

# 2024 High Risk Re-Review:

## Performance Audit of the City's Pothole Repair Operations

**APRIL 2024** | OCA-24-11

### Topic 1: Maximizing Resources

To increase the daily number of pothole repairs and reduce average response times, Transportation should aim to implement mapping software for pothole assignments and assess specific aspects of current activities to maximize staff productivity, such as when patch trucks are out for maintenance.

### Topic 2: Data Management

To more efficiently and accurately record pothole repairs, Transportation should provide crews with guidance on quantifying potholes, include IT controls to ensure all data is recorded, and require crews to only use paper forms in the field when necessary.

### Topic 3: Monitoring Performance

To improve Transportation's ability to monitor the performance of pothole operations, the department should implement an efficiency performance metric, evaluate the equity of operations across the City, and enter proactively repaired potholes in BlueWorx.

**Andy Hanau**, City Auditor

**Matthew Helm**, Assistant City Auditor

**Danielle Knighten**, Deputy City Auditor

**Kyle Elser**, Principal Performance Auditor

**Danielle Kish**, Performance Auditor

CITY OF SAN DIEGO



OFFICE of the CITY AUDITOR

## *independent. objective. accurate.*

The Office of the City Auditor is an independent office that reports to the City's Audit Committee. Our mission is to advance open and accountable government through independent, objective, and accurate audits and investigations that seek to improve the efficiency, effectiveness, and equity of City government.

The Office of the City Auditor would like to thank staff from the following departments and agencies for their assistance during this audit:

- Transportation Department
- Department of Information Technology GIS Team
- Fleet Operations Division



### CONTACT US:



Find past audit reports—and sign up to get future reports delivered to your inbox—on our website: [sandiego.gov/auditor](https://sandiego.gov/auditor)



[twitter.com/sdCityAuditor](https://twitter.com/sdCityAuditor)



[cityauditor@sandiego.gov](mailto:cityauditor@sandiego.gov)



619-533-3165



Report fraud, waste, or abuse in city operations through our fraud hotline: [866-809-3500](tel:866-809-3500)



600 B Street, Suite 1350, San Diego, CA 92101

# Re-Review of the 2013 Performance Audit of the City's Pothole Repair Operations

## Why OCA Did This Study

The abundance of potholes throughout the City of San Diego remains a primary concern for the public and City leadership. In 2013, the Office of the City Auditor (OCA) conducted an audit of the City's pothole operations. That audit issued four recommendations covering efficient deployment strategies, improved data management, and efficiency performance metrics. Since potholes are still a primary concern, we conducted a re-review audit of the City's pothole repair operations.

**The objective of this re-review is to determine the extent to which the Transportation Department (Transportation) is still implementing the identified (or similar) recommendations.**

## What OCA Found

The Transportation Department maintained implementation of most of the recommendations from the 2013 audit, but some efforts should be expanded or updated.

## Topic 1: Maximizing Resources

The 2013 audit found that the deployment of pothole crews could operate more efficiently. Our re-review found that while Transportation now aims to send the nine patch trucks to each of the nine Council Districts, **routing efficiency could be further improved.**

Assigning pothole requests in even closer geographic proximity would significantly improve the efficiency of operations. Mapping software could help assign pothole requests in closer proximity to each other, which would increase the number of potholes repaired and reduce the number of miles driven daily. By grouping pothole assignments in closer proximity for one day, we found that **potholes repaired could have increased by 27 percent and miles driven could have decreased by 40 percent.**

Furthermore, by responding to pothole requests more efficiently, Transportation could likely have more time to **proactively repair potholes, including in areas that do not request repairs as frequently as others.**

**Exhibit 7: In the Proximity Model, Crews Could Have Responded to 27% More Pothole Requests and Could Have Driven 40% Less Miles Compared to the Actual Work Completed on July 17, 2023**

	Actual 7/17/2023	Model 7/17/2023	Efficiency Improvement with Proximity Approach
Potholes and Pothole Requests Responded to	71	90	27% more potholes
Average Potholes Per Crew	11.8	15	27% more potholes
Total Miles Driven	417	248	40% less miles
Average Miles Per Truck	69	41	40% less miles

Source: OCA generated based on GIS model results, Daily Work Report forms, and BlueWorx pothole data.

Our re-review also found that **Transportation does not have enough patch trucks because they are frequently out for maintenance.** We found that four out of nine patch trucks were each out of service for repairs for more than 20 percent of a 15-month period.

When trucks are unavailable, all nine crews cannot be deployed to repair potholes, reducing the number of potholes that can be repaired with the program's \$3.95 million budget. **The addition of a backup patch truck for a one-time cost of about \$174,000 would substantially increase the number of potholes repaired** and decrease the average cost to repair a pothole.

We also found that a staffing analysis would allow Transportation to assess how to best utilize available staff when patch trucks are out for repairs as well as other staffing efficiencies.

## Topic 2: Data Management

The 2013 audit found issues with data entry and supervisor reviews of data. Our re-review found that the data entry forms now have separate fields for data points, such as potholes repaired and square footage of asphalt, and supervisors conduct a thorough review of the data entered.

We also found that while crews now record the data points on the paper forms as well as into the online platform, BlueWorx, **this process is time intensive and repetitive.** We also found that crews occasionally do not enter data points into BlueWorx, because the system does not require crews to enter all data points. Additionally, the supervisor conducts a daily time-intensive comparison review of paper forms against the data in the system, which limits the amount of time the supervisor can manage pothole operations in the field.

## Topic 3: Monitoring Performance

The 2013 audit found that an efficiency performance measure would help ensure that Transportation utilizes its resources in the most efficient manner. Our re-review found that Transportation implemented an efficiency KPI for one fiscal year, but it no longer uses an efficiency performance metric. **Transportation does not track or monitor efficiency metrics, such as the average number of pothole requests completed by each crew or by the department on a daily, weekly, or monthly basis.** Adding an efficiency metric would allow Transportation to determine if pothole operational resources are being utilized in an efficient manner and would help right-size the current daily goal of pothole requests for each crew.

We also found that **because pothole operations are based on public requests there could be inequity in pothole repairs across the City.** However, assessing the equity of pothole operations across the City is complex, due to the various factors that must be taken into consideration, such as: the frequency of pothole requests in each Council District, the condition of streets, the lane mileage in each Council District, as well as the mileage of heavy traffic streets (which tend to have more potholes).

We also found that crews have not consistently recorded proactively repaired potholes into BlueWorx, resulting in reports that do not include all pothole repairs. Notably Transportation stated it has begun to train staff on including entering proactively repaired potholes into BlueWorx.

## What OCA Recommends

We make 10 recommendations across the three re-review topics as described below:

**Topic 1 – Maximizing Resources:** Four recommendations to increase the efficiency of pothole operations, specifically for Transportation to: try to implement a mapping software for pothole repair assignments, emphasize the budget request for at least one additional patch truck, and conduct a staffing analysis to determine how to best maximize the productivity of available staff.

**Topic 2 – Data Management:** Three recommendations to strengthen the efficiency and accuracy of data collection, specifically for Transportation to: provide crews with guidance on quantifying potholes, include IT controls to ensure all data is recorded, and require crews to only use paper forms in the field when necessary.

**Topic 3 – Monitoring Performance:** Three recommendations to improve Transportation's ability to monitor the performance of pothole operations, specifically for Transportation to: implement an efficiency performance metric, evaluate the equity of pothole repair operations across the City, and enter proactively repaired potholes into BlueWorx.

Transportation agreed to implement all recommendations.

For more information, contact Andy Hanau, City Auditor, at (619) 533-3165 or [cityauditor@sandiego.gov](mailto:cityauditor@sandiego.gov).

# Table of Contents

**Background**.....1

## Overview

We found that Transportation has implemented most of the recommendations from the 2013 pothole repair audit, but some efforts should be expanded or updated. .... 8

## Topic 1: Maximizing Resources

To increase the daily number of pothole repairs and reduce average response times, Transportation should aim to implement mapping software for pothole assignments and assess specific aspects of current activities to maximize staff productivity, such as when patch trucks are out for maintenance. .... 9

    Current Status of Original 2013 Recommendation 3 ..... 9

    2024 Recommendations ..... 16

    New Issue: Patch trucks are frequently out for maintenance, which has impacted the number of potholes crews can repair daily. .... 17

    2024 Recommendations ..... 24

## Topic 2: Data Management

To more efficiently and accurately record pothole repairs, Transportation should provide crews with guidance on quantifying potholes, include IT controls to ensure all data is recorded, and require crews to only use paper forms in the field when necessary.....25

    Current Status of Original 2013 Recommendation 1 ..... 25

    2024 Recommendation ..... 28

    Current Status of Original 2013 Recommendation 2 ..... 29

    2024 Recommendations ..... 32



# Table of Contents Continued

## **Topic 3: Monitoring Performance**

To improve Transportation’s ability to monitor the performance of pothole operations, the department should implement an efficiency performance metric, evaluate the equity of operations across the City, and enter proactively repaired potholes in BlueWorx.....33

- Current Status of Original 2013 Recommendation 4 ..... 33
- 2024 Recommendation ..... 35
- New Issue 1: As pothole operations are based on public requests, there could be inequity in pothole repairs across the City. .... 36
- 2024 Recommendation ..... 38
- New Issue 2: Crews have not consistently recorded proactively repaired potholes in BlueWorx, resulting in reports that do not include all pothole repairs. .... 39
- 2024 Recommendation ..... 39

**Appendix A** Definition of Audit Recommendation Priorities ..... 40

**Appendix B** Audit Objectives, Scope, and Methodology ..... 41

**Appendix C** Methodology, Parameters, and Limitations of Theoretical Geographic Proximity Route Model ..... 44

**Appendix D** Management’s Response ..... 46



# Background

## The abundance of potholes across the City continues to frustrate San Diegans.

The abundance of potholes throughout the City of San Diego remains a primary concern for the public and City leadership. A 2023 Grand Jury Report focused on the inadequate conditions of the City's streets, while the most recent City of San Diego Resident Survey, from 2018, found that 60 percent of respondents felt dissatisfied with the condition and maintenance of City streets, which includes potholes. Moreover, Councilmembers have included pothole operations within their recent budget requests.

*Transportation has reported filling an average of 30,000–40,000 potholes annually.*

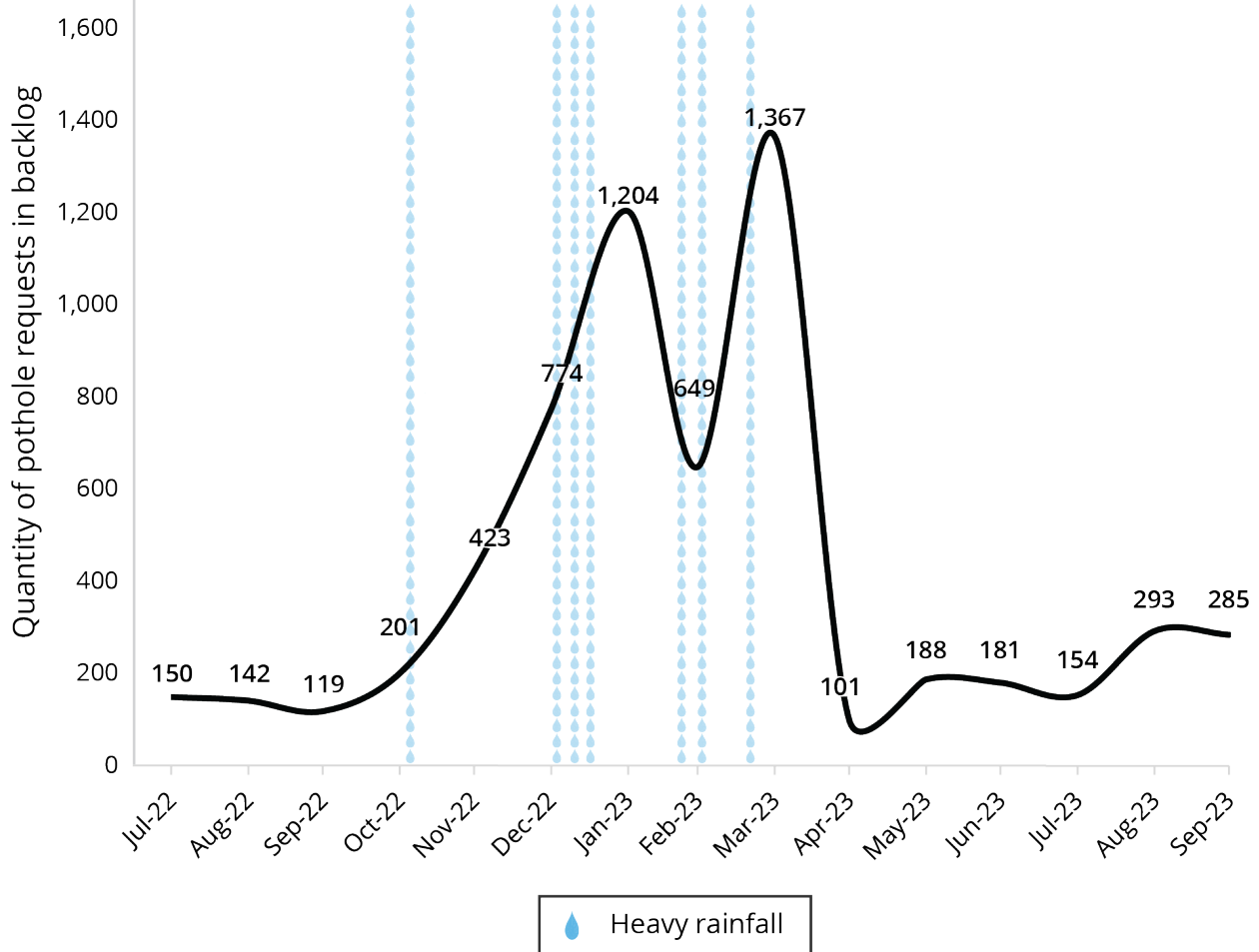
Furthermore, the continuously high number of pothole repair Get It Done requests shows the public's desire for pothole repairs across the City.<sup>1</sup> In fiscal year (FY) 2023, individuals submitted over 28,600 Get It Done requests for pothole repairs and Transportation has reported filling an average of 30,000–40,000 potholes annually.<sup>2</sup> Throughout FY2023, the number of pothole repair Get It Done requests frequently outpaced the capacity of the City's pothole operations, particularly after heavy rainfalls, as demonstrated by the continuous backlog of requests in the graph in **Exhibit 1**. When unprecedented rain fell during the winter of FY2023, the Mayor launched an "all hands-on deck" approach to pothole repairs to address the large increase of potholes caused by the heavy rainfall. While this required the diversion of resources from many of Transportation's other responsibilities, such as slurry seal and mill and pave work, the Mayor determined this was necessary to reduce the backlog in pothole repair requests.

