
OFFICE OF THE CITY AUDITOR

PERFORMANCE AUDIT OF STREET POTHOLE REPAIRS AND RELATED ISSUES

**Thomas M. Taylor, CPA
City Auditor**

Prepared by:

Terry R. Milrany, CPA
Senior Audit Manager

Theresa A. Hampden, CPA
Audit Manager

Craig J. Hametner, CPA, CMA, CFE
Auditor

**September 12, 2003
Report No. 395**

Memorandum



September 12, 2003

Honorable Mayor and Members of the City Council
City of Dallas

We have conducted a performance audit of street pothole repairs and related issues. Pothole repairs are the responsibility of the Street Services Department.

The Street Services Department adequately identifies potholes. We found that the department is diligent and responsive in repairing potholes. However, resource limitations (e.g., equipment, personnel) negatively impact the effectiveness and efficiency of pothole repairs, as well as the use of repair crews. These concerns are noted and discussed in the *Opportunities for Improvement* section of this report.

The overall street condition impacts the number and longevity of pothole repairs. The quality of the pothole repair may be less significant than the condition of the surrounding street in determining pothole occurrence or the duration of a pothole repair.

We appreciate the cooperation of City staff during our examination.

Thomas M. Taylor

Thomas M. Taylor, CPA
City Auditor

c: Teodoro J. Benavides, City Manager

**PERFORMANCE AUDIT OF
STREET POTHOLE REPAIRS AND RELATED ISSUES**

CONTENTS

	PAGE
EXECUTIVE SUMMARY	1
INTRODUCTION	3
Authorization	3
Scope and Methodology	3
Overall Conclusion	4
Background	5
MANAGEMENT'S ACCOMPLISHMENTS	11
OPPORTUNITIES FOR IMPROVEMENT	12

EXECUTIVE SUMMARY

We have conducted a performance audit of street pothole repairs and related issues for October 1, 2000, through September 30, 2002. Pothole repairs are the responsibility of the Street Services Department (SSD). As a result of our inquiries, observations, examinations, and tests, we conclude that:

The SSD adequately identifies potholes. The SSD is diligent and responsive in repairing potholes. However, resource limitations (e.g., equipment, personnel) negatively impact the effectiveness and efficiency of pothole repairs, as well as the use of repair crews.

The overall street condition impacts the number and longevity of pothole repairs. The quality of the pothole repair may be less significant than the condition of the surrounding street in determining pothole occurrence or the duration of a pothole repair.

Separate management letters were issued to SSD management regarding major thoroughfare routes/City street maintenance agreements and to the Public Works and Transportation Department regarding truck routes.

We have summarized our findings below.

- Some resources are not used efficiently or effectively. One district does not have a sufficient number of functioning pothole patch vehicles for pothole repairs; thus, dump trucks are used. Dump trucks are not designed for efficient and effective repair of potholes. Additionally, pothole patch trucks are picking up new batches of asphalt material more frequently than needed resulting in work crews being away (for at least one hour) from their primary responsibility of filling potholes.
- Efficiency and effectiveness are difficult to measure due to inconsistent and unreliable methodologies. Reported street repair activities are not consistent, comparable, or reliable. There are inconsistencies in and between SSD districts regarding what was reported as a pothole versus a level up. The number of pothole repairs reported suggests a more degenerated street, as compared to the number of level ups. Therefore, properly classifying the type of street repair is critical to management since it impacts management decisions. Measurements of productivity were also inconsistent since the crewmembers use their shoes as the primary tools for measuring the size of the pothole/level up.
- During our on-site reviews/testing, we observed various instances of non-compliance with departmental safety requirements. Non-compliance with departmental requirements and stated guidelines may indicate a need to provide safety training and monitor work crews more frequently to ensure adherence to departmental and other safety requirements.

- The Citizen Response Management System (CRMS) does not provide adequate information needed to assess the efficiency of the pothole repair process. We identified the following concerns:
 - Overall performance statistics (e.g., work orders open, closed, overdue) for a street repair group (e.g., hazardous, routine) are available; however, performance statistics for individual activity within the group, such as potholes repaired, are not currently available.
 - There is not reasonable assurance that the CRMS reflects actual response time for all hazardous street repairs.
 - Performance measurements for hazardous potholes as a single category are difficult to determine since hazardous potholes are shown as three separate categories within the CRMS.
- Current agreements with DART have not been implemented or consistently monitored. Bus traffic contributes significantly to the deterioration of streets.

