routes with High Debris Per Mile by Watershed Area

Watershed	Priority			Total Routes
	H	M	L	
Los Peñasquitos	6		11	17
Mission Bay	8	2	13	23
San Dieguito	1		1	2
San Diego Bay		3	4	7
San Diego Bay - Chollas	2	13	6	21
San Diego River		3	10	13
Tijuana	1		2	3
Total	18	21	47	86

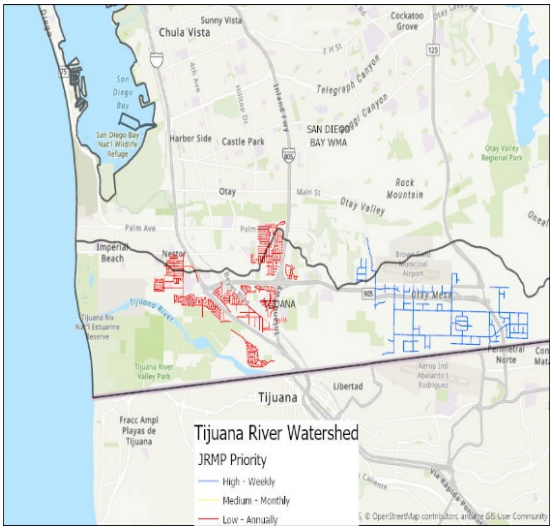
Source: TSWD Street Sweeping FY19 data.

Exhibits 22 and 23 below show examples of low priority routes with high debris in these watershed areas.

Exhibit 22

Majority of Routes in the Tijuana Watershed Area are Low Priority and Have High Debris

Route	JRMP Priority	FY19 Debris per Curb Mile
800	Low	0.29
801	Low	0.34
804	Low	0.32
806	Low	0.33
8A	High	0.19
8C	High	0.33

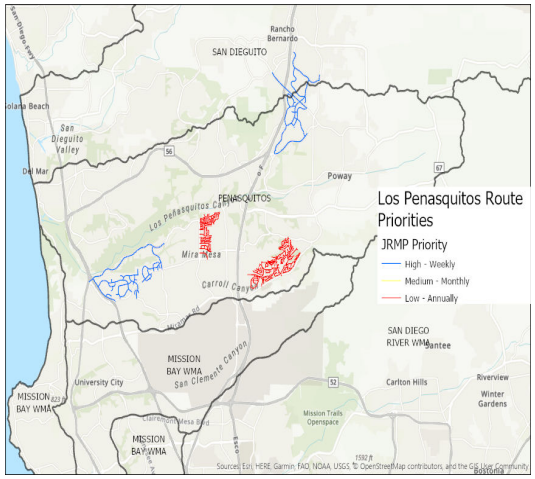


Source: TSWD Street Sweeping FY19 data. Image generated from ArcGIS.

Exhibit 23

Many Routes in the Los Peñasquitos Watershed Area are Low Priority and Have High Debris

Route	JRMP Priority	FY19 Debris per Curb Mile
5C	High	0.43
510	Low	0.39
508	Low	0.38
5F	High	0.37
507	Low	0.36



Note: This is snapshot of some of the 37 routes in the Los Peñasquitos watershed area.

Source: TSWD Street Sweeping FY19 data. Image generated from ArcGIS.

Regenerative-Air Sweepers Should Be Used More Often in Two Watershed Areas

Although Street Sweeping uses both mechanical and regenerative-air sweepers in these areas, best practices state that regenerative-air sweepers are best at removing sediment and fine metals. In FY19, we found that regenerative-air sweepers were used to sweep 23 and 26 percent of the Los Peñasquitos and Tijuana River watershed areas, respectively. In San Diego Bay-Chollas Creek, regenerative-air sweepers were used to sweep 42 percent of the streets. Citywide, regenerative-air sweepers are used for 27 percent of sweeping. Therefore, regenerative-air sweepers should be used more often in Los Peñasquitos and Tijuana River watersheds.

Using data can help Street Sweeping to determine whether certain routes in these watershed areas should be swept more frequently. Data can also help Street Sweeping shift its resources—using regenerative-air sweepers in key watershed areas over mechanical sweepers—to be more effective at removing debris. Data can also help Street Sweeping determine whether its enhanced efforts in these areas are successful.

Sweeping Frequencies Should Be Based on Debris Volume Data

There is a sweet spot for sweeping frequency. Therefore, frequency should be based on debris per mile swept and other factors such as proximity to water sources, to ensure that efforts and resources are used most effectively as demonstrated below. [13]

Based on our analysis of routes with high and low debris per mile and priority level, frequencies can be adjusted to account for debris volume. For example, sweeping frequencies for some routes in the San Diego Bay-Chollas Creek watershed area could be shifted to other routes with low frequency and high debris. **Exhibit 24** below compares routes in the San Diego Bay-Chollas Creek watershed area that have high frequencies, low debris with other routes that have low frequencies and high debris. Sweeping frequencies can be