1 The Get It Done platform is the City's primary service request intake channel for pothole repair requests.

2 Crews may proactively repair more than one pothole at the location of each request.

**Exhibit 1**

**The Number of the Pothole Repair Requests Frequently Outpaced the Capacity of Pothole Operations in FY2023, Particularly After Heavy Rainfalls**



Note: We define heavy rainfalls as three or more days in a row of rain.

Source: OCA generated based on Get It Done and performance data provided by the Transportation Department.

**Potholes can cause expensive damage to vehicles and pose a liability risk to the City.**

Potholes can damage residents’ vehicles and pose a liability risk for the City. Potholes can pop tires, damage the suspension, bend tie rods, throw off the car’s alignment, and damage rims. Potholes can also injure pedestrians and bicyclists. These repair and health bills can financially hurt the public, as AAA has reported repairing vehicle pothole damage costs on average over \$400. As for the liability risk to the City, in FY2017 through FY2021, one of the most frequent



public liability claims against the City was pothole claims. Since 2018, the City's public liability claims payouts due to injuries or damage to vehicles caused by potholes or road defects (such as deteriorated or missing asphalt, sunken trenches, or gaps between the asphalt and curb) totaled approximately \$2 million.

## Historical underfunding for the maintenance of the City's streets has contributed to the abundance of potholes.

*Historical underfunding for maintenance of the City's streets has contributed to the abundance of potholes across the City.*

The continuous historical underfunding for maintenance of the City's streets has contributed to the abundance of potholes across the City. The City's recently published Pavement Management Plan reports that the average annual investment for maintenance (\$19.8 million) and rehabilitation (\$26.6 million) has not been sufficient to maintain an average pavement condition at a satisfactory level. The Federal Highway Administration explains that as asphalt streets age and deteriorate, the need for street maintenance increases, but if funding does not keep up, entities must rely on more cost-effective road work, such as repairing potholes.

Additionally, the Office of the City Auditor's recently published Performance Audit of the City's Street Maintenance Program found that while the Transportation Department (Transportation) generally uses its limited resources effectively for street maintenance, the City continues to underfund its street maintenance program. Therefore, more and more streets fall into worse conditions, which require expensive and extensive repairs.

Additionally, the audit found that the street maintenance program has insufficient and unpredictable funding and that even recent efforts to increase funding are still not enough to address the approximately \$1.9 billion needed over the next 10 years (FY2025 to FY2034) to achieve the City's Pavement Condition Index score goal of 70.<sup>3</sup> The audit found that in the most realistic funding plans, the condition of the City's streets are likely to worsen, which would increase the number of potholes across the City and increase the demand on the City's pothole repair operations.

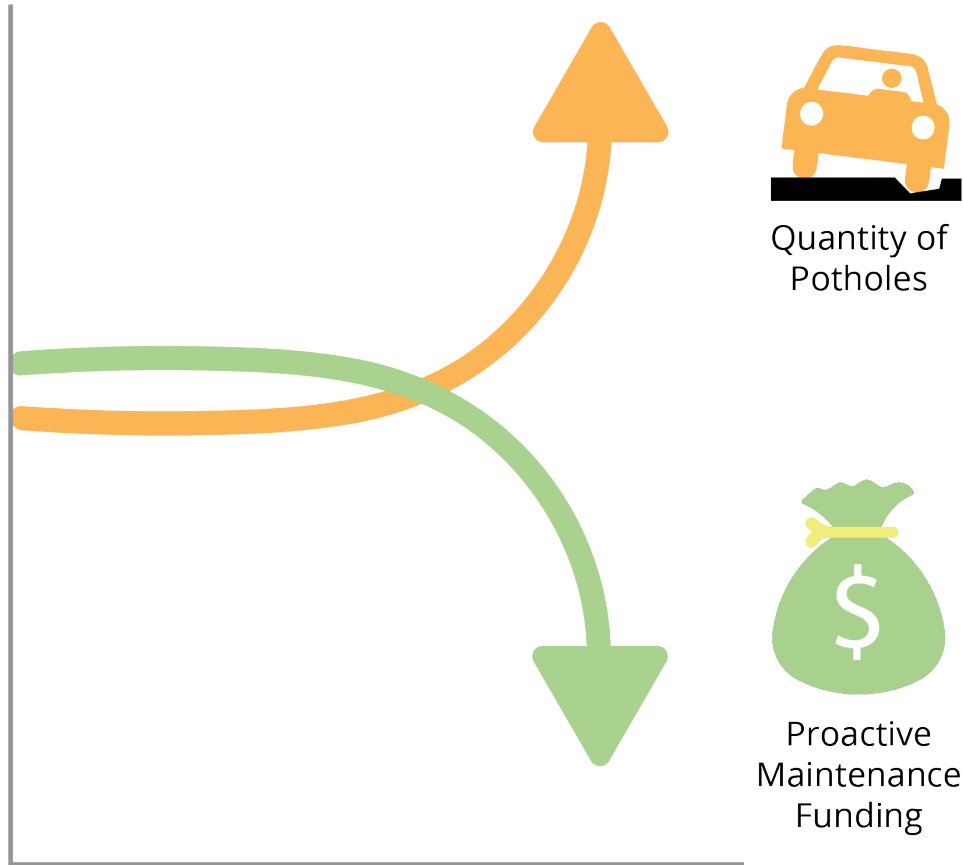
Therefore, when jurisdictions do not proactively maintain their streets, they must increasingly rely on pothole repairs to reestablish the integrity of the street. In FY2023, the City spent \$3.95 million on

<sup>3</sup> Pavement Condition Index scores represent the overall results of pavement condition assessments of streets.

pothole operations, which encompasses a supervisor and nine repair crews.<sup>4</sup> As demonstrated in **Exhibit 2**, the amount of funding for proactive street maintenance impacts the quantity of potholes in a jurisdiction.

*Exhibit 2*

**When Funding for Proactive Street Maintenance Is Insufficient, the Number of Potholes Across the City Generally Increases**



Source: OCA generated based on Federal Highway Administration Materials and Procedures Manual and the Transportation Department's 2024 Pavement Management Plan.

As pothole repairs remain a primary concern for both the public and City leadership, we conducted a High-Risk Re-Review audit of the City's Pothole Repair Operations, in accordance with the FY2024 Audit Work Plan.

<sup>4</sup> This \$3.95 million did not include personnel expenditures for other City staff during the all-hands approach to pothole operations during the winter of FY2023.

**In 2013, the Office of the City Auditor issued four recommendations for the City’s Pothole Repair Operations, all of which had been implemented as of April 2015.**

In FY2013, the Office of the City Auditor published the audit, Performance Audit of the Streets Division’s Pothole Repair Operations. The report focused on determining the accuracy and reliability of pothole operations’ operational data as well as analyzing the efficiency of pothole repair operations in the City. The audit found that data entry inaccuracies impeded the Street Division’s ability to accurately report key metrics and that Street Division’s pothole repair operations could increase efficiency of its operations. Specifically, the audit found that:

- The deployment strategy could be improved to operate more efficiently;
- Street Division was unable to determine the average response time to repair reported potholes due to data reliability issues;
- Other cities repair processes were similar to San Diego’s; and
- The number of requests for service differed by Council District.

*The FY2013 audit included four recommendations regarding improvements in data reliability and program efficiencies.*

The audit included four recommendations regarding improvements in data reliability and program efficiencies. Specifically, the audit recommended that Transportation should:

- Establish a regional deployment strategy to increase routing efficiency;
- Improve controls on data entry (particularly the date field) and evaluate data entry controls within Transportation’s data system;
- Standardize the data collection tool/process so each required data type has its own field, as well as implement a control for supervisory review of data entry; and
- Change its primary performance metrics to include a measure of production efficiency, such as a cost-per-pothole performance metric.

**The Transportation Department has improved the data collection process and has implemented changes to run pothole operations more efficiently.**

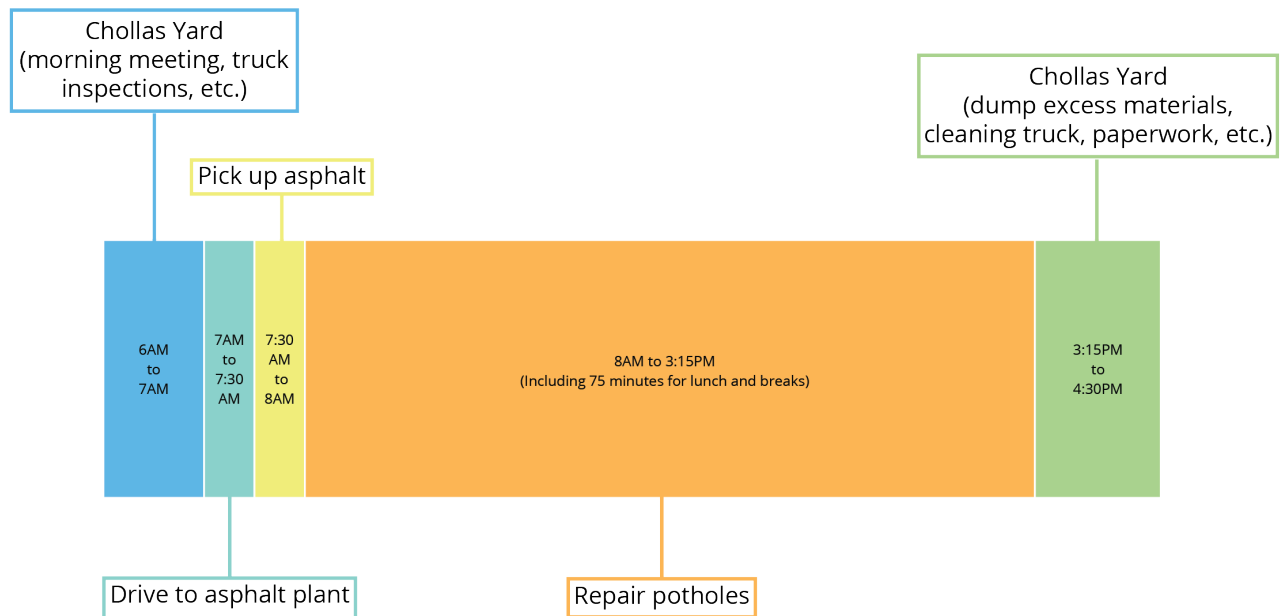
To ensure reliable data collection, patch trucks operators now enter pothole requests data into an online platform, BlueWorx, and on paper forms.<sup>5</sup> According to Transportation, the supervisor conducts a daily review of all data entered in the system and other Transportation staff conduct a second quality review check of the data.

<sup>5</sup> BlueWorx is an online platform for SAP, which is Transportation’s data system of record for pothole operations.

Furthermore, to increase productivity, Transportation has piloted a 4-day 10-hour work schedule for pothole crews. Patch truck operators must spend the start of each day picking up asphalt from the asphalt plant in Miramar. Therefore, the longer workday provides more time in the field for pothole crews to repair potholes. With the 10-hour workday, as shown in **Exhibit 3**, crews have an average of 6 hours to repair potholes in the field (excluding breaks and lunch). Alternatively, during the 8-hour workday, crews had about 4.5 hours to repair potholes. Therefore the 10-hour workday provides an additional 1.5 hours in the field per week per crew for a total of 13.5 additional hours in the field for all pothole operations.

**Exhibit 3**

**With the Switch to the 10-Hour Shift, Pothole Operations Crews Now Have 6 Hours a Day to Repair Potholes**



Source: OCA generated based on review of vehicle GPS records, BlueWorx pothole operations data, and pothole crews' daily paper forms.

Additionally, to help crews find reported potholes faster, Transportation and the Performance and Analytics Department added pothole location questions in Get It Done. Moreover, to identify and use the most durable cold patch asphalt, Transportation reported that it is testing various brands of cold patch asphalt on the same street to determine which brand provides the best quality repair over an extended period, to avoid redundant repairs.<sup>6</sup>

<sup>6</sup> Transportation stated that it generally uses cold patch asphalt when it rains because the chemicals used with hot patch asphalt will runoff into storm drains.