We commend the department for accepting our recommendations and taking steps to resolve these issues.

INTRODUCTION

Authorization

We have conducted a performance audit of street pothole repairs and related issues, which is administered and overseen by the Street Services Department (SSD). This audit was conducted under the authority of Chapter IX, Section 2 of the Dallas City Charter and in accordance with the Annual Audit Plan approved by the City Council.

Scope and Methodology

Our examination was made in accordance with generally accepted government auditing standards and, accordingly, included tests of the accounting and related records and other audit procedures that we considered necessary in the circumstances. Our audit covered the street pothole repair process for October 1, 2000, through September 30, 2002.

In November 2001, the international public accounting and consulting firm of KPMG completed a performance audit of the SSD. That audit addressed street repairs in general. However, KPMG's report also addressed issues specific to potholes. Pothole related recommendations specified that the City should report:

- "... the number of potholes identified and repaired;
- Actual per unit cost to fix potholes, resurface lane mile by district;
- Percentage of projects completed at or under budget;
- Percentage of projects completed on time;
- Utilization of overtime; and
- MWBE utilization in contracting."

KPMG also recommended that SSD improve its management information system and institute activity-based costing for measuring the real cost of providing every identifiable activity within the department.

Recognizing the objectives and scope of the KPMG audit and reported recommendations, we identified additional issues that were significant to the pothole repair process that had not been addressed by KPMG. Thus, our audit covers issues specific to pothole repairs and related matters. While the thrust of this audit is pothole repairs, it must be noted that potholes, in most instances, are the by-products of the street area (that is in need of more extensive repairs) surrounding the pothole. The City Council recognizes the need for major street repair and has proposed \$266.9 million in the bond projects, which was approved by voters on May 3, 2003.

INTRODUCTION

The objectives of our audit were to determine whether:

- The City has used all reasonable means to identify potholes.
- Street repair crews repair potholes in the most effective and efficient manner.
- Street repair crews are deployed in the most efficient and effective manner.
- Roving crews provide the City with the most efficient use of resources to fill potholes.

To achieve our audit objectives, we:

- Observed pothole repairs in four maintenance districts.
- Conducted interviews with departmental personnel.
- Examined and analyzed SSD management information system reports and documentation from the maintenance districts.
- Reviewed the Inter Local Agreement with Dallas Area Rapid Transit (DART).
- Surveyed several cities regarding street repair processes and equipment used (see Exhibit).
- Reviewed KPMG's November 2001 *Street Services Department Performance Audit Report*.

Overall Conclusion

The SSD adequately identifies potholes. The SSD is diligent and responsive in repairing potholes. However, resource limitations (e.g., equipment, personnel) negatively impact the effectiveness and efficiency of pothole repairs and use of repair crews. These concerns are noted and discussed in the *Opportunities for Improvement* section of this report.

The overall street condition impacts the number and longevity of pothole repairs. The quality of the pothole repair may be less significant than the condition of the surrounding street in determining pothole occurrence or the duration of a pothole repair.

Separate management letters were issued to SSD management regarding major thoroughfare routes/City street maintenance agreements and to the Public Works and Transportation Department (PWT) regarding truck routes.

INTRODUCTION

Background

Damage and breakdown to the City's street surfaces result from a variety of causes [e.g., weather, traffic (volume, weight of vehicles), prior street cuts, age]. The repairs needed to correct breakdown and/or damage to street surfaces vary depending on the nature of the problem. A pothole is a crater or hole in the street. A level up is a procedure to correct a swag or dip in the road. A full-depth repair (beyond the scope of this audit) covers a more significant deterioration of the street surface.

We also considered users of City streets (e.g., DART) to determine additional significant street wear caused by the identified user(s), as well as any remuneration paid/contributions received to offset additional street wear.

Asphalt, both hot and cold mix, is the primary material used by the City to repair potholes. Asphalt has several advantages over concrete for street repairs.