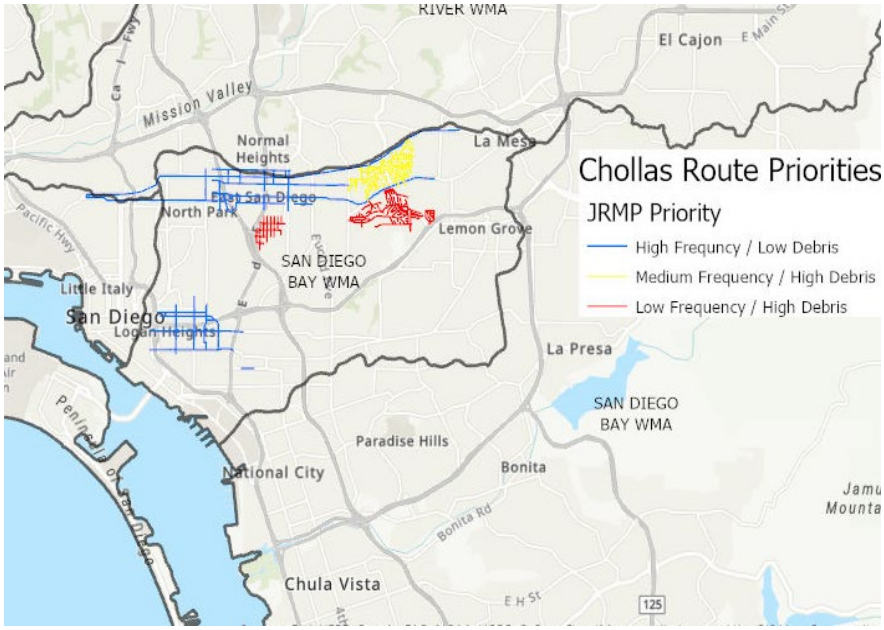
[13] According to TSWD, they consider all streets in the watershed to be in the proximity of the water source.

shifted from routes 8F, 3J, and 3F to focus on routes 310, 701, and 702.

Exhibit 24

Some Routes with Low Debris in San Diego Bay-Chollas Creek Watershed Are Swept More Frequently than Planned & Some Routes with High Debris Are Swept Less Frequently than Planned

Route	JRMP Priority	Planned Frequency Annual	Actual Frequency	Debris per Curb Mile
8F	High	52	91	0.15
3J	High	52	86	0.20
3F	High	52	86	0.23
310	Low	6	4	0.43
701	Medium	12	9	0.36
702	Low	6	4	0.33



Source: TSWD Street Sweeping FY19 Data. Image created using ArcGIS.

Data can help determine optimal sweeping frequencies based on debris and other criteria. Sweeping too frequently, especially on routes with low debris, is ineffective and uses resources (staff and equipment) that could be spent sweeping other routes with high debris. It ultimately reduces the

potential amount of debris that is removed from City streets. Our analysis shows that using data can help Street Sweeping identify streets like those in our example and shift resources (staff and equipment) to focus on areas with high debris.

Street Sweeping Should Maximize the Effectiveness of Its Posted Routes and Selectively Add More Posted Routes

Restricted parking with no-parking signs (posted routes) is a highly effective street sweeping best practice. It increases sweeper access to the curb, results in higher debris removal (over 50 percent more) according to Street Sweeping's pilot study, is more cost efficient, and has a significant positive impact on water quality. Best practices also state that routes should be posted in problematic areas to obtain the greatest benefit. Although 24 percent of the City's 215 routes are posted, we observed that some improvements can be made in this area.

To increase the effectiveness of posted routes, they should align with the JRMP priority levels. Of the City's 51 posted routes, however, most (25) are designated as medium priority (see **Exhibit 25** below).

Exhibit 25

Posted Routes and Priority Levels

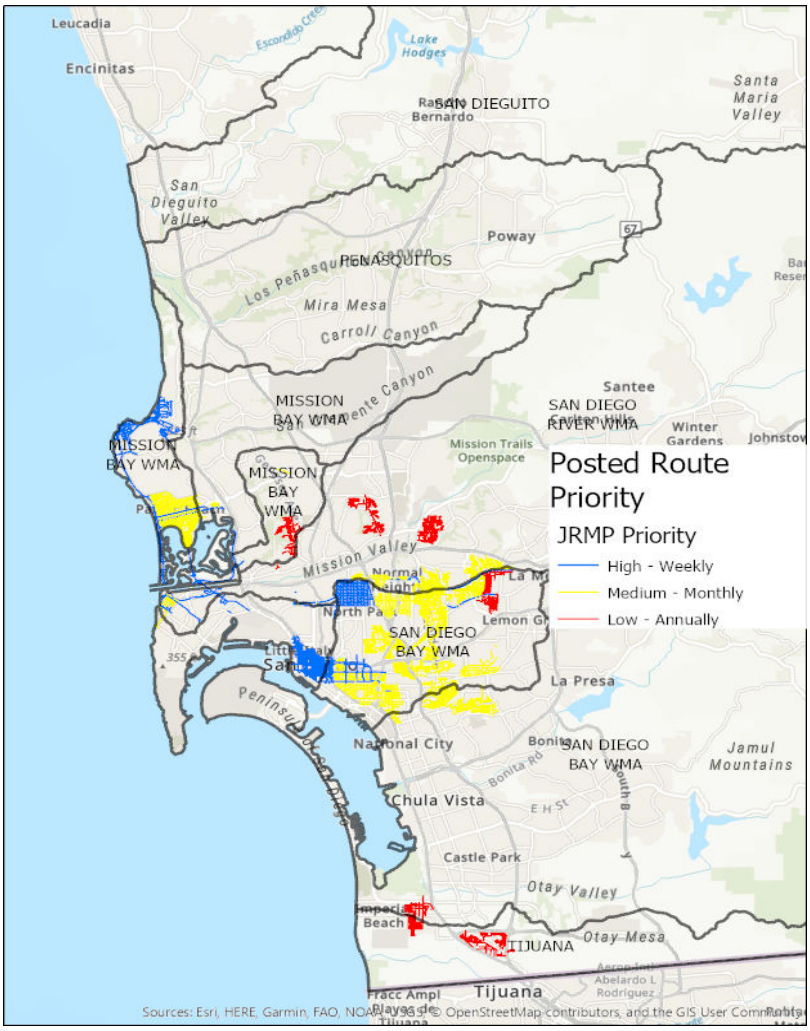
Priority Level	# of Routes	# of Miles	# Posted Routes	% Total Routes	Posted Miles	% Total Miles
High	61	78,244	20	9%	17,638	16%
Medium	40	11,620	25	12%	7,268	7%
Low	114	17,142	6	3%	669	1%
Totals	**215**	**107,006**	**51**	**24%**	**25,575**	**24%**