Furthermore, to improve the quality of the streets with the most frequent requests for pothole repairs, Transportation implemented its Hot Roads initiative to reduce the number of potholes on those streets. Alongside the Performance and Analytics Department, Transportation identifies which streets consistently have the highest number of potholes repaired. Transportation then schedules these streets for mill and pave, a more extensive street maintenance repair.

# Overview

***We found that Transportation has implemented most of the recommendations from the 2013 pothole repair audit, but some efforts should be expanded or updated.***

---

Due to the continued high risk experienced by the public and the City alike, OCA conducted a high-risk re-review of the recommendations set forth in the 2013 pothole repair audit. Based on our assessment of the current status of the recommendations, we now consider most recommendations as implemented with further improvements recommended due to emerging issues or the need for the City to update key steps.



3 Implemented with Further Improvements Recommended



1 Not Implemented

This report also encompasses some emerging risks, such as the availability of pothole repair trucks (patch trucks), equity of operations across the City, and including proactive repair work in operational reporting, that were not applicable or high-risk areas during the 2013 audit.

## **Navigating the High-Risk Re-Review**

This re-review evaluates four recommendations originally assigned in the 2013 audit. We found that these recommendations, and the emerging risks, fall within the three topics of: 1) maximizing resources; 2) data management; and 3) monitoring performance. Considering the City's upcoming budget constraints in the FY2025 budget, we have re-ordered the FY2013 audit recommendations to first discuss the areas in which Transportation could increase productivity with its existing resources, then discuss areas in which Transportation could improve data collection and performance monitoring.

Within each section, we provide the text of the original recommendation, followed by the current status, as well as any emerging risks not covered in the original 2013 recommendations. Finally, we provide updated recommendation(s) as necessary.


# Topic 1: Maximizing Resources

*To increase the daily number of pothole repairs and reduce average response times, Transportation should aim to implement mapping software for pothole assignments and assess specific aspects of current activities to maximize staff productivity, such as when patch trucks are out for maintenance.*

## Current Status of Original 2013 Recommendation 3

### Recommendation 3:

The Transportation & Storm Water Department Streets Division’s pothole repair group should implement a regional deployment strategy in order to reduce redundant trips to the same areas and systematically address pothole repair.

Original Implementation:	June 2014	Transportation adopted a regional deployment strategy to systematically address potholes.
 Current Status:	Implemented with Further Improvements Recommended	Transportation aims to deploy one patch truck per Council District (CD) daily, but trucks often work in multiple CDs as frequently trucks are out for maintenance. Due to the size of the nine CDs, assigning pothole requests in even closer geographic proximity would significantly improve the efficiency of operations and would increase the number of potholes repaired daily. Therefore, Transportation should try to implement mapping software to assist with the assignment of pothole requests.
New Issue	Availability of Resources	Transportation does not have enough patch trucks. Therefore, Transportation should highlight this need in its budget presentation to City Council and the Chief Operating Officer should consider the request in the May revise; also, Transportation should conduct a staffing analysis on how to best maximize available staff, such as when trucks are out for maintenance and other potential efficiencies.

At the time of the FY2013 audit, Transportation sent crews to four quadrants in the north and four quadrants in the south regions of the City, based on the public's requests for pothole repairs. Now, Transportation aims to send a crew to each of the nine Council Districts (CDs) to repair potholes reported by the public via the Get It Done (GID) app.

### **Assigning pothole requests within closer geographic proximity would likely significantly increase overall productivity.**

Since the 2013 audit, the process of assigning pothole requests has not significantly changed. Currently, the supervisor prioritizes requests reported as emergencies and then assigns pothole requests to crews based on the Council District and the age of the request. Previously, supervisors prioritized pothole requests reported as emergencies and then responded to requests as they came in with some consideration of the location of the reported pothole.

*Assigning requests in closer proximity to each other would likely decrease the average time to respond to residents' requests.*

Considering the large geographic size of each Council District and the continuous backlog of pothole requests (as explained in the background), Transportation could respond to pothole requests more efficiently by assigning requests in closer proximity to each other, as this would reduce crews' driving time between locations. We found that Transportation could increase daily productivity of pothole repairs if it utilizes a geographic routing or mapping system to help assign pothole requests in closer geographic proximity to each other. As a result, the average time to respond to residents' pothole requests would likely decrease.

Currently BlueWorx allows crews to see all of their pothole assignments on a map, but it does not have a feature for the supervisor to see all open pothole requests on a map. The supervisor can only see pothole requests in a list format, as shown in **Exhibit 4** below. On this particular day, the supervisor had 380 pothole requests available to assign to the pothole crews. Without a map, the supervisor generally selects the oldest requests in each Council District, which may not be grouped together, so crews may drive long distances between the requests they are assigned while passing other open requests along their way.



Exhibit 4

**As the Supervisor Only Has a List of Pothole Requests, the Supervisor is Limited in Their Ability to Assign Pothole Requests in Close Proximity**

Number of Entries (without Filtering): 380

S	System status	UserStatus	Notification	Order	Notif.date	Description	P	Room Location
✓	NOPT OSNO	CRTD	40300815908		02/23/2024	CROWN POINT DR;POTHOLE	2	N-17 CD01
✓		CRTD	40300816160		02/23/2024	14750 EL CAMINO REAL;POTHOLE	2	N-98 CD01
✓		CRTD	40300815498		02/23/2024	4582 CHESHIRE ST;POTHOLE	2	N-06 CD02
✓		CRTD	40300815448		02/23/2024	372 FOURTH AVE;POTHOLE	2	S-04 CD03
✓		CRTD	40300815911		02/23/2024	1550 HOTEL CIR N;POTHOLE	2	N-19 CD03
✓		CRTD	40300816183		02/23/2024	450 WEST UNIVERSITY AVENUE;BIKE MAINT-PA	2	S-42 CD03
✓		CRTD	40300815456		02/23/2024	4423 ARIZONA STREET;POTHOLE	2	S-28 CD03
✓		CRTD	40300815457		02/23/2024	LISBON ST;POTHOLE	2	S-44 CD04
✓		CRTD	40300815446		02/23/2024	9343-9363 CLAIREMONT MESA BLVD;POTHOLE	2	N-50 CD06
✓		CRTD	40300815449		02/23/2024	8751-8769 FLANDERS DR;POTHOLE	2	N-15 CD06
✓		CRTD	40300816180		02/23/2024	10159 SALUDA AVE;POTHOLE	2	N-15 CD06
✓		CRTD	40300815909		02/23/2024	9012 WOODLAWN DRIVE;POTHOLE	2	N-15 CD06
✓		CRTD	40300815487		02/23/2024	8701-8743 AERO DR;POTHOLE	2	N-50 CD07
✓		CRTD	40300816161		02/23/2024	6306 SEAMAN ST;POTHOLE	2	N-20 CD07
✓		CRTD	40300815509		02/23/2024	6881 ALVARADO ROAD;POTHOLE	2	S-38 CD09
✓		CRTD	40300815900		02/23/2024	4504 COPELAND AVE;POTHOLE	2	S-58 CD09
✓		CRTD	40300815897		02/23/2024	3655 SWIFT AVE;POTHOLE	2	S-56 CD09
		CRTD	40300812882		02/13/2024	6693 ARANDA AVE;POTHOLE	2	N-10 CD01
		CRTD	40300813200		02/14/2024	2201-2247 CALLE CLARA;POTHOLE	2	N-10 CD01
		CRTD	40300813448		02/15/2024	CARMEL CREEK RD & CARMEL COUNTRY RD;POTH	2	N-21 CD01
		CRTD	40300813460		02/15/2024	3800-3898 CARMEL GROVE RD;POTHOLE	2	N-21 CD01
		CRTD	40300814518		02/19/2024	7304 ENCELIA DR;POTHOLE	2	N-10 CD01
		CRTD	40300814283		02/17/2024	10308 JOHN JAY HOPKINS DRIVE;POTHOLE	2	N-99 CD01
		CRTD	40300815067		02/21/2024	GILMAN DR;POTHOLE	2	N-10 CD01
		CRTD	40300814491		02/19/2024	13000 HARTFIELD AVE;POTHOLE	2	N-21 CD01
		CRTD	40300815099		02/21/2024	INGRAHAM ST;POTHOLE	2	N-27 CD01

Source: Transportation provided this screenshot from SAP, the data system of record for pothole operations.

The inability to visualize all outstanding pothole requests on a map makes it difficult for the supervisor to assign pothole requests located in closer proximity to each other.

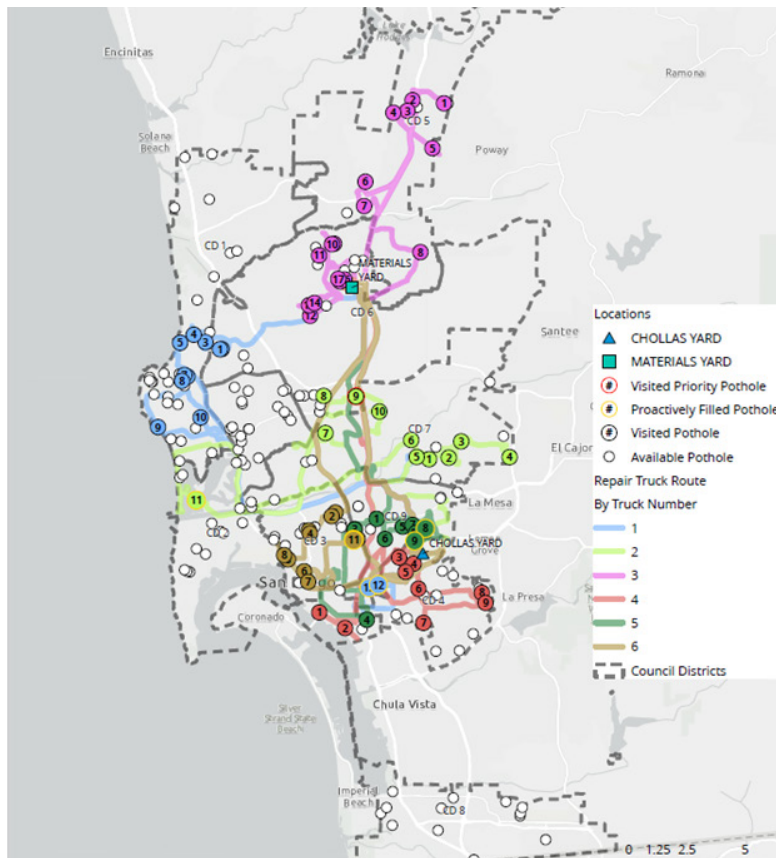
**By grouping pothole assignments in closer proximity for one day, we found that productivity could have increased by 27 percent and miles driven could have decreased by 40 percent.**

We performed a test to determine if crews could respond to more pothole requests in a day when pothole requests are assigned in closer geographic proximity to each other. Our results show that by assigning pothole requests that are in closer proximity to one another, Transportation could likely repair thousands of additional potholes per year within its existing budget, increase efficiency, and shorten the average drive time between locations.

Specifically, we randomly selected a date and, with the assistance of the City’s GIS team, compared the actual routes and work completed to the potential routes and work completed if Transportation had used a geographic routing tool. As shown in **Exhibit 5**, crews had six patch trucks to respond to pothole requests on July 17, 2023.<sup>7</sup> The crews also repaired some potholes proactively and one crew responded to a reported emergency pothole.

**Exhibit 5**

**Under the Current Process of Assigning Requests Based on Age and Council District, Six Patch Trucks Responded to 71 Potential Potholes on July 17, 2023**



TRUCK	NUMBER OF REPAIRS	MILES DRIVEN
1	13	70.47
2	11	85.39
3	17	72.57
4	9	81.68
5	10	52.23
6	11	54.28
<b>TOTAL</b>	<b>71</b>	<b>416.62</b>

Source: City GIS team generated based on Vehicle GPS data, the Daily Work Report forms, and BlueWorx pothole data.

<sup>7</sup> On this date, the other three patch trucks were under repair and therefore not available.

These six patch trucks and corresponding crews responded to a total of 63 pothole requests and proactively filled 8 potholes (for a total of 71 responses), averaging 12 pothole responses per crew.<sup>8</sup> Notably, crews likely filled more than 71 potholes as crews often fill more than one pothole at each repair location. The six patch trucks drove a total of 417 miles, averaging 69 miles per truck.

We worked with the City's GIS team to create a theoretical model of routes and assignments for this same day, based on all open pothole requests as of July 17, 2023, and selected assignments based on the geographic proximity of pothole requests.<sup>9</sup> This model routes pothole requests based on proximity to maximize productivity. As shown in **Exhibit 6**, this model includes only six patch trucks, limits each crew to one Council District, and includes the same reported emergency (priority) pothole that was responded to on July 17, 2023.