- Asphalt is more cost effective.
- Asphalt adheres better than concrete.
- Asphalt's setting time is considerably less than concrete's.

The equipment used for pothole repair consists primarily of pothole patch trucks; however, dump trucks are also used. Pothole patch trucks are all-in-one vehicles that carry tack, asphalt, compressed air, a jackhammer, vibratory plate, and a bin used for storing discarded street material. Currently, a pothole patch truck costs approximately \$94,000.

Through September 2002, the SSD was decentralized and divided into four operating districts. A district manager was responsible for each district. Information pertaining to each district is summarized in the table on the following page:

INTRODUCTION

SSD's Operating Districts through September 2002						
District	Area Within the City	# of Lane Miles in District	Number in Each District			
			Pothole Patch Trucks		Dump Trucks Available for Asphalt Operations	Number of Asphalt Repair Crews
			Assigned	In Use		
1	Southeast and the Central Business District	3,553	6	6	8	6
2	Southwest	2,822	3	*1	8	3
3	Northwest	2,422	3	3	8	3
4	Northeast	2,569	3	3	8	3
Total		11,366	15	13	32	15

* One pothole patch truck was unavailable for 60 days during April through October 2002. Another pothole patch truck has been unavailable since April 2002.

Beginning in October 2002, the SSD realigned its resources into two operating districts. Former District Managers are now contact persons for areas of specialization (asphalt, concrete, excavation, right-of-way). For example, resources for asphalt street repairs, which are located in Southeast and Northwest districts, are coordinated through the asphalt specialist or contact person. The current information pertaining to each district is summarized below:

SSD's Operating Districts Effective October 2002						
District	Area Within the City	# of Lane Miles in District	Number in Each District			
			Pothole Patch Trucks		Dump Trucks Available for Asphalt Operations	Number of Asphalt Repair Crews
			Assigned	In Use		
1	Southeast and the Central Business District Southwest	6,375	9	*8	16	9
3	Northwest Northeast	4,991	6	6	16	6
Total		11,366	15	14	32	15

* One pothole patch truck has been unavailable since April 2002.

Two crewmembers are assigned to each pothole patch vehicle. Dump trucks are also used for asphalt operations. The dump trucks are not designated for "pothole" or "level up" repairs. Dump trucks are also used for full-depth and other street repairs as needed. In each designated area, one crew is dedicated to

INTRODUCTION

patrolling the major thoroughfare routes and repairing/notifying appropriate personnel when other street repair needs are identified. The concept and utilization of roving crews is operationally viable. The roving crew proactively identifies and fixes pothole and level up problems on major thoroughfare routes. The other crews are assigned to specific areas within each district and are more flexible in responding to “dispatch calls” received through the 3-1-1 system as well as other sources. The SSD provided the following unaudited information:

Labor/Materials Cost for Asphalt Street Repairs	FY 2001 & 2002		BUDGET
	FY 2000-2001	FY 2001-2002	FY 2002-2003
Labor	\$2,232,553	\$2,336,073	\$2,398,528
Materials	\$1,114,632	\$1,156,597	\$1,192,395
Total	\$3,347,185	\$3,492,670	\$3,590,923

The SSD provided the following productivity data pertaining to potholes and level ups completed from October 2001 through September 2002.

District Productivity Report for Potholes and Level ups for October 2001 – September 2002							
District	Potholes Repaired			Level ups Repaired			Average Number
	Number of Repairs (a)	Number of Lane Miles Repaired (b)	Average # of Potholes Repaired Per Lane Mile (c) = (a) / (b)	Number of Repairs (d)	Number of Lane Miles Repaired (e)	Average Number of Level ups Per Lane Mile (f) = (d) / (e)	Potholes & Level ups Repaired Per Lane Mile (g) = (c) + (f)
1	9,434	720	13	1,909	117	16	29
2	9,317	376	25	2,764	215	13	38
3	2,130	91	23	6,635	465	14	37
4	6,478	475	14	4,143	142	29	43
Totals	27,359	1,662	16	15,451	939	16	

The preceding table is based on data provided by the SSD and is unaudited.