Source: TSWD Street Sweeping FY19 Data

Posted routes are also concentrated in the Mission Bay and San Diego Bay-Chollas Creek watershed areas, as shown in **Exhibit 26**.

Exhibit 26

Posted Routes Are Concentrated in Mission Bay and San Diego Bay-Chollas Creek Watershed Areas



Source: OCA generated based on FY19 data from TSWD. Image generated from ArcGIS.

To establish posted routes and the proper priority level of some posted routes, these routes should account for debris volume. For example, of the 86 high debris routes we reviewed, a majority (64) are not posted and 47 are designated as low priority. Posting some of these routes and changing their priority levels could increase the sweeper's effectiveness and remove more debris from the City's streets.

The Los Peñasquitos and Tijuana River watershed areas would benefit from the addition of posted routes and changes in priority levels of some routes. Although Los Peñasquitos has 37 routes, several that are designated as low priority and have high debris, it does not have any posted routes. Similarly, the Tijuana River watershed area has a total of six routes, five of which have high debris. Four of the high debris routes are designated a low priority. Again, posting and adjusting priority levels in these areas can increase the sweeper's effectiveness.

Posted Routes Are an Effective Tool for Removing Debris

Ideally, according to Street Sweeping, all routes should be posted to obtain the maximum effectiveness from street sweeping. However, community and political influences drive the decision-making process. According to Street Sweeping, adding posted routes in the past has been met with considerable backlash from communities. Residents may feel burdened to move their cars during sweeping days, especially in neighborhoods where parking is already limited. Additionally, Street Sweeping states that adding posted routes requires budget approval to cover initial first-year costs that involves staff working with other departments, filling new parking enforcement staff positions, getting new equipment, posting of the new signs (materials and labor), and initial public outreach and flyering. According to TSWD, posted routes become cost neutral after the second year. Lastly, Street Sweeping has not added posted routes since the beginning of managed competition in 2012 as part of maintaining Council's approved level of service at that time and throughout the managed competition period. Now that managed competition has ended, Street Sweeping can consider adding posted routes.

In lieu of posting all routes, Street Sweeping can increase the benefit of its currently posted routes by adjusting sweeping frequencies as appropriate based on debris level. Data can help determine which routes are good candidates for increased frequencies by analyzing the debris volume. For example, ten posted routes with high debris are swept below their required frequencies. Adjusting these frequencies gains an immediate and tangible benefit. Street Sweeping can also

consider selectively adding posted routes based on assessment of route priority criteria including debris level and watershed areas with high priority pollutants.

According to Street Sweeping, posted routes and priorities do not necessarily have to correlate because the JRMP does not dictate postings. For example, there are several areas of the City, some of which may have high debris, that cannot be posted, such as bike lanes. Although streets with red curbs cannot be posted, they behave like posted routes by virtue of the red curb that prohibits parking at any time; these streets allow greater access to the curb. Barring these kinds of restrictions, posting routes based on debris and priority is a best practice that makes sense.

Timely Data Evaluation and Operational Adjustments Are Important to Manage Program Performance

Ensuring the street sweeping program's effectiveness requires timely data evaluation, and making operational adjustments based on that data assessment. Going too long without assessment and adjustment risks ineffective program operations.

According to the Transportation and Stormwater Department (TSWD), it manages the stormwater program from a systemwide watershed approach where street sweeping is one of many tools that it uses to manage water quality and flood control across the City. Additionally, TSWD manages all assets within its program using the systemwide approach to ensure that the most critical assets are prioritized. All of TSWD's planning and operations elements are integrated to deliver water quality and flood management outcomes; hence, no one section's work or strategy can be implemented successfully without the others, and decisions cannot be made siloed. Therefore, TSWD regularly reviews Stormwater Division programs for innovation, efficiency, and performance during each five-year municipal permit (National Pollutant Discharge Elimination System permit) cycle.[14]

[14] The National Pollutant Discharge Elimination System permit applies to owners and operators of municipal separate storm sewer systems (MS4s). This permit is issued by the California Regional Water Quality Control Board, San Diego Region, for a five-year term.

TSWD states that analyzing street sweeping data and adjusting operations accordingly between permit cycles conflicts with its systemwide, five-year program management approach. According to TSWD, events like heavy rainfall and major construction projects can skew data for a year. Furthermore, integrating efficiencies—such as changing sweeping frequencies, evaluating noise impacts, posting new or updating no-parking signs, and changing sweeper types—crosses all aspects of the stormwater program. Therefore, according to TSWD, an integrated management approach is appropriate, and adjusting operations between permit cycles would not be efficient due to the amount of resources required to re-prioritize routes.