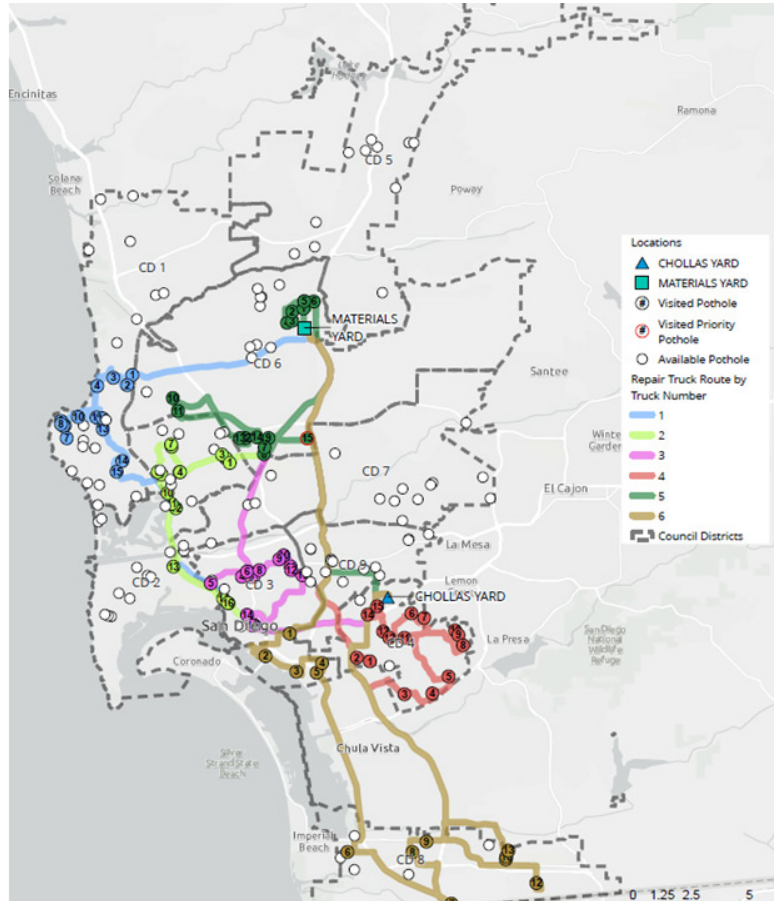
---

<sup>8</sup> Crews proactively look for and repair potholes once they have completed their daily assigned pothole requests.

<sup>9</sup> The analysis of actual work completed on July 17, 2023 includes the reported emergency (priority) pothole responded to as well as the proactively filled potholes. The theoretical geographic proximity model includes the same number of available patch trucks (six) on July 17, 2023 and the same reported emergency (priority) pothole that was responded to on July 17, 2023. The parameters of the geographic proximity model include: 1) patch trucks leave the Asphalt Materials Yard at 8:00 a.m.; 2) time for a 30-minute lunch and two 15-minute breaks (but does not include restroom breaks); and 3) an average of 20 minutes to respond to a pothole request. (This 20-minute average is based on the results of our analysis of paper form records in our statistically significant data reliability test.) More details of the methodology and parameters of the model can be found in **Appendix C**.

Exhibit 6

By Using Proximity to Determine Assignments, Six Patch Trucks and Crews Could Have Responded to 90 Pothole Requests Open on July 17, 2023



TRUCK	NUMBER OF REPAIRS	MILES DRIVEN
1	15	39.61
2	16	31.45
3	16	31.36
4	15	41.45
5	15	36.12
6	13	68.46
<b>TOTAL</b>	<b>90</b>	<b>248.46</b>









Note: Due to rounding, the numbers in the chart may not add up exactly to the total amounts listed.

Source: City GIS team generated based off Vehicle GPS data, Daily Work Report forms, and BlueWorx pothole data.

In the proximity model, as shown in **Exhibit 7**, crews could have responded to 19 (27 percent) more pothole requests and could have driven 169 (40 percent) less miles compared to the actual work completed on July 17, 2023. Notably, reducing the miles driven by the trucks would not only decrease fuel costs but also reduce wear and tear and thus likely decrease maintenance costs.

Exhibit 7

**In the Proximity Model, Crews Could Have Responded to 27% More Pothole Requests and Could Have Driven 40% Less Miles Compared to the Actual Work Completed on July 17, 2023**

	Actual 7/17/2023	Model 7/17/2023	Efficiency Improvement with Proximity Approach
 Potholes and Pothole Requests Responded to	71	90	 27% more potholes
 Average Potholes Per Crew	11.8	15	 27% more potholes
 Total Miles Driven	417	248	 40% less miles
 Average Miles Per Truck	69	41	 40% less miles

Source: OCA generated based on GIS model results, Daily Work Report forms, and BlueWorx pothole data.

**A routing or mapping software would help Transportation more efficiently reduce large backlogs and could allow time for proactive repairs in areas that do not often request repairs.**

A routing or mapping software would be especially effective to more efficiently respond to the high quantity of requests when Transportation has a high number of pothole requests in its backlog. For instance, for half of FY2023, the average request backlog was over 200 pothole requests. Furthermore, by responding to the backlog of requests more efficiently, Transportation likely would have more time to proactively repair potholes, including in areas of the City in which residents do not request repairs as frequently as others. This proactive repair work could help ensure equitable operations across the City.

*Proactive repair work could help ensure equitable operations across the City.*

Although the proximity model has limitations as it cannot include all aspects of real-life field work, such as real-time traffic congestion, it demonstrates how assigning pothole requests within closer proximity would likely significantly improve overall productivity.

Therefore, Transportation should research and determine if a compatible geographic routing or mapping software is feasible to purchase and pilot. For example, the Public Utilities Department (PUD) has used the Geo.explorer map function in SAP to assign meter work orders. If Transportation determines that no software is feasible to purchase and pilot, Transportation should explain why no software is feasible. If a compatible software is found, Transportation should pilot the software with the intent to implement the tool to help assign pothole requests within closer proximity to each other to overall increase productivity and improve the efficiency of operations. If Transportation implements the geographic routing or mapping system, Transportation should assess and increase crews' daily pothole response goal.

Notably, Transportation stated that crews now have access to the BlueWorx app on their work phones and can use a map within the BlueWorx app to help plan the route to the next assignment. This improvement allows crews to plan and respond to their assignments more efficiently. However, this does not address the issue of crews being assigned potholes that are not in close proximity to begin with.

## 2024 Recommendations:

### **Recommendation 1.1**

(Priority 2)

The Transportation Department (Transportation) should research and determine if a compatible geographic routing software is feasible to purchase and pilot, such as SAP's Geo.explorer mapping function. If Transportation cannot find feasible software to purchase and pilot, it should document its efforts and evaluations. If a feasible software is found, Transportation should pilot the software with the intent to implement the use of geographic routing or mapping software to assist with the assignment of pothole requests. The software should allow the supervisor to see all outstanding pothole requests to help with assigning pothole requests geographically near each other.

**Management Response:** Agree [See full response beginning on page 47.]

**Target Implementation Date:** TBD (Complete feasibility research by September 2024. If feasible, procure software if necessary and conduct a pilot from October 2024 through September 30, 2025. The target implementation date is TBD depending upon resource allocation and the results of the pilot.)

**Recommendation 1.2**

(Priority 2)

If geographic routing or mapping software is implemented to assist with the assignment of pothole requests (Recommendation 1.1), the Transportation Department should:

- Update the Standard Operating Procedure to instruct the supervisor to assign pothole requests in geographic clusters; and
- Assess and increase crews' daily pothole request goal.

**Management Response:** Agree [See full response beginning on page 47.]

**Target Implementation Date:** TBD (dependent upon identification, funding, procurement, integration, and testing outcomes from Recommendation 1.1)

***New Issue: Patch trucks are frequently out for maintenance, which has impacted the number of potholes crews can repair daily.***

---

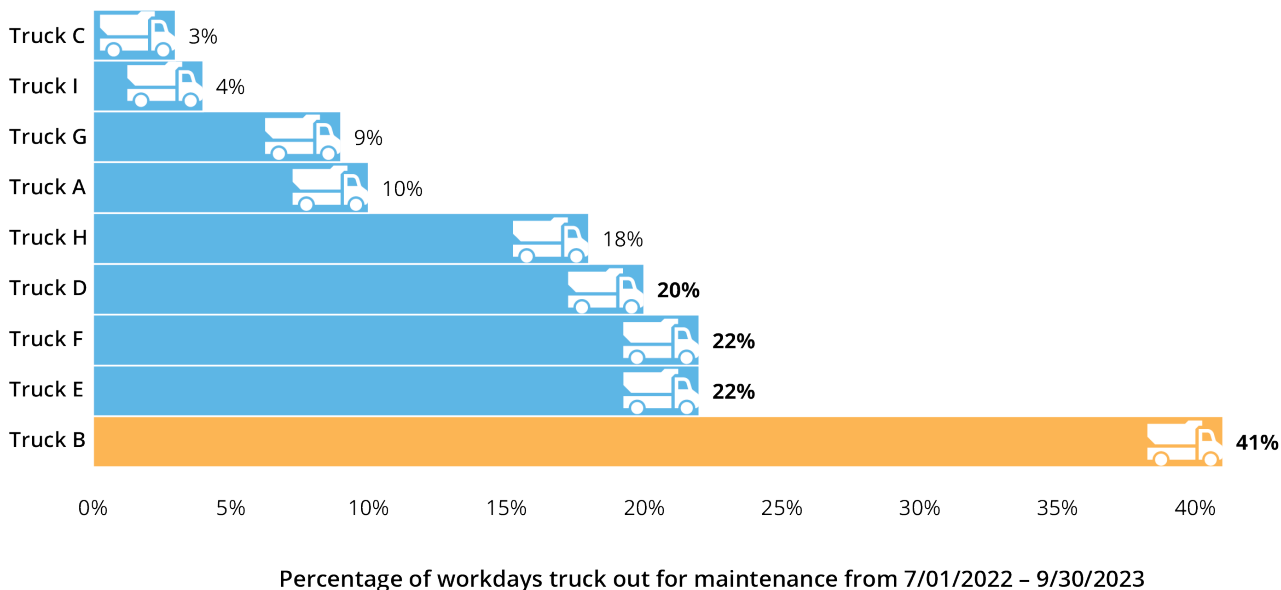
**Transportation does not have a sufficient supply of patch trucks.**

We found that during our testing period, Transportation regularly did not have all nine patch trucks available, as patch trucks were out for maintenance, which impacted the department's capacity for pothole repairs. Transportation does not have a backup truck for pothole crews to use when a patch truck is out for repairs. All nine patch trucks were available to repair potholes for only 20 percent of the 15-month testing period. During this 15-month period, only eight or fewer patch trucks were available on most days.

We also found that four out of the nine patch trucks were each out for repairs for 20 percent or more workdays during the 15-month testing period, as shown in **Exhibit 8**. Additionally, one patch truck (of the four mentioned previously) was out of service for repairs for 41 percent of workdays during the 15-month testing period.

*Exhibit 8*

**Four of the Nine Patch Trucks Were Each Out of Service for Maintenance for More Than 20% of a 15-Month Period**



Source: OCA generated based on review of Fleet Maintenance records.

In addition, all seven cities we benchmarked with stated they have at least one extra truck (patch truck or other type) available when a patch truck is out of service for repairs.

**The one-time cost of an additional patch truck would significantly increase the number of potholes the City’s nine pothole crews can repair, even if Transportation kept the same operating expenses.**

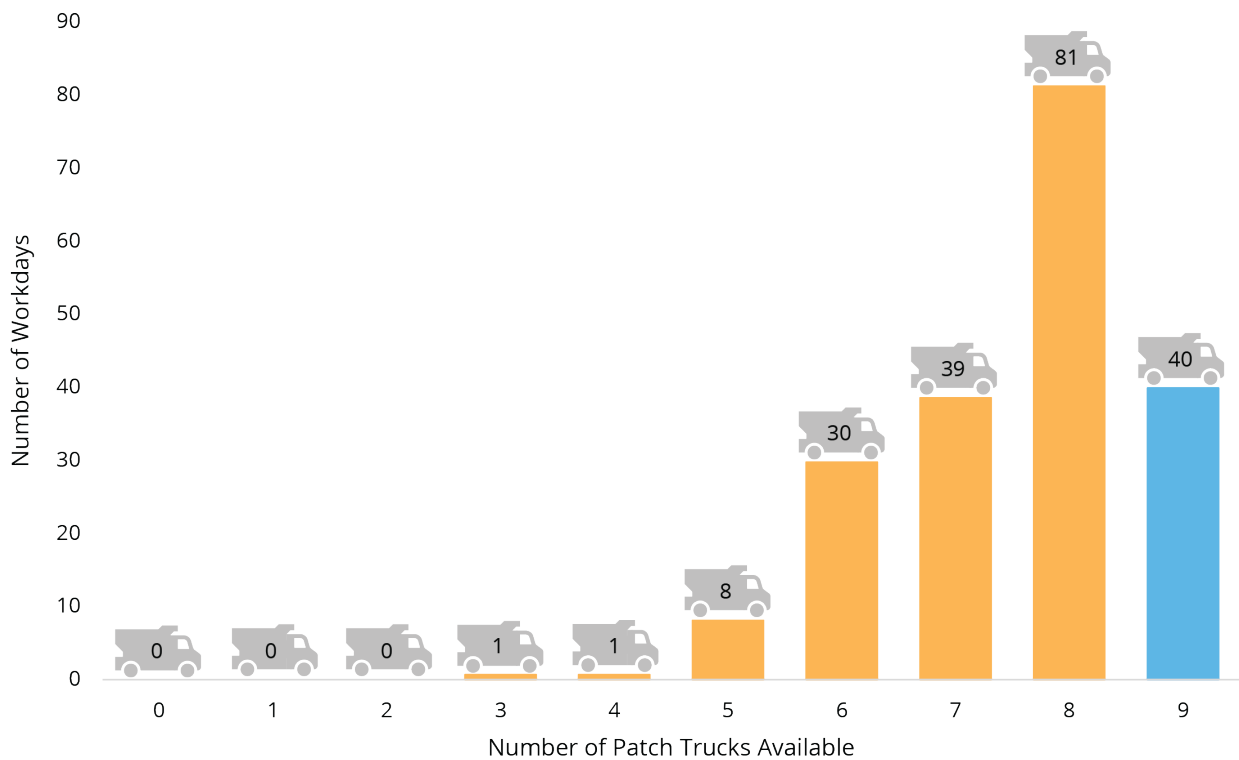
While acquiring a new patch truck may be difficult with the current budget deficit projections for the next several years, an additional patch truck would significantly increase the daily number of potholes Transportation’s nine pothole crews can repair with the current \$3.95 million annual expenditures on pothole operations. Transportation confirmed it has requested additional patch trucks for the upcoming FY2025 budget. Therefore, the City should weigh the cost of adding a pothole patch truck, a cost of approximately \$174,000, with the significant productivity benefits that can be gained.