The Citizen Response Management System (CRMS) is the primary source used by individuals/groups to report City street repair needs. The CRMS receives calls through the City’s 3-1-1 system. The 3-1-1 system became operational in January 2002. Other sources used to identify street repair needs include roving pothole crews, City employees (including police, fire, and

INTRODUCTION

water), DART, neighborhood associations, and utility company personnel.

Operators receiving 3-1-1 calls request sufficient information to make an initial determination whether the problem is considered a hazard requiring immediate attention or a non-hazardous street problem. The 3-1-1 operators will contact the appropriate district “via dispatch” to request that action be taken within twenty-four hours for problems that are considered hazardous. 3-1-1 calls considered non-hazardous are forwarded to a Service Request Agent (SRA), who is assigned to each district. Each SRA will:

- Perform a site visit and assess the street condition.
- Notify and inform the asphalt or concrete supervisor regarding any identified problem(s).
- Contact the individual who placed the 3-1-1 call to provide information regarding the response as well as specific plans to address any identified problem.

Based on the SRA’s assessment and, in some cases, site visits by the asphalt and/or concrete supervisor, reviewing personnel determine needed street repairs. The applicable district prepares a work order. Each district distributes work orders to the pothole crews daily.

The SSD’s objective is for the pothole repair process to begin soon after repair needs are identified. Filling a pothole consists of:

- Cleaning debris from the hole.
- Squaring the area around the hole (using a jackhammer).
- Removing and cleaning the material from the hole.
- Applying “tack” to the area.
- Pouring in the asphalt.
- Packing/compacting the fill material in the hole.
- Measuring the size of the repaired area.

Repairing a level up is similar, although it typically does not involve squaring the area around the hole. Both non-hazardous potholes and level ups are generally completed within 30-90 days. A full-depth repair requires additional equipment, materials,

INTRODUCTION

personnel, and time to complete. A pothole patch truck is designed for efficient and effective minor street repairs. In one district, two pothole patch trucks were not in service due to breakdowns and/or other maintenance needs. As a result, dump trucks are also used to transport crews, material, and equipment to fix potholes and level up problems. Dump trucks are not designed for efficient and effective repair of potholes or level ups.

Pothole crews also respond to alley pavement surface problems. The City's sanitation trucks cause the majority of alley problems. Many of the City's alleys are eight feet wide, which is the approximate width of a sanitation truck. Because the alleys and trucks are approximately the same width, the vehicle's weight cannot be equally distributed on the alley pavement. Sanitation trucks are loaded from the side of the vehicle, which means the truck must move as far to the opposite side of the alley as possible. This need creates excessive stress to one side of the alley, ultimately causing it to crack. Over time the crack spreads. Water penetrates these cracks causing additional damage to the base and pavement.

A study by the Federal Highway Administration stated, "The most critical issue in pothole repair is the quality of the materials used to fill in the pothole.... Higher grades of pothole patching material typically have aggregate mixes that are less susceptible to moisture damage and are more durable." The City currently uses hot mix asphalt, which is a mixture of aggregate, sand, and emulsified asphalt. The cold mix used by the City is a Universal Pothole Mix.

The study discusses other factors, such as the compaction of pothole fill material following the repair, the preparation of the site for repair, the levels of precipitation at the location, and the amount of and vehicle mix of traffic on the road all impact the effectiveness of the pothole repair. In the book *Municipal Benchmarks* it states, "Responsiveness is also an important aspect of street maintenance. High-quality street maintenance programs will not allow potholes and other road hazards to remain unrepaired for extended periods."

Highway departments have successfully used three methods for repairing potholes: throw-and-roll, semi-permanent, and spray injection. The semi-permanent patching is the most widely recommended method of pothole repair. This repair method

INTRODUCTION

requires more equipment and workers than the throw-and-roll or spray injection methods, but results in a very tightly compacted patch. The SSD primarily uses a semi-permanent patch method.

Other than the method used to repair the pothole, there are various other factors that impact the life of a pothole. A publication by the American Public Works Association states, “A pothole can be repaired to last for several years – if the causes of the initial failure (poor drainage, weakened subbase, etc.) are also corrected and if the patch is bonded to the old pavement well enough to prevent water from seeping into the subbase along the seam.”

Thus, good design, the quality of materials, and continuous maintenance can substantially prolong the life of a street and minimize the emergence of potholes.