Street Sweeping Routes Should Be Re-Evaluated Periodically During Each Permit Cycle

An intermediate analysis between permit cycles, however, can be an appropriate time to reevaluate street sweeping data. Due to the length of each permit cycle, an intermittent analysis between permit cycles is both appropriate and feasible. Although the municipal permit is technically renewed every five years, in practice the timeframe is longer. The current permit, last issued in 2013, expired in 2018. According to TSWD, routes may have been last reassessed in 2015 when the permit was amended. The California Regional Water Quality Control Board, San Diego Region (Board) says it plans to issue the next permit by the end of 2021. Once the permit is issued, it then typically takes approximately one year to update the JRMP, which is when street sweeping priorities are re-evaluated. Thus, if TSWD waits for the JRMP update to adjust routes, the routes will not be updated for over two years from now—or approximately seven years since their last update in 2015.

Given the long time between updates, we believe it is reasonable to conduct a trend analysis with each subsequent permit cycle or as frequently as possible. The permit allows programmatic changes as long as the City notes these changes either in the Water Quality Improvement Plan annual report or in the report of waste discharge (every five years) to the Board. Furthermore, the City's JRMP gives TSWD the flexibility to change sweeping frequencies when needed, noting that

some areas may be swept less frequently in exchange for more frequent sweeping of targeted areas. In our discussion with the Board, it noted that beyond being simply allowed, the Board would encourage permittees to make such data-driven adjustments as needed to improve effectiveness. Therefore, TSWD should consider reassessing its street sweeping program at minimum in accordance with the next permit cycle and future cycles or as frequently as possible.

Recommendation 2 The Transportation and Stormwater Department Stormwater Division (SWD) should develop and document a process to review route frequencies to determine if any route sweeping priorities need adjusting based on management analysis of debris collection data and motor sweeper operator input of results. (Priority 3)

a. The review process should include an annual assessment of operational adjustments to determine if any near-term modifications are needed for items such as missed or incomplete routes, newly implemented cycle tracks, new development or seasonal variability.

b. In FY22, SWD should analyze data from FY19-FY21 for a comprehensive reassessment of all route frequencies, priorities, posting designations, staffing for shifts, sweeper types, and debris removal to ensure that these elements correlate with one another and that they account for debris levels and watershed areas. Reallocation of resources/staff should be based on this trend analysis and incorporated into the MS4 Permit cycle to focus on sweeping areas with high debris and that are in watershed areas with high priority pollutants.

c. A trend analysis should be conducted at a minimum with each subsequent permit cycle or as frequently as possible. When changes are made outside of the permit cycle and Jurisdictional Runoff Management Plan (JRMP) renewal period, the changes should be communicated to the California Regional Water

Quality Control Board, San Diego Region, via the annual JRMP report.

Recommendation 3 After completing the FY19–FY21 program assessment in Recommendation 2, the Transportation and Stormwater Department Stormwater Division should request budget approval to selectively add posted routes and make any other improvements identified to optimize watershed areas with high priority pollutants and/or high debris. (Priority 3)

Finding 3: Street Sweeping Should Establish More Meaningful Performance Measures to Monitor and Evaluate Operations Over Time

Finding Summary

Performance measures help guide and gauge an organization's success, especially in relation to meeting the organization's goals, mission, and purpose. The Transportation and Stormwater Department's (TSWD) Street Sweeping Section's (Street Sweeping's) current key performance indicator (KPI)—annual miles swept—does not reflect the effectiveness at achieving its purpose, removing debris and sediment from City of San Diego's (City's) streets. Additionally, Street Sweeping has kept the same target number of annual miles swept, even though it has not met this goal in the past four fiscal years. Attention should be placed at choosing appropriate performance metrics, because these metrics help guide and gauge an organization's success. Furthermore, the evaluation of results is integral to effectively use performance metrics.

Street Sweeping would benefit from additional annual performance measures, such as total debris collected and percent of miles or routes completed, as used by other California jurisdictions. They provide a more complete picture of Street Sweeping's overall performance, especially if it monitors trends over time. We recommend Street Sweeping add annual debris volume collected and percent of planned miles completed to its KPIs.

Street Sweeping's Key Performance Indicator Does Not Fully Reflect the Effectiveness of Sweeping Operations

The main impetus to sweep the City's streets is to remove as much debris and hazardous waste products as possible before entering the stormwater system and the City's bodies of water, yet the current KPI does not directly correlate with maximizing the amount of debris collected. Maximizing the amount of debris sweepers can collect from City streets directly impacts residents, as the pollutants contained in stormwater runoff

can kill native vegetation and make San Diego's recreational areas unsafe.

According to the American Society for Quality, organizations should place great attention at choosing appropriate performance measures, because these measures help guide and gauge an organization's success. Moreover, performance measures need to provide useful information to demonstrate the success and/or quality of operations, in relation to the organization's goals, mission, and purpose. Presently, Street Sweeping's KPI does not reflect the effectiveness of sweeping operations.