As noted above, while Transportation has nine pothole repair trucks and nine crews, on 80 percent of workdays, one or more patch trucks are out for maintenance. When trucks are unavailable, Transportation cannot deploy all nine crews to repair potholes, reducing productivity, as Transportation reassigns these crews to assist other pothole crews (i.e., for extra traffic control). Our analysis found that, in a fiscal year, Transportation has all nine patch trucks available for only 40 out of 200 workdays, as shown in **Exhibit 9**.

**Exhibit 9**

**In a Fiscal Year, All Nine Patch Trucks are Available for Only 40 Workdays**



Source: OCA generated based on the review of Fleet Maintenance records.

The addition of a truck for a one-time cost of about \$174,000 would substantially increase productivity and decrease the average cost to repair a pothole, as shown in **Exhibit 10** below.

Specifically, over a 5-year period, we estimate that an extra truck would allow the nine pothole crews to respond to 11 percent more pothole

requests with a cost increase of only 1 percent.<sup>10</sup> Furthermore, we estimate that the cost per pothole would be reduced by 9 percent. This is because more crew members, which Transportation already pays for, can respond to pothole requests rather than provide additional assistance to other crews.

## Exhibit 10

### Over a 5-Year Period, One Extra Patch Truck Would Increase Current Pothole Crews' Productivity by 11%, with Only a 1% Cost Increase

Total 5-Year Cost of Pothole Repairs without New Truck	\$19,758,425	
Pothole Requests Responded to without New Truck	75,166	
Average Cost Per Pothole Request without New Truck	\$262.86	
Total 5-Year Cost of Pothole Repairs with New Truck	\$19,932,199	
Pothole Requests Responded to with 1 New Truck	83,120	
Average Cost Per Pothole Request with New Truck	\$239.80	
<b>Total Cost Increase with 1 New Truck</b>	<b>\$173,774</b>	<b>1% Increase</b>
<b>Total Pothole Requests Responded to with 1 New Truck</b>	<b>83,120</b>	<b>11% Increase</b>
<b>Average Cost Per Pothole Request with 1 New Truck</b>	<b>\$239.80</b>	<b>9% Decrease</b>

Note on Methodology: Transportation confirmed that it responds to all pothole requests, and this estimation demonstrates how an additional patch truck could improve the efficiency of operations. The Department has a goal of each pothole crew responding to 10 pothole repair requests on each 10-hour workday. We calculated the annual number of pothole requests the nine crews currently can respond to, based on 10 pothole requests per crew per workday and the frequency patch trucks were available during our 15-month testing period. This analysis also does not take into consideration staffing, such as when pothole staff are out on vacation or extended leave.

Source: OCA generated based on pothole operations' FY2023 expenditures, Transportation's September 2023 vendor quote for a new patch truck, and interviews with Transportation.

Furthermore, we estimate that the purchase of two extra patch trucks would allow the nine crews to respond to 16 percent more pothole requests, compared to its current operational capacity with nine patch trucks. The purchase of two patch trucks would create a 2 percent cost increase over a 5-year period, but the cost per pothole would decrease by 12 percent.

<sup>10</sup> On occasion, to keep up with the backlog of pothole requests, Transportation has had to rely on overtime as well as on the "all hands-on deck" approach, which means pulling other street maintenance personnel from Transportation to help with pothole repairs. Transportation stated these additional personnel either use other Transportation vehicles that can hold hot asphalt or cold patch asphalt to repair potholes. An additional patch truck would allow the nine pothole crews to collectively respond to more requests each day, which would ultimately reduce the use of Transportation's other street maintenance personnel.

## **An additional patch truck could help ensure equitable pothole operations across the City.**

As an additional patch truck would allow Transportation to respond to pothole requests more efficiently, the additional truck could provide time for crews to proactively repair potholes in underreported areas of the City. As discussed in Topic 3: Monitoring Performance, the rate of pothole requests varies across Council Districts. The additional patch truck could provide Transportation with more time to search for and proactively repair potholes in areas of the City where residents are less likely to request repairs.

Therefore, if additional patch trucks are not included in the proposed FY2025 Transportation budget, Transportation should highlight the need in its budget presentation to City Council and the Chief Operating Officer should consider the request in the May Revise. If the request for additional patch trucks is not granted for FY2025, Transportation should repeat the budget request in the next budget cycle. Along with this budget request, Transportation should report the frequency patch trucks were out of service for repairs in the prior fiscal year(s), as well as the efficiencies that could be gained with additional truck(s) to help the Mayor and Council balance this funding need with the many others they must consider.

## **A staffing analysis would allow Transportation to determine how to best maximize available staff when patch trucks are out for repairs and how other staffing efficiencies could be made.**

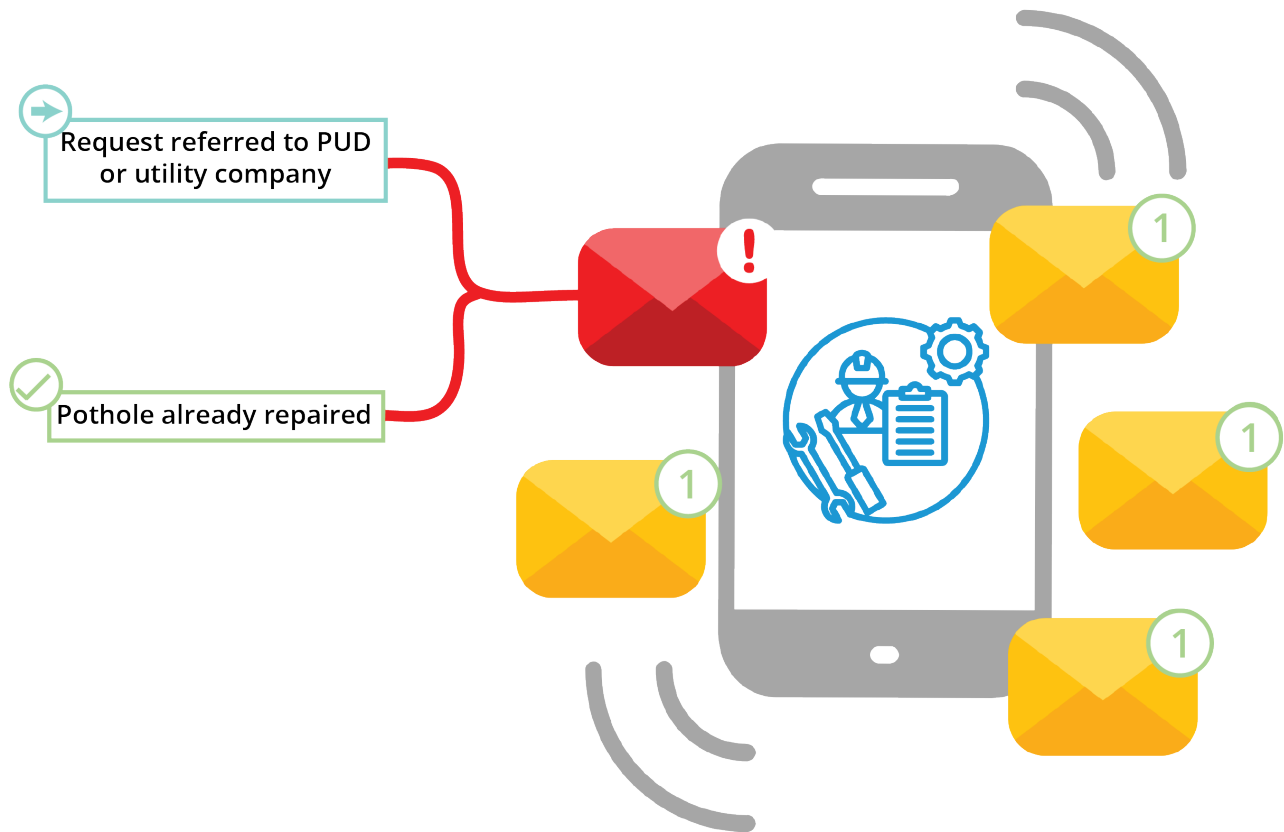
A staffing analysis could allow Transportation to assess how to maximize the productivity of available staff when patch trucks are out for repairs. As previously mentioned, when a patch truck is out for maintenance, Transportation reassigns that pothole crew to assist with other pothole crews. However, the crews might be more productive by assisting in other areas, such as inspecting some pothole requests, especially reported emergency potholes, before patch trucks drive to the pothole locations.

For instance, within our testing period, we found that pothole crews responded to but could not repair 19 percent of pothole requests (almost 1 in 5) for reasons such as the pothole could not be found,

the pothole was already repaired, or the work needed to be referred to PUD or other agencies, as shown in **Exhibit 11**. Therefore, crews regularly spend time driving to and evaluating locations at which no repair can be done or is needed.

**Exhibit 11**

**No Repair Could be Done in One Out of Five Pothole Requests**



Source: OCA generated based on BlueWorx pothole operations data.

In addition, five of the seven jurisdictions we benchmarked with include a pre-inspection step before sending crews to the location of a pothole request. Furthermore, in Seattle, while operators pick up asphalt, crew members are encouraged to pre-inspect their assigned pothole locations.

## The current response process to emergency pothole requests likely decreases productivity as crews are pulled from their assignments.

Furthermore, crews prioritize pothole requests reported as emergencies, which means crews must stop working on their pothole assignments and drive to the location of the reported emergency pothole, which may be far away, impacting the efficiency of operations. We found that during our 15-month testing period, there was an average of 3.9 reported emergency potholes per workday. Transportation also stated that sometimes the crews cannot repair the reported emergency potholes because the potholes were already repaired in response to an earlier request or were on privately owned streets. Therefore, crews lose time in the field to respond to reported emergency potholes that were already resolved or could not be repaired by the City's pothole crews.

Some jurisdictions, such as Seattle and Phoenix, use a single-person rapid response method, in which the crew member uses cold mix asphalt to repair the pothole, or the member determines that hot asphalt is needed for the repair. Similarly, Transportation stated that during the swing shift when no patch trucks are available, a staff person responds to potholes reported as emergencies and repairs the potholes with cold mix asphalt. Some Transportation crews also used cold mix asphalt during the "all hands-on deck" approach in the winter of FY2023. However, Transportation shared that cold mix asphalt repairs are not as durable as hot patch repairs.

*A staffing analysis will help determine how to maximize productivity when patch trucks are out for maintenance.*

Therefore, Transportation should conduct a staffing analysis to determine how to best maximize the productivity of available staff when patch trucks are out for maintenance as well as how other staffing efficiencies could be made.

## 2024 Recommendations:

### **Recommendation 1.3**

(Priority 2)

If one or more additional patch trucks are not included in the proposed FY2025 Transportation Department (Transportation) budget, Transportation should highlight this need in its budget presentation to City Council and the Chief Operating Officer should consider the request in the May Revise. If the request for one or more additional patch trucks is not granted for FY2025, Transportation should repeat the budget request in the next budget cycle. Along with this budget request, Transportation should report the frequency patch trucks were out of service for repairs in the prior fiscal year(s) along with the efficiencies and additional productivity that can be gained with additional truck(s).

**Management Response:** Agree [See full response beginning on page 47.]

**Target Implementation Date:** April 2024 for May 2024 budget revision (initial request); an additional request will be made for FY2026 if patch trucks are not added to the FY2025 budget

### **Recommendation 1.4**

(Priority 3)

The Transportation Department should conduct a staffing analysis to determine how to maximize the productivity of available staff, such as when patch trucks are out for repairs, while staff is waiting for asphalt to be picked up, as well as for other staffing efficiencies, considering options such as staff conducting pre-inspections or repairing potholes with cold mix asphalt.

**Management Response:** Agree [See full response beginning on page 48.]

**Target Implementation Date:** First Quarter of FY2025

# Topic 2: Data Management


*To more efficiently and accurately record pothole repairs, Transportation should provide crews with guidance on quantifying potholes, include IT controls to ensure all data is recorded, and require crews to only use paper forms in the field when necessary.*

## Current Status of Original 2013 Recommendation 1

### Recommendation 1:

In order to improve the quality of data, the Streets Division of the Transportation & Storm Water Department should standardize its data collection tool. Specifically, the Streets Division should:

- Specify the types of data that should be collected by repair crews (e.g., number of potholes patched and square footage), and revise the data collection form so that each required data type has its own field and standardized way of recording.
- Establish a process to ensure supervisory review and approval prior to data entry with confirmation of review, such as a signature.

Original Implementation:	June 2014	Transportation standardized a Daily Work Report with the appropriate fields that also includes a supervisor review signature line.
 Current Status:	Implemented with Further Improvements Recommended	Transportation records the number of potholes repaired and the square footage and conducts two levels of data review. However, crews do not consistently estimate the count of potholes repaired or square footage. This limits Transportation’s ability to track, analyze, and report crew efficiency and productivity. Therefore, Transportation should provide crews with guidance on how to quantify pothole repairs.