MANAGEMENT'S ACCOMPLISHMENTS

In anticipation of this report, the management staff of the SSD was asked to provide comments on procedural and operational changes and improvements. Their unedited comments are included below.

- Created a career development program to train people to become supervisor and managers to replace people expected to retire in the next several years.
- Created job specific asphalt and concrete repair training programs emphasizing correct procedures and consistency among districts.
- Initiated the Road Block Busters program to elicit process improvement ideas from employees.
- Started a new production report for Street Operations districts to better describe what work has been accomplished.
- Posted a status report on Streets 2010 programs on the Internet to inform citizens of progress and accomplishments.
- Implemented a new inventory program to better track purchase and use of materials.
- Designed and purchased, in a pilot program, new vehicles for asphalt and concrete crews to better deliver personnel and tools to job sites.

OPPORTUNITIES FOR IMPROVEMENT

We identified certain policies, practices, and procedures that should be improved. Our audit was not designed or intended to be a detailed study of every relevant system, procedure, and transaction. Accordingly, the opportunities for improvement presented in this report may not be all-inclusive of areas where improvement may be needed.

1. Some resources are not used efficiently or effectively.

During our site visits and discussions with personnel in each district, we found that:

- A. One district does not have a sufficient number of functioning pothole patch vehicles for pothole repairs; thus, dump trucks are used. Two of three pothole patch trucks were inoperative. The inoperative trucks were seven and ten years old. Continued reductions in the SSD's annual budgets have impacted the purchase, as well as prompt repair, of pothole patch trucks.

To compensate for the shortage of pothole patch repair trucks, dump trucks were used. However, dump trucks are unable to maintain the hot mix at its optimum level, since the container holding the mix is unheated. Further, these trucks do not carry needed equipment (jackhammers and vibratory plates). We observed a crew (two employees) that repaired a pothole using material and equipment transported to the site by a dump truck. The crew could not square up the hole (i.e., make the sides of the repaired area vertical so that the repair material could better adhere to the cut out area) because the dump truck was not equipped with a jackhammer. Additionally, the crew used a manual tamp (instrument used to compact the asphalt) instead of a vibratory plate. The manual tamp is not as effective at compacting as a vibratory plate; thus, asphalt repairs made using manual tamps are more susceptible to ridges and/or dips with minimal external pressure. As a result, within minutes after completing this job, we noted that depressions could be made in the newly repaired area. Depressions hold water that will damage the repair job. Additionally, since manual tamping is labor intensive, the potential for employee injuries is increased.

Employees should have sufficient and appropriate resources to perform their jobs efficiently and effectively. We found that some districts do not have the needed resources.

- B. Pothole patch trucks are picking up new batches of asphalt material more frequently than needed. Some pothole patch trucks are capable of holding up to six tons of asphalt mix. This hot mix can be retained in a pothole patch truck for up to three days without losing its strength. Pothole patch trucks are equipped with heaters that can be plugged into electrical outlets overnight to maintain the heat of the hot mix. We reviewed tickets for asphalt and saw that several work crews load their trucks with a day's supply, approximately 1.7 tons, of hot mix asphalt each morning. Therefore, work crews would travel to the asphalt plant each day. The City obtains

OPPORTUNITIES FOR IMPROVEMENT

asphalt from two asphalt plants, which are located within ten to twenty miles of the four SSD operating districts.

The daily loading of pothole patch vehicles takes crews away from their primary responsibility, which is filling potholes. The daily pickup of asphalt results in at least one hour of inefficient use of employee time. If trips to the asphalt plant were limited to two per week, crews could repair streets for an additional three hours per week, or increase repair time by 8.57% hours per week. Additionally, daily pickup of material requires additional fuel and more wear and tear on pothole patch vehicles.

Material management requires that materials be received in a manner that will optimize the use of available truck capacity.