The current KPI—annual miles swept—establishes a quantifiable level of sweeping to occur, but it does not encourage prioritizing streets with the greatest amounts of debris. Currently, Street Sweeping could hypothetically sweep the exact same 10 streets for eight hours a day, throughout the entire year and meet their annual goal. These 10 streets would have high levels of cleanliness; however, the remaining City streets would stay untouched with high amounts of debris entering the stormwater system. Therefore, the Street Sweeping should reexamine its KPI to align better with its primary purpose, to remove the most debris possible from City streets.

Street Sweeping Should Adjust Its Annual Miles Swept Key Performance Indicator to a More Realistic Target

Street Sweeping has maintained the same goal of sweeping 117,000 miles annually, even though it has not met this goal in the past four years, as shown in **Exhibit 27** below.

Exhibit 27

City of San Diego Transportation & Stormwater Department's Performance Measure for Street Sweeping

San Diego Street Sweeping Section Performance Measure				
Key Performance Indicator (KPI):	**FY17 Target: 117,000**	**FY18 Target: 117,000**	**FY19 Target: 117,000**	**FY20 Target: 117,000**
Miles of streets swept annually*	FY17 Actual: 106,172	FY18 Actual: 112,500	FY19 Actual: 91,836	FY20 Actual: 93,028

*According to Street Sweeping, miles swept represents curb miles.

Source: OCA generated from TSWD's FY19 and FY20 Adopted Budgets

The American Society for Quality describes how performance measures help guide and gauge an organization's success. Key success factors are only useful if they are acknowledged and tracked. Importantly, organizations' measurements must carefully ensure that they ask the right questions. In other words, organizations should carefully choose and track the right measurement(s). Additionally, should an organization not meet the established measures, it signals that management should make changes in activities, or the target goal, based on an assessment of results.

Street Sweeping's KPI target of 117,000 miles is not a realistic target. As discussed above, Street Sweeping has not met this goal for the past four fiscal years. Based on our review of street sweeping data, we found several reasons for incomplete routes. Primarily, staff could not complete routes because of heavy debris, followed by equipment problems and then staffing issues. Therefore, a more realistic target

should be set to account for reasons why routes may not be completed.

Street Sweeping may also benefit from distinguishing special sweeps within their KPI. The current KPI comprises of planned route sweeping and special sweeps. Planned sweeping accounts for scheduled street sweeping throughout the year. If Street Sweeping sweeps all streets as planned, they will sweep a total of 107,006 miles within one fiscal year. Special sweeps encompass sweeping in response to residents' Get It Done requests as well as sweeping City department's facilities.

Specifically, in FY19, Street Sweeping swept a total of 91,933 curb miles, of which 9,222 miles were special sweeps. Special sweeps in FY19 included the accumulated miles sweeping the San Diego County Credit Union Stadium's extensive parking lot throughout the year. Due to the sale of the property, the Street Sweeping will likely no longer be requested to sweep the parking lot throughout FY21. Therefore, the mileage of special sweeps could decrease in FY21 but will allow regularly planned routes to be swept. Consequently, excluding special sweeps in the annual miles swept KPI could assist Street Sweeping in analyzing the amount of time spent on planned sweeping.

Street Sweeping Can Look to Other Jurisdictions for More Meaningful Performance Measures

Street Sweeping does not have processes for analyzing operations and therefore it has not identified other KPIs for measuring performance. While they report other metrics in the annual JRMP report, it has not prioritized comparing these metrics on a periodic basis. Other jurisdictions in California use performance measures that better align with the street sweeping's purpose: remove the most debris possible from city streets. **Exhibit 28** details the performance measures used by other California jurisdictions.

Exhibit 28

Other California Jurisdictions Street Sweeping Performance Measures

Jurisdiction	Performance Measure
City of Los Angeles, CA	**Percent of posted sweeping routes completed**
San Jose, CA	1)Number of curb miles swept **2)Tons of sweeping debris collected**
Long Beach, CA	**Tons of debris diverted**
Glendale, CA	**1)Total tons of street sweeping refuse collected** 2)Curb miles of streets swept
City of Santa Barbara, CA	Sweep 90 percent of the established commercial and residential sweeping route annually

Source: OCA based on review of other jurisdictions' budget documents.

The performance measures in bold above focus on the total debris collected and/or prioritizing sweeping posted routes. These performance measures provide annual metrics that reinforce best practices: concentrating on sweeping the dirtiest streets. Adding a KPI that reflects total debris collected can encourage Street Sweeping to prioritize sweeping routes with the highest debris levels. This prioritization aligns with the guidance of the City's JRMP and the California State Water Board, that note route sweeping frequencies should be based on debris volume.

An annual total debris collected KPI would also facilitate Street Sweeping's ability to track debris volume in the aggregate over time, helping determine if current enhanced sweeping operations in the dirtiest areas are effective. Adopting a KPI centered on debris removal can help Street Sweeping focus on reducing the most pollutants from our waterways, thereby having a positive impact on the community.

Some cities, like Los Angeles and Santa Barbara, use annual completion rates with a goal to complete a specific percentage of posted routes and residential/commercial routes,

respectively. Adding a similar metric for percent of planned route miles swept will show the rate at which Street Sweeping completes its planned annual sweeping mileage goal. Assuming the scheduled/planned routes encompass the dirtiest and high priority streets, a completion rate tracks whether sweeping on these routes is completed and if improvements are needed when sweeping falls short of the goal. Tracking the completion rate over time may help Street Sweeping address any performance issues that may arise if completion rates fall below desired levels.