After responding to each pothole request, repair crews record the count of potholes and the square footage of asphalt directly into the online platform, BlueWorx, as well as on their paper Daily Work Report form. The supervisor reviews all paper forms against the data entered in BlueWorx, notates corrections on the paper forms, and updates BlueWorx with any missing data. Other Transportation staff conduct a second quality review check, looking for irregularities in BlueWorx, which they refer to the supervisor for follow up.

**Crews do not consistently estimate the count of potholes repaired or square footage of asphalt, impeding uniform reporting on total repairs.**

Crews’ methodology to estimate the number of potholes repaired and the amount of square feet of asphalt used varies greatly. Therefore, Transportation cannot uniformly quantify, track, or report the total number of potholes repaired, which is an important indicator of crew efficiency and productivity. For example, when crews recorded repairing one pothole, estimates of square footage of asphalt used varied between 4 and 110 square feet, as shown in **Exhibit 12**.

*Exhibit 12*

**Crews Inconsistently Estimate the Square Footage of Potholes**

Date on Form	Patch Truck Operator	Request Number	Count of Potholes on Form	Square Feet on Form
4/13/2023	Operator A	20300237496	1	10
4/14/2023	Operator B	40300683049	1	4
4/18/2023	Operator C	20300238236	1	90
4/19/2023	Operator D	20300230252	1	40
4/21/2023	Operator A	20300238719	1	25
4/24/2023	Operator A	20300239028	1	60
4/26/2023	Operator E	40300689880	1	10
4/27/2023	Operator C	20300239638	1	80
4/28/2023	Operator E	40300691030	1	25
5/2/2023	Operator C	20300240252	1	110
5/4/2023	Operator D	40300692533	1	45
5/4/2023	Operator E	40300692629	1	25
5/11/2023	Operator D	20300241332	1	60
5/12/2023	Operator E	20300241480	1	30
5/16/2023	Operator D	40300699557	1	100
5/17/2023	Operator A	20300242157	1	8
5/17/2023	Operator C	20300242178	1	90
5/18/2023	Operator F	20300242064	1	4
5/18/2023	Operator C	20300242261	1	15
5/23/2023	Operator A	20300243047	1	10

Source: OCA generated based on review of Daily Work Report forms.



Similarly, when crews estimated the same square footage of asphalt used, 60 square feet, the estimated counts of potholes repaired varied from 1 to 15 potholes, as shown in **Exhibit 13**.

*Exhibit 13*

**Crews Inconsistently Estimate the Count of Potholes**

Date on Form	Patch Truck Operator	Request Number on Form	Count of Potholes on Form	Square Feet on Form
7/18/2022	Operator D	20300196240	2	60
7/21/2022	Operator C	40300551052	2	60
7/22/2022	Operator G	40300608044	1	60
9/15/2022	Operator B	40300621484	15	60
9/29/2022	Operator E	40300624380	4	60
9/30/2022	Operator D	20300206045	1	60
12/19/2022	Operator E	40300644443	10	60
2/24/2023	Operator B	40300667838	15	60
3/27/2023	Operator A	20300232970	5	60
3/29/2023	Operator D	20300235255	1	60
4/17/2023	Operator D	40300663004	1	60
5/19/2023	Operator D	20300241838	2	60
6/12/2023	Operator C	20300186762	2	60
6/22/2023	Operator C	20300246689	1	60
7/27/2023	Operator H	40300726124	1	60
8/29/2023	Operator K	40300733355	8	60
9/28/2023	Operator B	40300738672	15	60

Source: OCA generated based on review of Daily Work Report forms.

Notably, potholes vary in size and shape, as shown in **Exhibit 14**. However, it is unlikely a single pothole is 60 square feet or more. Also, Transportation’s crews do not have any references in the Standard Operating Procedure to refer to when estimating the count of potholes repaired or square footage of asphalt used, which would be particularly useful with irregularly shaped potholes. Notably, no industry best practice exists for estimating the size or number of potholes.

While some variance in estimating size will always exist, Transportation should include references in the Standard Operating Procedure (such as descriptions, photographs, or definitions) to establish more consistency in crews' estimates.<sup>11</sup>

**Exhibit 14**

**Potholes Vary in Shape and Size**



Source: OCA generated from a ride-along with a pothole repair crew.

**2024 Recommendation:**

**Recommendation 2.1** (Priority 2)

To improve consistency of data collection, the Transportation Department (Transportation) should update the Potholes Standard Operating Procedures (SOP) with criteria (definitions, descriptions, and/or photographs) to guide crews on how to quantify the estimated count of potholes repaired and the square footage of asphalt used (if this metric is kept). Transportation should also train all crews on the updated SOP.

**Management Response:** Agree [See full response beginning on page 48.]

**Target Implementation Date:** First Quarter of FY2025


<sup>11</sup> Transportation stated that it is considering removing the square footage metric as it is no longer used for Citywide reporting.

## Current Status of Original 2013 Recommendation 2

### Recommendation 2:

The Streets Division of the Transportation & Storm Water Department should improve controls over data entry. Specifically, the Streets Division should:

- Modify the date field to a blank, yet required field to help ensure the date field is entered correctly into the system.
- Evaluate potential data entry controls available in SAP for data recorded in the system to strengthen edit checks and controls.

Original Implementation:	September 2014	Transportation established appropriate controls over data entry to improve data reliability.
 <p>Current Status:</p>	Implemented with Further Improvements Recommended	Crews now enter pothole data in BlueWorx along with the paper forms. However, to ensure all fields are accurately recorded in BlueWorx, the supervisor conducts a daily time-intensive comparison review of the paper forms against the data in SAP. <sup>12</sup> Therefore, Transportation should implement an IT control to ensure all data is captured in BlueWorx and stop the inefficient practice of duplicate recording on Daily Work Report paper forms.

### Pothole data recorded on paper forms substantially matched the data records in SAP.

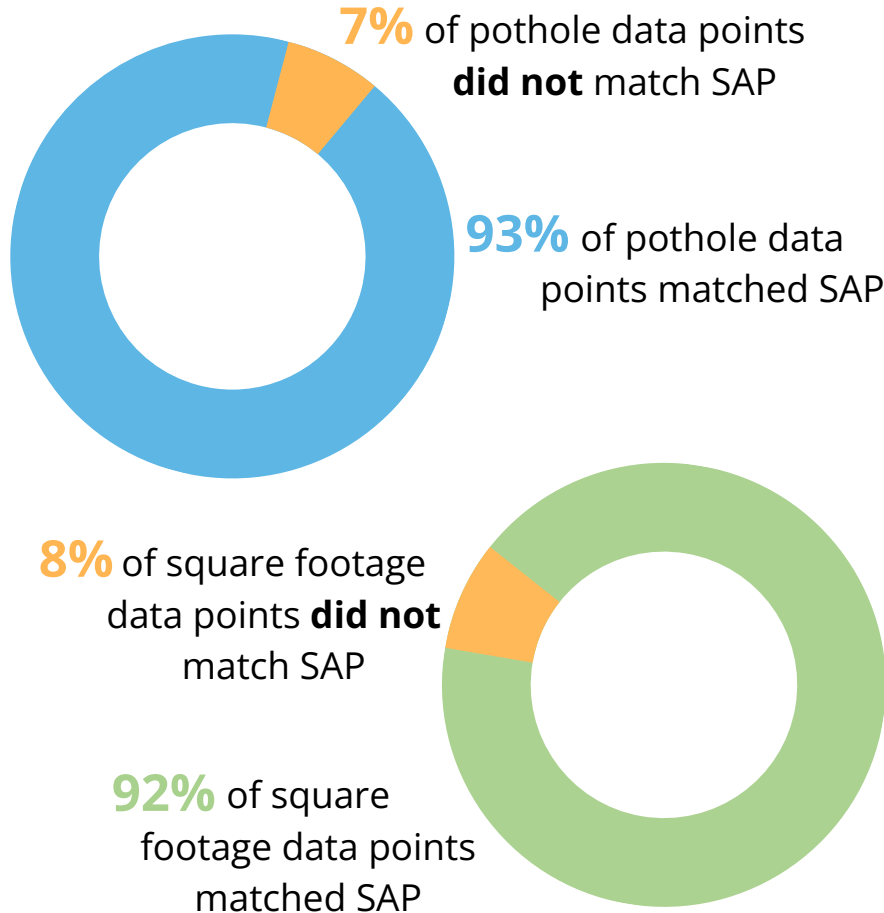
While in the field, pothole crews enter pothole data into BlueWorx as well as on the Daily Work Report forms, to help ensure pothole data has been entered into BlueWorx accurately. Data entered in BlueWorx automatically records the data into SAP. We found that the pothole data recorded on paper forms primarily matched the records in SAP. In our statistically significant sample, 93 percent of the counts of potholes repaired on the paper forms matched the SAP data. This is an improvement from the FY2013 audit, which found only 86 percent of counts of pothole repairs were recorded accurately in the judgmental sample. Meanwhile, 92 percent of the square footage records on the paper forms matched the BlueWorx data, as shown in **Exhibit 15**.<sup>13</sup>

<sup>12</sup> Crews enter data into the online platform BlueWorx, which automatically transfers data into SAP, Transportation's data system of record for pothole operations.

<sup>13</sup> Note, due to the current reporting limitations within SAP, there will always be some discrepancy between the paper records and SAP reports. SAP reports only reflect the most recently entered data for pothole operations. For instance, if a

Exhibit 15

**93% of Pothole Data Points and 92% of Square Footage Data Points Matched SAP Pothole Data**



Source: OCA generated based on review of pothole Daily Work Report forms and pothole records in SAP.

**Entering pothole data on paper forms and in BlueWorx is time intensive and repetitive work.**

Entering pothole data into both BlueWorx and paper forms is repetitive work and time-consuming, when crews already need to maximize their available time in the field. Industry best practice also recommends using IT controls to improve accurate data entry and discontinuing time-intensive data recording on paper forms in the field.

crew returns to the site of a pothole request a few days later for additional work, the data in SAP updates and the report will longer match the original paper form. For these instances, the discrepancy between the paper form and SAP reports is not a data entry error. However, our analysis could not determine the rate of these specific discrepancies.

## **Pothole crews occasionally miss data points in BlueWorx because BlueWorx does not require crews to enter all data points.**

*An IT control will help ensure all information is entered into BlueWorx.*

BlueWorx does not require crews to enter all data fields before closing out the online form; therefore, crews can unknowingly miss a data point. In our statistically significant sample, we found that out of 580 pothole requests reviewed, 9 percent (50 requests) listed on the paper forms could not be found in BlueWorx. For this 9 percent, crews likely miswrote the pothole request numbers on the paper forms. In a smaller judgmental sample of 15 pothole requests, a paper form could not be found for 47 percent of the requests in BlueWorx (7 requests). Transportation stated that crews do not always remember to return the paper forms or always remember to enter all data points into BlueWorx. Therefore, Transportation should develop an IT control that will not allow crews to close the online form in BlueWorx until all data fields are selected and entered. Already recognizing this deficiency, Transportation has begun to explore IT control options to ensure all data points are captured in BlueWorx before the online form is closed out.

## **Using the paper forms to verify the accuracy of SAP pothole data requires extensive supervisor time.**

To verify the accuracy of SAP pothole data, the supervisor conducts a daily time-intensive line-by-line comparison review of paper forms against the SAP pothole data, correcting the SAP data when necessary. This ultimately limits the amount of time the supervisor can manage pothole operations in the field. Also, at times SAP may have the correct data, and the paper form is incorrect, so the change in SAP could be incorrect.

Once Transportation establishes an IT control to ensure crews enter all pothole data into BlueWorx rather than comparing the paper forms to the SAP data, the supervisor can instead conduct a more efficient regular SAP spot check to review for accidentally transposed data points or abnormal quantities. This will ensure Transportation still conducts a quality review of SAP pothole data but also frees up time for the supervisor to manage pothole operations.

Notably, Transportation has begun to pilot crews taking before and after photos of work completed and uploading these photos in BlueWorx. These photos could assist the supervisor in the SAP spot check reviews. Therefore, with the implementation of the IT data entry

control, crews should only enter the data points in BlueWorx, and the supervisor should begin conducting a regular spot check in SAP. However, the paper forms should still be kept in the patch trucks for use when crews cannot connect to the network while out in the field.

## 2024 Recommendations:

### **Recommendation 2.2**

(Priority 2)

The Transportation Department should include an IT control that will prevent crews from closing the online form in BlueWorx until all necessary data fields are selected and entered (i.e., date, request number, number of potholes repaired, square footage, and activity code).

**Management Response:** Agree [See full response beginning on page 48.]

**Target Implementation Date:** TBD (Transportation will work with DoIT to determine a course of action for creating mandatory data field controls no later than the second quarter of FY2025; the final implementation date is TBD dependent upon DoIT's ability to support it)

### **Recommendation 2.3**

(Priority 2)

Once Transportation implements the IT control in Recommendation 2.2, Transportation should update the Standard Operating Procedures to instruct crews to only enter data into BlueWorx; train crews on the change; and keep paper forms in the patch trucks in case crews cannot connect to the network in the field. Additionally, the supervisor should continue with regular data reliability reviews, but should spot check SAP for completeness and irregularities rather than review every request entered by crews.