- C. The number of personnel involved in assessing and completing needed repairs is excessive and inefficient. Currently, an SRA receives information (through the CRMS) regarding street repair needs where non-hazardous conditions exist. The SRA is the liaison between the City and the citizen. The SRA will visit the site and make an initial assessment of repair needs and subsequently communicate with the citizen who reported the problem. Based on the site visit, the SRA makes a determination whether asphalt or concrete work is needed and contacts the appropriate work crew supervisor. In most cases, the supervisor will visit the site before scheduling a work crew to do the needed work. After completion, the supervisor returns to the jobsite and assesses the repair work completed. Thus, including the trip made by the work crew, SSD personnel make a total of four trips to a job site in order to correct the reported street problem.

Prudent business practices require the efficient use of resources to accomplish necessary tasks. The job should be completed expeditiously, utilizing needed resources efficiently. Therefore, the number of trips to a job site should be reduced.

We recommend that the Director of the SSD:

- A. Procure/repair pothole patch vehicles to minimize the use of dump trucks for pothole and level up repairs. To increase the effectiveness of using dump trucks for pothole repairs (when necessary), ensure that proper equipment is available on the dump trucks and provide staff training specific to using dump trucks for repairs.
- B. Reduce the number of daily trips to the asphalt plant by picking up more material initially.
- C. Reevaluate the number of trips required to assess and complete repairs.

OPPORTUNITIES FOR IMPROVEMENT

Management's Response:

- A. The mechanic primarily responsible for the maintenance of the pothole trucks was sent to the manufacturer H.D. Industries where he received specific training on the repair and maintenance of these trucks. With his knowledge we plan to work with EBS to keep these trucks running.

Training for the operators of the pothole trucks in the daily maintenance was conducted as part of the training conducted in 2002; crews were given a list of tools/equipment they need to take with them to make repairs.

Dump trucks are used only as a back up. Nine of the fifteen pothole trucks are over six years old. Several of them are beyond repair.

- B. Sixty percent of the current fleet of pothole trucks have out lived their useful life. These older units are not capable of operating at full capacity and hence staff picks up the appropriate amount of materials given the operating capacity of each truck.
- Frame design of the truck causes uneven distribution of the weight of the load causing stress on the frame. This leads to cracking and buckling of the frame.
 - Older trucks are equipped with oil sending units. The weight of this oil as well as the weight of the tack tank (200 gal. max. capacity) must be considered when determining maximum H.M.A. loads.
 - Recommended maximum load weights:
 - 1992 models – 5,000 to 6,000 lbs.
 - 1995 models – 5,000 to 6,000 lbs.
 - 2001 models – 7,500 to 8,000 lbs.

- C. Most citizens are unfamiliar with the correct terminology to report a pothole. They also have a tendency to believe that everyone (including contractors) works for the City of Dallas.

Most of the time the SRA determines if the request warrants any action by the department. It would be a waste of time to send a supervisor if it is not even a City of Dallas job.

After determining that it is indeed a request that warrants action, the SRA consults with the responsible supervisor to schedule the requestor repairs that are needed.

SRAs have been instructed to work with the supervisors to limit the trips to job sites.

OPPORTUNITIES FOR IMPROVEMENT

Auditor's Comment:

The manufacturer's specification shows that the 1992 Pro Patch Pothole Patcher's capacity is 6,000 tons.

2. Efficiency and effectiveness are difficult to measure due to inconsistent and unreliable methodologies.

Based on discussions with work crews and our observations, we noted that daily street repair activities reported by work crews are not consistently classified. We observed crews working thoroughfare routes and crews on other routes in each of the four SSD maintenance districts. We noted that:

- A. There were inconsistencies in and between SSD districts regarding what was considered a pothole versus a level up. Personnel in one district called a level up repair a pothole, and a crew in another district called a similar type of repair a level-up. During a discussion with a supervisor at a job site, the supervisor classified the repair job as a pothole; however, the lead crewmember classified the repair as a level up on the activity report for the day.

Based on discussions with SSD personnel, classifying the street repairs by repair type provides information relative to the condition of the street. The number of pothole repairs suggests a more degenerated street, as compared to the number of level ups. Thus, this information is critical to management since it affects management's decision-making. Therefore, it is vital that the repair work reported on the daily activity sheet is classified and reported correctly and consistently within each maintenance district and between maintenance districts.