Monitoring the trends of annual debris volume collected and percent of planned miles completed can help Street Sweeping make operational adjustments to improve program effectiveness, based on the assessment of results. Therefore, to improve the meaningfulness of Street Sweeping's performance measures, we have made the following recommendation:

Recommendation 4

The Transportation and Stormwater Department Stormwater Division (SWD) should incorporate the following adjustments to their performance measures:

a. Create a target for planned annual miles swept that excludes special sweeps and anticipated typical operational limitations (such as winter or seasonal restrictions); and add this as a performance measure to track total mileage and percent of miles completed, and;

b. Add an annual key performance indicator for annual debris volume collected using the same unit of measurement as the annual Jurisdictional Runoff Management Plan report. (Priority 3)

Conclusion

Stormwater is an essential resource that serves our City's (City of San Diego) waterways—streams, rivers, and ocean. However, pollutants that enter our waterways can kill wildlife and vegetation. Therefore, stormwater pollution prevention is essential to keeping our waterways clean.

Street sweeping is an integral part of stormwater pollution prevention and one of the most effective tools the Transportation and Stormwater Department has to reduce the flow of debris (i.e., trash, litter, organic materials) and sediment (i.e., metals) into our waterways. Although the department's Street Sweeping Section (Street Sweeping) has made several improvements to its street sweeping program over the years, including sweeping medians and increasing the use of regenerative-air sweepers in watershed areas, some programmatic changes can improve the program's effectiveness.

Street Sweeping's transition to EAM provides an opportunity to monitor operations and make timely program adjustments to capture data necessary to analyze operations. Additionally, Street Sweeping can use the data to align its route priorities and sweeping frequencies based on debris volume. Using debris volume data can inform Street Sweeping on where to adjust sweeping frequencies, add posted routes, and determine where to increase the use of regenerative-air sweepers or assess these sweepers' effectiveness in watershed areas with high priority pollutants. Furthermore, modifying Street Sweeping's key performance indicator to exclude special sweeps from planned sweeps and adding a performance measure for percent of miles completed will help Street Sweeping monitor its performance and make operational adjustments to improve program effectiveness. Lastly, adding a performance measure to capture the total debris collected each year will also help determine if current sweeping operations in the dirtiest areas are effective.

Regular assessments of the street sweeping program are important to ensuring the program's effectiveness, both operationally and environmentally. Therefore, we made recommendations to review and monitor the program using EAM data, perform annual assessments of operational adjustments to determine if new changes are necessary, and comprehensively reassess the sweeping program using a trend analysis that is to be incorporated—at minimum—into the next municipal permit cycle for FY22 and each subsequent cycle or as frequently as possible. With these improvements, the City's street sweeping program will continue to lead the industry.

Recommendations

Recommendation 1 The Transportation and Stormwater Department Stormwater Division (SWD) should develop a periodic report, generated no less than annually (via a Business Objects report from EAM), to capture data necessary to analyze operations. SWD should work with the Department of Information Technology to create reports in EAM to extract sweeping information, such as tonnage or volume of debris and other meaningful measuring points or data which can be reported from EAM. (Priority 2)

Recommendation 2 The Transportation and Stormwater Department Stormwater Division (SWD) should develop and document a process to review route frequencies to determine if any route sweeping priorities need adjusting based on management analysis of debris collection data and motor sweeper operator input of results. (Priority 3)

a. The review process should include an annual assessment of operational adjustments to determine if any near-term modifications are needed for items such as missed or incomplete routes, newly implemented cycle tracks, new development or seasonal variability.

b. In FY22, SWD should analyze data from FY19–FY21 for a comprehensive reassessment of all route frequencies, priorities, posting designations, staffing for shifts, sweeper types, and debris removal to ensure that these elements correlate with one another and that they account for debris levels and watershed areas. Reallocation of resources/staff should be based on this trend analysis and incorporated into the MS4 Permit cycle to focus on sweeping areas with high debris and that are in watershed areas with high priority pollutants.

c. A trend analysis should be conducted at a minimum with each subsequent permit cycle or as frequently as possible. When changes are made outside of the

permit cycle and Jurisdictional Runoff Management Plan (JRMP) renewal period, the changes should be communicated to the California Regional Water Quality Control Board, San Diego Region, via the annual JRMP report.

Recommendation 3 After completing the FY19–FY21 program assessment in Recommendation 2, the Transportation and Stormwater Department Stormwater Division should request budget approval to selectively add posted routes and make any other improvements identified to optimize watershed areas with high priority pollutants and/or high debris. (Priority 3)

Recommendation 4 The Transportation and Stormwater Department Stormwater Division (SWD) should incorporate the following adjustments to their performance measures:

a. Create a target for planned annual miles swept that excludes special sweeps and anticipated typical operational limitations (such as winter or seasonal restrictions); and add this as a performance measure to track total mileage and percent of miles completed, and;

b. Add an annual key performance indicator for annual debris volume collected using the same unit of measurement as the annual Jurisdictional Runoff Management Plan report. (Priority 3)

Appendix A: Definition of Audit Recommendation Priorities

The Office of the City Auditor maintains a priority classification scheme for audit recommendations based on the importance of each recommendation to the City, as described in the table below. While the City Auditor is responsible for providing a priority classification for recommendations, it is the City Administration's responsibility to establish a target date to implement each recommendation, taking into consideration its priority. The City Auditor requests that target dates be included in the Administration's official response to the audit findings and recommendations.