**Management Response:** Agree [See full response beginning on page 49.]

**Target Implementation Date:** TBD (dependent upon the implementation outcome of Recommendation 2.2)


# Topic 3: Monitoring Performance

*To improve Transportation’s ability to monitor the performance of pothole operations, the department should implement an efficiency performance metric, evaluate the equity of operations across the City, and enter proactively repaired potholes in BlueWorx.*

## Current Status of Original 2013 Recommendation 4

Recommendation 4:

The Transportation & Storm Water Department Streets Division should change its primary performance metrics to include a measure of production efficiency. Specifically, the department should utilize the cost-per-pothole as its primary performance measure to capture the efficiency of its operations.

Original Implementation:	April 2015	Transportation planned to start using the cost-per-pothole Key Performance Indicator (KPI) as of the FY2016 budget
 Current Status:	Not Implemented	Transportation discontinued its performance metric that measured production efficiency in FY2017. Therefore, Transportation should establish an efficiency KPI or internal performance measure.
New Issue 1:	Equity of Operations	As pothole repairs are based on the public’s requests, there could be inequity in pothole operations across the City. Therefore, Transportation should work with the Department of Race and Equity to assess the equity of pothole operations.
New Issue 2:	Tracking Proactively Filled Potholes	Transportation does not have a systematic process to record proactively repaired potholes in BlueWorx. Therefore, Transportation cannot accurately track and report all completed pothole repairs. Therefore, Transportation should update the Standard Operating procedures to direct crews to enter proactively repaired potholes into BlueWorx.

**Transportation implemented the cost-per-pothole KPI for only one fiscal year; however, only one other benchmarked jurisdiction currently uses this metric.**

Transportation implemented the cost-per-pothole KPI in FY2016 but has since FY2017 only kept the KPI that tracks the average number of working days to repair a reported pothole. Of the nine cities for which we benchmarked performance measures, only one city (Dallas) uses a “cost-per-pothole” performance metric. Of the nine cities benchmarked, six cities use a performance measure similar to San Diego’s pothole KPI that monitors the time to respond to a pothole request.

**Transportation has internal pothole repair goals and monitors the pothole request backlog, but it does not have a metric to monitor the efficiency of pothole repairs.**

Transportation also stated it does not track or monitor efficiency metrics, such as the average number of pothole requests completed by crews or by the department on a daily, weekly, or monthly basis. While Transportation has a current internal crew goal to respond to 10 pothole requests per workday and monitors the size of the request backlog, it does not formally monitor the actual number responded to by teams. The current KPI of “average number of working days to repair a pothole that has been reported” shows how quickly Transportation responds to pothole requests. However, this KPI does not reflect when additional staff, outside of pothole operations, are utilized to meet this KPI goal, such as when Transportation was instructed to take an all-hands approach to pothole operations during the winter of FY2023.

*An efficiency metric would help Transportation determine if pothole operational resources are being utilized in an efficient manner.*

Adding an efficiency metric would allow Transportation to determine if pothole operational resources are being utilized in an efficient manner. For instance, the department could consider a KPI or internal potholes operational metric such as:

- The average number of potholes repaired per day compared to the internal goal;
- The percentage of sites that need additional repair work; or
- The average time between initial pothole repair and the pothole needing additional repair.

An efficiency metric would also help right-size the current internal goal of 10 pothole requests per day, as this goal will need to increase when



Transportation assigns pothole requests in closer proximity through the implementation of Recommendation 1.1.

Of note, the City's Performance and Analytics Department (PandA) is currently working with all City departments to comprehensively review, evaluate, and update department KPIs to a uniform standard, ensuring Citywide performance is adequately tracked, monitored, and reported. Therefore, Transportation should independently, or with the assistance of PandA, establish a KPI or internal performance measure that assesses the efficiency of pothole operations.

## 2024 Recommendation:

### **Recommendation 3.1**

(Priority 3)

The Transportation Department should independently, or with the assistance of the Performance and Analytics Department, establish a KPI or internal performance measure that encompasses assessing the efficiency of pothole operations, considering metrics such as the average number of potholes repaired per day compared to the internal goal; the percentage of sites that need additional repair work, or the average time between pothole repair and the pothole needing additional repair.

**Management Response:** Agree [See full response beginning on page 49.]

**Target Implementation Date:** First Quarter of FY2025

## *New Issue 1: As pothole operations are based on public requests, there could be inequity in pothole repairs across the City.*

---

*Assessing the equity of pothole operations across the City is complex.*

Most potholes in the City are repaired based on public requests, which may create inequity in pothole operations as the number of requests for pothole repairs varies across the City. Recognizing that the City's Strategic Plan includes equity of operations as an operating principle, it is important for Transportation to consider the equity of pothole operations throughout the City.

However, assessing the equity of pothole operations across the City is complex, as numerous factors must be considered. For instance, factors such as the frequency of pothole requests, the condition of streets, the lane mileage, and the mileage of heavy traffic streets (which tend to have more potholes) all vary across Council Districts (CDs). For instance, we found that within the testing period, most of the public's requests identified potholes in CD 2 (16 percent) followed by CD 3 (15 percent). Conversely, only 6 percent of requests identified potholes in CD 8.<sup>14</sup>

Because the City does not receive a similar number of requests for pothole repairs across CDs, the street condition, lane mileage, and mileage of heavy traffic streets must also be considered when assessing the equity of pothole operations. The City's recent Pavement Management Plan provides the current average pavement condition of each CD. While all CDs fall within the "fair" PCI range (55–69), CDs 5, 7, and 8 have the highest average PCIs. Meanwhile CDs 2, 3, and 4 have the lowest average PCIs.

Regarding lane mileage, CD 2 has the largest portion of the City's streets (14 percent), followed by CDs 1, 5, and 6 (all with 13 percent). Meanwhile, CD 9 has the lowest portion of the City's streets (8 percent). Another factor is the proportion of heavy traffic streets within each CD. For instance, CD 1 has the highest portion of heavy traffic streets compared to other road types within its boundaries. Conversely, CD 4 has the lowest portion of heavy traffic streets compared to other road types. Therefore, to determine if inequities exist within pothole operations across the City, numerous factors must be taken into consideration, as shown in **Exhibit 16**.

---

<sup>14</sup> Of note, the 2022 Performance Audit of the City's Get It Done Application and Service Request Management found that the lack of a centralized, phone-based intake option, or 3-1-1, likely makes it more difficult for some residents to contact the City, such as residents with technical barriers or those with limited English proficiency.

*Exhibit 16*

**CD Characteristics Such as the Average PCI, the Percent of Pothole Requests, the Percent of the City’s Street Network, and the Number of Miles of Heavy Traffic Streets Factor into the Equity of Pothole Operations Across the City**

Council District	Average PCI Rating	Percent of City’s Pothole Requests	Percent of City’s Street Network	Miles of Heavy Traffic Streets
1	65	13%	13%	116
2	57	16%	14%	95
3	61	15%	9%	32
4	61	8%	9%	18
5	69	7%	13%	109
6	62	14%	13%	105
7	67	11%	12%	78
8	66	6%	9%	71
9	62	11%	8%	28

Note: Heavy Traffic Streets include streets categorized as Prime and Major streets.

Source: OCA generated based on the City’s 2024 Pavement Management Plan, data provided by Transportation, and the City’s Get It Done request data.

Should Transportation determine that inequities in pothole operations exist across the City, it will need to assess the best method to address these inequities, such as by sending crews to proactively repair potholes in underreported areas of the City. The department could more easily facilitate proactively sending crews to these underreported areas of the City if it implemented a mapping software and had at least one additional patch truck, as discussed in Topic One. Mapping software and at least one additional patch truck would allow crews to respond to repair requests more quickly. Therefore, crews could respond to more pothole requests each day and have more time to proactively repair potholes.

The Department of Race and Equity has mentioned that part of Transportation's updated Citywide street assessment will include evaluating the equity of street maintenance services. Therefore, Transportation should work with the Department of Race and Equity to assess the equity of pothole operations and should inequities be present, Transportation should determine how these inequities will be addressed and present this plan to the Active Transportation and Infrastructure Committee.

## 2024 Recommendation:

### **Recommendation 3.2**

(Priority 3)

The Transportation Department (Transportation) should work with the Department of Race & Equity to assess the equity of pothole operations. Should inequities in operations exist, Transportation should determine how it will address potential inequities in pothole repair operations, include the approach to improve equity in the Pavement Management Plan, and present this plan to the Active Transportation and Infrastructure Committee.

**Management Response:** Agree [See full response beginning on page 50.]

**Target Implementation Date:** TBD (Transportation plans to meet with the Department of Race and Equity in the first quarter of FY2025 to evaluate potential improvements in pothole operations)

## ***New Issue 2: Crews have not consistently recorded proactively repaired potholes in BlueWorx, resulting in reports that do not include all pothole repairs.***

---

At the time that fieldwork was completed, Transportation's tracking and monitoring of pothole operations did not include proactively filled pothole repairs; therefore, Transportation could not accurately track or report the total number of potholes repaired. Pothole repair crews did not systematically record proactively filled potholes in BlueWorx; instead, crews recorded these repairs on paper forms only. According to Transportation, prior to BlueWorx, crews did not have a reliable method to record proactively repaired potholes into the data system. Transportation stated that while crews can now record proactively repaired potholes in BlueWorx, crews had not yet received training on how to record these proactive repairs on the platform.

At the end of this audit, Transportation reported that crews are already receiving training on recording proactively repaired potholes into BlueWorx. Therefore, Transportation should update the Standard Operating Procedure and require crews to record proactively repaired potholes in BlueWorx to ensure the department can accurately track and report all pothole repairs completed. Transportation should create an indicator in BlueWorx that identifies proactively filled pothole repairs.

## **2024 Recommendation:**

### ***Recommendation 3.3***

(Priority 2)

The Transportation Department should update the Standard Operating Procedure to require crews to enter proactively repaired potholes into BlueWorx, with an indicator in BlueWorx that notes the location was a proactively repaired pothole.

**Management Response:** Agree [See full response beginning on page 50.]

**Target Implementation Date:** According to Transportation, the practice has been trialed and implemented; the SOP will be updated in the first quarter of FY2025.

# 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*	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 nonfiscal 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.

\* 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*

---

### Objective

In accordance with the Office of the City Auditor's approved Fiscal Year 2024 Audit Work Plan, we conducted a high-risk re-review of the City of San Diego's (City) pothole repair operations. The objective of this audit was to determine the extent to which the City is still implementing the identified (or similar) recommendations in OCA's 2013 Performance Audit of the Street Division's Pothole Repair Operations. Specifically, the objectives were to:

- Determine the completeness and reliability of pothole operational data collected, analyzed, and publicly reported; and
- Analyze the effectiveness, efficiency, and equity of Citywide pothole repair operations.

### Scope

The scope of this audit included the City's pothole repair operations from July 1, 2022 through September 30, 2023.

### Methodology

To determine the extent to which the City was continuing to implement the identified (or similar) recommendations from the 2013 audit, we:

- Reviewed previous City of San Diego Office of the City Auditor reports, data, and recommendation follow-up documentation;
- Reviewed the 2023 San Diego County Grand Jury Report on street paving;
- Reviewed current industry best practices regarding pothole street maintenance, and related data collection in the field;
- Reviewed the City's current internal and external policies and procedures with regard to pothole operations and pavement management;
- Reviewed 2023 and 2024 published articles related to potholes within the City of San Diego;
- Reviewed City communications materials relating to pothole operations including the City's website and social media posts;
- Reviewed Transportation's 2024 adopted budget;
- Reviewed the current contract documents for vendors relevant to the City's pothole operations;

- Interviewed members of the Transportation Department that oversee the City's pothole operations and relevant performance metrics;
- Conducted a ride-along with a pothole operations crew;
- Benchmarked pothole operations procedures and performance metrics to determine best practices. Public entities we benchmarked with include:
  - City of Los Angeles
  - City and County of San Francisco
  - City of Sacramento
  - City of Long Beach
  - City of Oakland
  - City of San Jose
  - City of Dallas
  - City of Houston
  - City of Phoenix
  - City of Seattle
- Tested the data reliability and analyzed a statistically significant random sample of pothole notifications on paper records against the records in SAP within the testing period of July 1, 2022 through September 30, 2023;
- Reviewed a judgmental sample of 15 pothole notifications in SAP against the paper records within the testing period of July ,1 2022 through September 30, 2023;
- Analyzed pothole operations data from July 1, 2022 through September 30, 2023 within SAP;
- Analyzed Get It Done pothole operations data available on the City's open data portal, DataSD;
- Worked with staff from the City's Fleet Operations Division to export pothole operations vehicle work order data from July 1, 2022 through September 30, 2023 and analyzed the exported data reports;
- Worked with staff from the City's Fleet Operations Division to export GPS records of pothole operations vehicles from September 17, 2022 through September 30, 2023 and analyzed the exported data reports;
- Worked with the City's GIS analysts to map the pothole operations activities of a randomly selected date, based on GPS, SAP pothole data, and Daily Work Reports; and
- Worked with the City's GIS analysts to map a route model map of routes and pothole notifications that could have been responded to on the same randomly selected day if notification assignments were more geographically based.



## Data Reliability

Testing of the completeness and reliability of pothole operational data was included within the objective of our audit. We primarily reviewed the pothole operational data within SAP as well as the paper records of pothole operations. We interviewed the Transportation Department regarding controls over the data collection process.

To assess the reliability of pothole operations data, we reviewed a statistically significant random sample (with a 95 percent confidence level, a 5 percent margin of error, and a 50 percent response distribution) of pothole notifications on paper records against the records in SAP. We also reviewed a judgmental sample of 15 pothole notifications in SAP against the paper records.

## Internal Controls Statement

We limited our review of internal controls to specific controls relevant to our audit objective, described above.