- B. Measurements of productivity are inconsistent, unreliable, and inefficient. Crewmembers measure their output in a variety of ways. For example, repair jobs that are squared up (damaged sides cut to straight edges) are first measured in square feet and then converted to square yards. We observed one crewmember that measured the size of the completed repair by using her shoes to determine the length and width of the square. The crewmember had very small feet. To test the measurement, which happened to be 4' x 6', we requested a second crewmember to measure the hole using the same method of measurement. The second crewmember's measurement was 3' x 5'. For some jobs, we noted that work crews guessed the measurements by looking at the size of the square.

Crewmembers' shoes were the most consistently used instruments for computing work effort within all four maintenance districts. Measurements taken in this manner are probably inaccurate. Such measurements will skew statistical results and under or overstate actual work accomplishments. Measurement tools used should be accurate and standardized to provide for accuracy, consistency, and comparability.

OPPORTUNITIES FOR IMPROVEMENT

Standardized measurements for analytical and evaluation purposes are essential. Additionally, the department's statistics need to be verifiable, reliable, and comparable for management to make informed decisions concerning productivity and the allocation of scarce resources.

Standardized measurements are not currently required in the SSD's policies and procedures. Reasonably exact measurement techniques are not formally provided to crews, and supervisors and managers do not monitor measurements taken to ensure that they are accurate, consistent, and comparable.

We recommend that the Director of the SSD ensure that all district personnel receive training relative to asphalt street repair. The training should cover:

- A. Standardized method(s) for classifying and reporting repair types, as well as periodic supervisory verification of reported repair types.
- B. Standardized instruments for measuring productivity, including using tape measures or other standardized measuring instruments and recording the initial measurement in square yards rather than in square feet. Formalized procedures should include monitoring of calculations, and a mechanism that easily allows crews to convert square feet to square yards (e.g., develop a chart that goes from one square foot to 200 square feet and show the equivalent measurement in square yards: one square foot = .33 square yards, two square feet = .67 square yards).

Management's Response:

- A. In October 2002 the MIS system was revised to identify codes for potholes, level ups, and full-depth repairs.
 - The department held a class in November 2002 for all supervisors at which this issue was covered. A book was issued that shows all activity codes, definitions, units of measurements, and step by step examples of how to fill out time sheets.
 - The revised 2001-2002 Department of Street Services Activity Codes defines a pothole as "an area less than 3' x 3'."
 - Anything larger is classified "level ups."
- B. To ensure accuracy and consistency in reporting production, crew leaders have been issued tape measures and measuring wheels, where appropriate. Additionally, training has been provided to ensure familiarity with the revisions as well as the definitions of both a pothole and a level up.

OPPORTUNITIES FOR IMPROVEMENT

3. Work crews did not follow various departmental safety requirements.

During our observations of work crews repairing potholes and doing level ups in all four districts, we found:

- A crewmember was not wearing a required helmet or any type of required protective eyewear while using a jackhammer. The crewmembers wore sunglasses, which did not comply with departmental requirements.
- A dump truck carrying hot mix asphalt, and other equipment, was not covered with tarpaulin or other protective cover. Thus, the temperature of the hot mix asphalt was not maintained, and truck contents were not adequately secured.

Crewmembers stated that they did not wear department approved safety goggles because perspiration would form in the goggle covered area and prevent crewmembers from seeing clearly. Crewmembers also stated that the dump truck was not covered with a tarpaulin because it was too time consuming.

Training standards set by the SSD and published in a departmental training manual require that standard apparel include a hardhat and safety eyewear. State law also requires that a tarpaulin be used to cover all loads on open trucks and tractor-trailers that contain loose materials. Additionally, the lack of adherence to safety standards puts the City at risk for a potential lawsuit, and employees risk injury.

Non-compliance with departmental requirements and stated guidelines may indicate a need to provide safety training and to monitor work crews more frequently to ensure adherence to departmental and other safety requirements. District managers stated that asphalt crewmembers receive on the job training while they are in the field filling potholes and doing level ups. However, formal, consistent, department-wide training classes for asphalt crewmembers have not been held. The SSD is in the process of updating training material and plans to schedule training classes for asphalt crewmembers in the near future.