Priority Class[15]	Description
1	Fraud or serious violations are being committed. Significant fiscal and/or equivalent non-fiscal losses are occurring. Costly and/or detrimental operational inefficiencies are taking place. A significant internal control weakness has been identified.
2	The potential for incurring significant fiscal and/or equivalent non-fiscal losses exists. The potential for costly and/or detrimental operational inefficiencies exists. The potential for strengthening or improving internal controls exists.
3	Operation or administrative process will be improved.

[15] The City Auditor is responsible for assigning audit recommendation priority class numbers. A recommendation that clearly fits the description for more than one priority class shall be assigned the higher priority.

Appendix B: Audit Objectives, Scope, and Methodology

In accordance with the Office of the City Auditor's Fiscal Year (FY) 2020 Audit Work Plan, we conducted a performance audit of the City of San Diego's (City) Transportation and Stormwater Department's Street Sweeping Section (Street Sweeping). The overall objective of this audit was to determine whether Street Sweeping has processes in place, following industry best practices or other established criteria, to evaluate and prioritize street sweeping routes and schedules.

Objectives

Determine whether TSWD has processes in place, following industry best practices or other established criteria, to evaluate and prioritize street sweeping routes and schedules.

Methodology

- Reviewed relevant street sweeping policies, procedures, and sweeping schedules.
- Reviewed local, state, and federal stormwater regulations such as the San Diego Municipal Code, the National Pollutant Discharge Elimination System Permit, and the Clean Water Act.
- Reviewed the City's stormwater plans and reports, including: Jurisdictional Runoff Management Plan and annual FY19 report, Comprehensive Load Reduction Plans, Water Quality Improvement Plans, Watershed Asset Management Plan, and Street Sweeping Pilot Studies I-V.
- Reviewed street sweeping best management practices from the following organizations: City of San Diego, California Stormwater Quality Association, California State Water Board, US Environmental Protection Agency, and US Department of Transportation.
- Interviewed and accompanied motor sweeper operators on ride-alongs to observe street sweeping activities in real time.
- Interviewed Street Sweeping staff about how they use technology (EAM, GPS) to track sweeping activities.

- Reviewed TSWD's consultant contracts.
- Interviewed Street Sweeping management about their practice of capturing measuring point data on paper worklogs and in EAM.
- Requested and reviewed fiscal year 2019 sweeping data to determine the number of posted routes, priority level of each route, planned sweeping miles vs. actual sweeping miles for each route, debris collected per route, debris collected per mile, and route completion rates.
- Used ArcGIS to map routes onto watershed areas.
- Interviewed the Performance and Analytics Department to determine its ability to help TSWD with annual sweeping data analysis.

Determine whether street sweeping resources are used effectively according to prioritization of street sweeping needs.

- Reviewed TSWD's sweeping data (daily sweeping events) from FY19 to determine average debris collected per mile for each route, sweeping frequencies based on debris per mile and posted route, and whether enhanced sweeping occurs in watershed areas with high priority pollutants.
- Performed data reliability on TSWD's FY19 sweeping data. From a population of 5,918 daily sweeping events in a spreadsheet, selected a statistical sample size of 259 data entries using a 90 percent confidence interval. Obtained the underlying worklogs for these entries and matched the worklogs with the data entries to ensure validity.
- Using data, reviewed whether current sweeping frequencies could be shifted based on best practices identified in our first objective.
- Reviewed staffing levels to determine staffing adequacy.
- Benchmarked TSWD's street sweeping key performance indicator with other cities, including Los

Angeles, Santa Barbara, Glendale, San Jose, and Long Beach.

- Reviewed TSWD's budgets for Street Sweeping and Parking Enforcement sections.
- Reviewed TSWD's FY19 service level agreements and memorandums of understanding with other City departments.

Internal Controls

The internal controls were evaluated to determine if Street Sweeping exercised oversight responsibility, enforced accountability, selected and developed control activities, developed controls over technology, used relevant information, conducted ongoing and/or separate evaluations, and evaluated and communicated deficiencies pertaining to the administration of the street sweeping program. Our findings, conclusions and recommendations are included in the audit report.

Compliance Statement

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.

THE CITY OF SAN DIEGO

M E M O R A N D U M

DATE: September 11, 2020

TO: Kyle Elser, Interim City Auditor

FROM: Kris McFadden, Director, Transportation & Stormwater Department

SUBJECT: Management Response to Performance Audit of the Transportation and Stormwater Department's Street Sweeping Section

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The purpose of this memorandum is to provide Management's response to the Audit Report titled "Performance Audit of the Transportation and Stormwater Department's Street Sweeping Section." The Audit's primary objective was to determine whether the Street Sweeping Section has processes in place (follows industry best practices or other established criteria) to evaluate and prioritize street sweeping and schedules.

The Transportation and Stormwater Department (TSW) manages the stormwater program with a systemwide watershed approach where street sweeping is one of the many tools that are used to achieve the program goals of improving water quality and managing flood control across the City. The Department manages all assets within its program using this systemwide approach to ensure that the most critical assets and programs are prioritized, and resources are used most efficiently. All of TSW's planning and operations elements are integrated, and each section's work contributes to the overall stormwater program success. Accordingly, changes to any one element of this integrated approach must be considered within the broader context of the overall stormwater program.

In 2012 TSW implemented the Most Efficient Government Organization's (MEGO) technical and management approach to street sweeping due to Managed Competition. This MEGO was based on the 2012 Council-approved level of service and did not incorporate any additional resources for efficiencies and enhancements.