## 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.

# Appendix C

## *Methodology, Parameters, and Limitations of Theoretical Geographic Proximity Route Model*

---

### **Methodology of Date Selection and Modeling Actual Work Completed**

For the specific test date, we randomly selected one workday within our testing period, July 1, 2022 through September 30, 2023, with the following criteria: a non-overtime workday, after May 21, 2023 when Transportation implemented the 10-hour workday, and before the driest part of the calendar year (August and September) when the pothole backlog is lighter. This resulted in the selection of July 17, 2023 as the test date. We then used SAP pothole data to identify all pothole requests received on or before July 17, 2023 that had not yet closed. We also excluded reported emergency potholes, except for the reported emergency pothole that occurred on July 17, 2023, as these reports tend to come in after the supervisor assigns the pothole requests to crews and therefore cannot be planned with the assignments.

Then the City's GIS team used City Vehicle GPS data and data we gathered from Transportation's Daily Work Report forms and SAP to determine and model the actual routes driven and work completed on July 17, 2023.

### **Methodology for the Theoretical Geographic Proximity Route Model**

For the proximity model, the City's GIS team used the Vehicle Routing Problem analysis model, which uses Dijkstra's algorithm to solve for shortest path. The team utilized data from City Vehicle GPS data, data from Transportation's Daily Work Report forms, and SAP pothole data to create the proximity model. We selected the six Council Districts for the proximity model based on Council Districts with the highest number of open pothole requests. To break a tie between the two Council Districts with the same number of open pothole requests, we selected the Council District with the oldest pothole request.

### **Parameters of Proximity Model**

Based on our analysis of the average Chollas departure times, average drive time to the asphalt materials yard, average wait time at the asphalt materials yard, average time to respond to a pothole request, average times for breaks and lunch, and average return time to Chollas, the GIS team included the following parameters in the proximity model:

- Routing begins at 8:00 a.m. from the materials yard, with an allowed 7 hours and 15-minutes in the field;

- Two 15-minute breaks and one 30-minute lunch;
- Breaks occur along the route within the window times indicated below:
  - 9:15–9:30 a.m. for 15-minute break
  - 11:45–12:15 p.m. for 30-minute lunch
  - 2:00–2:15 p.m. for 15-minute break
- Time spent at each pothole location is 20 minutes;
- U-turns not allowed during routing or immediately after repair; and
- Hard zones enforced (patch trucks may only visit potholes in designated Council District).

### **Limitations of the Proximity Model**

The proximity model could not include certain aspects of real-life field work for pothole repairs, such as:

- Traffic delays;
- When patch trucks must travel slower than the posted speed limits;
- If patch trucks and crews must return to Chollas or the asphalt material yard for additional supplies;
- When the planned route is changed to respond to a reported emergency pothole request; and
- When trucks respond to pothole requests in more than one Council District.



THE CITY OF SAN DIEGO

MEMORANDUM

DATE: April 19, 2024

TO: Andy Hanau, City Auditor, Office of the City Auditor

FROM: Bethany Bezak, Director, Transportation Department

SUBJECT: Management Response to the Office of the City Auditor’s Re-Review Pothole Repair Operations Audit Report

This memorandum serves as the Management Response to the Re-Review Performance Audit of the City’s Pothole Repair Operations. Management appreciates the Re-Review Performance Audit prepared by the Office of the City Auditor and thanks the staff involved. Management agrees with all recommendations.

The City of San Diego has the 2nd largest roadway network in California with over 6,600 lane miles. The recent condition assessment completed in 2023 resulted in an average Pavement Condition Index (PCI) score of 63 compared to 71 in 2016. Overall, the network has deteriorated as expected primarily due to the historically inconsistent maintenance and rehabilitation funding, and has led to a predictable increase in demand for pothole repairs. Though efficiencies in the deployment of personnel and equipment are continuously being sought, the primary limiting factors in the City’s ability to prevent and respond to pothole repair requests are personnel and resources. Recovering from years of budgetary shortfalls will require supporting the maintenance and rehabilitation requirements identified in the Pavement Management Plan (PMP) including increases in the City’s Mill and Pave operations. However, improving the overall condition of the City’s streets will take years of investment, and in the interim, increased resourcing of the City’s pothole repair operations through the procurement of additional patch trucks and the addition of patch crews can mitigate the impact of streets in poor condition.

**Recommendation 1.1**

The Transportation Department (Transportation) should research and determine if a compatible geographic routing software is feasible to purchase and pilot, such as SAP’s Geoexplorer mapping function. If Transportation cannot find feasible software to purchase and pilot, it should document its efforts and evaluations. If a feasible software is found, Transportation should pilot the software with the intent to implement the use of geographic routing or mapping software to assist with the assignment of pothole requests. The software should allow the supervisor to see all outstanding pothole requests to help with assigning pothole requests geographically near each other.

**Management Response:** Agree. A software solution that provides a graphical view of open pothole Service Notifications along with the integrated ability to group and assign those Service Notifications to field workers has the potential to improve operational efficiency, especially during periods with elevated pothole reports. If a functional solution is identified, the software would need to be procured, if necessary, integrated with the City's current software suite, and then tested to ensure functionality and to resolve or mitigate any potentially adverse outcomes (e.g., negative effects of average time-to-repair or overaged geographical-outlier potholes).

**Target Implementation Date:** TBD. Complete feasibility research by September 2024. If feasible, procure software if necessary and conduct a pilot from October 2024 through September 30, 2025. The target implementation date is TBD depending upon resource allocation and the results of the pilot.

### Recommendation 1.2

If geographic routing or mapping software is implemented to assist with the assignment of pothole requests (Recommendation 1.1), the Transportation Department should:

- Update the Standard Operating Procedure to instruct the supervisor to assign pothole requests in geographic clusters; and
- Assess and increase crews' daily pothole request goal.

**Management Response:** Agree. If a practicable software solution is identified, its use would be incorporated into the Pothole Repair SOP, and daily production targets could be increased dependent upon the results of field testing and analysis.

**Target Implementation Date:** TBD. Dependent upon identification, funding, procurement, integration, and testing outcomes from recommendation 1.1.

### Recommendation 1.3

If one or more additional patch trucks are not included in the proposed FY2025 Transportation Department (Transportation) budget, Transportation should highlight this need in its budget presentation to City Council and the Chief Operating Officer should consider the request in the May Revise. If the request for one or more additional patch trucks is not granted for FY2025, Transportation should repeat the budget request in the next budget cycle. Along with this budget request, Transportation should report the frequency patch trucks were out of service for repairs in the prior fiscal year(s) along with the efficiencies and additional productivity that can be gained with additional truck(s).

**Management Response:** Agree. Productivity is impacted as patch trucks require regular repair, maintenance, and state and federal-mandated inspections. A bench of available trucks would improve the City's pothole repair performance. Transportation will request additional patch trucks to create a bench and to replace holdover vehicles.

**Target Implementation Date:** April 2024 for May 2024 budget revision (initial request); an additional request will be made for FY26 funding if patch trucks are not added to the FY25 budget.

## Recommendation 1.4

The Transportation Department should conduct a staffing analysis to determine how to maximize the productivity of available staff, such as when patch trucks are out for repairs and maintenance, while the staff is waiting for asphalt to be picked up, as well as for other staffing efficiencies, considering options such as staff conducting pre-inspections or repairing potholes with cold mix asphalt.

**Management Response:** Agree. Transportation has conducted such reviews in the past with the resulting practice of deploying available staff members (when their patch trucks are down for repairs and maintenance) to support larger patching jobs requiring increased traffic control and using personnel to screen Service Notifications suspected of being road-condition complaints rather than reparable potholes. Transportation will further assess potential operational efficiencies for staff hours and document those practices in the Pothole Repair SOP.

**Target Implementation Date:** The first quarter of FY2025.

## Recommendation 2.1

To improve consistency of data collection, the Transportation Department (Transportation) should update the Potholes Standard Operating Procedures (SOP) with criteria (definitions, descriptions, and/or photographs) to guide crews on how to quantify the estimated count of potholes repaired and the square footage of asphalt used (if this metric is kept). Transportation should also train all crews on the updated SOP.

**Management Response:** Agree. Transportation will define a methodology for counting potholes, include it in the Pothole Repair SOP, and conduct crew training. Square footage of potholes repaired is a legacy metric that is no longer used and will be discontinued.

**Target Implementation Date:** The first quarter of FY2025.

## Recommendation 2.2

The Transportation Department should include an IT control that will prevent crews from closing the online form in BlueWorx until all necessary data fields are selected and entered (i.e., date, request number, number of potholes repaired, square footage, and activity code).

**Management Response:** Agree. Transportation will work with DoIT to determine the ability to include a control requiring certain data fields to be completed before moving to a new job to improve data completeness.

**Target Implementation Date:** TBD. Transportation will work with DoIT to determine a course of action for creating mandatory data field controls no later than the second quarter of FY2025. The final implementation date is TBD dependent upon DoIT's ability to support it.

### Recommendation 2.3

Once Transportation implements the IT control in Recommendation 2.2, Transportation should update the Standard Operating Procedures to instruct crews to only enter data into BlueWorx; train crews on the change; and keep paper forms in the patch trucks in case crews cannot connect to the network in the field. Additionally, the supervisor should continue with regular data reliability reviews but should spot-check SAP for completeness and irregularities rather than review every request entered by crews.

**Management Response:** Agree. Once a data-entry-forcing-function is enabled in BlueWorx, a reduction in paperwork and a shift to both IT data and field spot-checks would allow more effective use of crew and supervisor time.

**Target Implementation Date:** TBD. Dependent upon the implementation outcome of recommendation 2.2.

### Recommendation 3.1

The Transportation Department should independently, or with the assistance of the Performance and Analytics Department, establish a KPI or internal performance measure that encompasses assessing the efficiency of pothole operations, considering metrics such as the average number of potholes repaired per day compared to the internal goal; the percentage of sites that need additional repair work, or the average time between pothole repair and the pothole needing additional repair.

**Management Response:** Agree. Though efficiency measures have the potential to create conflicting incentives with the City's primary pothole KPI of average time to repair, the Department recognizes the benefit of tracking certain measures internally to help assess performance and will reflect the measures below in the updated Pothole Repair SOP.

- Cost per pothole: as the City has large fixed costs (payroll, some vehicle costs), the cost per pothole is largely an inversely proportional function of the number of potholes repaired with lower cost/pothole in rainy years with high pothole counts and higher cost/pothole in dry years with fewer potholes. This information does provide the Department with another metric to help explain pothole operations from year to year.
- Potholes repaired/day/crew: provides the Department with metrics on daily production rates and could prompt future process improvements if production declines.

**Target Implementation Date:** The first quarter of FY2025.

### Recommendation 3.2

The Transportation Department (Transportation) should work with the Department of Race & Equity to assess the equity of pothole operations. Should inequities in operations exist, Transportation should determine how it will address potential inequities in pothole repair operations, including the approach to improve equity in the Pavement Management Plan and present this plan to the Active Transportation and Infrastructure Committee.

Page 5  
Andy Hanau, City Auditor, Office of the City Auditor  
April 19, 2024

**Management Response:** Agree. Transportation will work with the Department of Race and Equity to review pothole repair practices and assess equity in operations. Transportation will determine a way ahead based on the outcome of the assessment.

**Target Implementation Date:** TBD. Meet with the Department of Race and Equity in the first quarter of FY2025 to evaluate potential improvements in pothole operations.

### Recommendation 3.3

The Transportation Department should update the Standard Operating Procedure to require crews to enter proactively repaired potholes into BlueWorx, with an indicator in BlueWorx that notes the location was a proactively repaired pothole.

**Management Response:** Agree. The ability to enter proactively repaired potholes in BlueWorx has been implemented and crews have been trained. This process will be included in the next revision of the Pothole Repair SOP.

**Target Implementation Date:** The practice has been trialed and implemented; the SOP will be updated in the first quarter of FY25.

In summary, Management has been and continues to be interested in the ongoing improvement of pothole repair operations through the efficient and effective use of available resources. In response to the FY13 audit, Transportation implemented new deployment strategies and data management processes to improve data collection accuracy. Management supports the continued evolution of these goals to capitalize on the potential efficiency and productivity gains to be made through further technology integration as suggested by the Office of the City Auditor. Funding additional Patch Trucks to ensure City workers have available equipment each day, as called for in this audit, would be the most direct, effective, and beneficial method to improve the City's pothole repair operations.

Thank you for the opportunity to provide responses to these recommendations. Management appreciates your team's professionalism throughout the review.



Bethany Bezak  
Director  
Transportation Department

BB/ph



Page 6

Andy Hanau, City Auditor, Office of the City Auditor

April 19, 2024

cc: Paola Avila, Chief of Staff, Office of the Mayor  
Eric Dargan, Chief Operating Officer  
Charles Modica, Independent Budget Analyst  
Matthew Vespi, Chief Financial Operator  
Alia Khouri, Deputy Chief Operating Officer  
Kris McFadden, Deputy Chief Operating Officer  
Nick Serrano, Deputy Chief of Staff  
Matt Yagyagan, Director of Policy, Office of the Mayor  
Kim Desmond, Chief of Race and Equity  
Musheerah Little, Director, General Services Department  
Rolando Charvel, Director, Department of Finance  
Christiana Gauger, Chief Compliance Officer, Compliance Department  
Kirby Brady, Chief Innovation Officer, Performance and Analytics Department  
Jonathan Behnke, Chief Information Officer, Department of IT



[sandiego.gov/auditor](http://sandiego.gov/auditor)