The Stormwater Division regularly reviews each section's work for innovation, efficiency, and performance to ensure program goals and compliance requirements are achieved. Since 2008, the Street Sweeping Section dedicated resources to implement five pilot studies to optimize street sweeping efficiency including: 1) street sweeping frequencies; 2) machine technology; 3) median sweeping; 4) speed efficiency; and 5) posted routes with limited parking. The results of these studies were program optimization recommendations that were substantially implemented for City-wide water quality and community benefits. All of these program updates have resulted in long-term program efficiencies.

The Audit Report provided recommendations to improve the effectiveness and efficiency of the City's Street Sweeping Section which substantially align with the Division's long-term commitments to adaptive management and program success. Below are the Department's responses to the Audit Recommendations.

Recommendation #1: The Transportation and Stormwater Department Stormwater Division (SWD) should develop a periodic report, generated no less than annually (via a Business Objects report from EAM), to capture data necessary to analyze operations. SWD should work with the Department of Information Technology to create reports in EAM to extract sweeping information, such as tonnage or volume of debris and other meaningful measuring points or data which can be reported from EAM. (Priority 2)

Management Response: Management agrees with this recommendation. The Street Sweeping Section will coordinate with the Department of Information Technology to establish a standardized report that can be generated for consistent assessment of performance measures. The report will be generated annually in the first quarter of each fiscal year for the prior fiscal year, and it will be utilized as part of the program assessment identified in Recommendation #2. **Target Implementation Date: September 2021.**

Recommendation #2: The Transportation and Stormwater Department Stormwater Division (SWD) should develop and document a process to review route frequencies to determine if any route sweeping priorities need adjusting based on management analysis of debris collection data and motor sweeper operator input of results. (Priority 3)

a) The review process should include an annual assessment of operational adjustments to determine if any near-term modifications are needed for items such as missed or incomplete routes, newly implemented cycle tracks, new development or seasonal variability.
b) In FY22, SWD should analyze data from FY19-FY21 for a comprehensive reassessment of all route frequencies, priorities, posting designations, staffing for shifts, sweeper types, and debris removal to ensure that these elements correlate with one another and that they account for debris levels and watershed areas. Reallocation of resources/staff should be based on this trend analysis and incorporated into the MS4 Permit cycle to focus on sweeping areas with high debris and that are in watershed areas with high priority pollutants.
c) A trend analysis should be conducted at a minimum with each subsequent permit cycle or as frequently as possible. When changes are made outside of the permit cycle and Jurisdictional Runoff Management Plan (JRMP) renewal period, the changes should be communicated to the California Regional Water Quality Control Board, San Diego Region, via the annual JRMP report.

Management Response: Management agrees with this recommendation. A standard operating procedure (SOP) will be established to define the annual assessment of potential operational adjustments and the multi-year trend analysis. The SOP will include use of the standardized report established in Recommendation #1. The FY19-FY21 analysis is targeted for completion by December 2021 utilizing this SOP. Results of the FY19-FY21 and subsequent future assessments will be used to inform SWD staff input in future MS4 Permit updates and negotiations with the Regional Water Quality Control Board. Operational changes will likely require resources that are not identified; per Recommendation #3, future budget requests will be made accordingly and will compete with future General Fund priorities. **Target Implementation Date: December 2021.**

Recommendation #3: After completing the FY19-FY21 program assessment in Recommendation 2, the Transportation and Stormwater Department Stormwater Division should request budget approval to selectively add posted routes and make any other

improvements identified to optimize watershed areas with high priority pollutants and/or high debris. (Priority 3)

Management Response: Management agrees with this recommendation. Results of the FY19-FY21 assessment will be used as the basis for the development of a budget request to add posted routes or other improvements which will compete with future general fund priorities. **Target Implementation: June 2022.**

Recommendation #4: The Transportation and Stormwater Department Stormwater Division (SWD) should incorporate the following adjustments to their performance measures:

a) Create a target for planned annual miles swept that excludes special sweeps and anticipated typical operational limitations (such as winter or seasonal restrictions); and add this as a performance measure to track total mileage and percent of miles completed, and;
b) Add an annual key performance indicator for annual debris volume collected using the same unit of measurement as the annual Jurisdictional Runoff Management Plan report. (Priority 3)

Management Response: Management agrees with this recommendation. **Target Implementation: June 2021.**

We appreciate the opportunity to provide comments and responses to this audit and thank the City Auditor's team for their cooperation and professionalism throughout the audit process. If there are any questions in this matter, please contact me at (619) 236-6595.

Kris McFadden
Director, Transportation & Stormwater Department

cc: Aimee Faucett, Chief of Staff, Office of the Mayor
Kris Michell, Chief Operating Officer
Andrea Tevlin, Independent Budget Analyst
Jeff Sturak, Assistant Chief Operating Officer
Johnnie Perkins, Deputy Chief Operating Officer, Public Utilities Branch
Ally Berenter, Program Manager, Office of the Mayor
Matthew Helm, Chief Compliance Officer
Drew Kleis, Interim Assistant Director, Transportation & Stormwater Department
Sumer Hasenin, Interim Deputy Director, Transportation & Stormwater Department
Bethany Bezak, Assistant Deputy Director, Transportation & Stormwater Department
Eddie Salinas, Program Manager, Transportation & Stormwater Department