We recommend that the Director of the SSD require:

- District managers to ensure that all personnel assigned to pothole repair crews attend periodic formalized, department-wide training classes that include safety issues appropriate to their level of responsibilities.
- Each repair crewmember to sign an acknowledgement stating that they are aware of the safety requirements and agree to adhere to each. The SSD should develop the form, and each employee should be required to sign a new form no less often than annually.
- Supervisors to monitor crewmembers for compliance with applicable safety and other requirements and take appropriate action as needed.

OPPORTUNITIES FOR IMPROVEMENT

Management's Response:

- The following procedures are in place and on going.
 - All Pothole crews have attended class on proper repairs of potholes; the class addressed safety issues. Classes were conducted 6/4, 6/6, 6/11 & 6/13/02.
 - All personnel are required to attend monthly team meetings conducted by department safety officers.
- The department safety manual was updated in October 2002.
 - All employees attended a presentation of its contents.
 - Safety manuals were issued to all personnel during November team meetings. This included completing a form indicating the receipt of this manual by the employee, a copy of the form can be found in their employee file folder in each district.
- Field supervisor's goal is to visit each crew twice a day.
 - This will include monitoring crews for required safety equipment. (Hard hats are worn in accordance with the SSD Safety manual.)
 - Job Quality Pothole Repair presentations were conducted 7/31 & 9/5/02 for all supervisors. Classes included reemphasizing of safety requirements, visual discussion, and comparison of pothole repairs.

4. The CRMS does not provide information needed to adequately assess efficiency of the pothole repair process.

Citizens can call 3-1-1 to report any type of street concern. The 3-1-1 operators use pre-formatted forms to record pertinent information. Based on the caller's responses, a service request summary report is generated. This report lists items such as:

- Type of repair (Nature of concern)
- Location
- Priority (Urgency)
- Method received (How was information received)
- Jurisdiction
- Operator number
- Status

Service request summary reports can be tallied to create a Service Request Statistical Report, which provides useful performance measurement information such as percent of work orders open, closed and overdue work orders, and the average response time. However, the system does not adequately provide the following relevant performance data.

OPPORTUNITIES FOR IMPROVEMENT

- A. The CRMS does not provide information needed (i.e., percent of work orders open/closed) for each item (i.e., potholes) within a Street Repair Grouping (i.e., Hazardous, Routine). The system has twenty-one repair items that fall under each group type. Currently for each group, all twenty-one repair items are accumulated as one overall number. Thus, none of the individual twenty-one repair types is uniquely captured to provide relevant and useful information on the efficiency of the individual street repair types.
- B. There is no reasonable assurance that the CRMS reflects actual response time for all hazardous street repairs. 3-1-1 dispatchers close out hazardous street repair work orders; however, due to 3-1-1 call volume, those work orders may not be closed out promptly. The CRMS shows the input date as the close out date for each work order. For example, if a job was completed on May 1, but the close out date was not input into the CRMS until May 10, CRMS would show May 10 as the close out date. There is no way to backdate the close out date.

Information pertaining to completed hazardous street repairs are manually recorded by 3-1-1 personnel, and subsequently input into the CRMS. If the CRMS was designed as a dispatch system, it would allow for more direct input and efficient close out of work orders. Currently, 3-1-1 personnel query various CRMS screens before accessing the appropriate one to close out a specific work order. Thus, the close out of work orders is not efficient. The expected response time for Street Repairs - Hazardous Pothole Street Repairs is one day. The actual response time reported by the CRMS was 2.8 days for January 16, 2002, through March 17, 2003. Because the CRMS improperly shows the input date as the work order close out date, it negatively impacts performance measurement statistics. The close out date should be the date shown by the repair crew rather than the input date. A two-way pager could be used to update the database directly.

- C. Overall performance measurements are not available for hazardous potholes as a single category. The CRMS reports on hazardous potholes in at least three categories. Specifically, hazardous potholes are included in:
- “STS – Street Services Department – Pothole – Hazardous – STS”
 - “STS – Street Services Department, Street Repair – Hazardous – STS”
 - “STS – Street Services Department, Alley Repair – Hazardous – STS”

These categories make it more difficult to obtain overall information for hazardous potholes. For January 16, 2002, through March 17, 2003, we summarized the following information obtained from the CRMS:

Audit of the Efficiency and Effectiveness of the Street Pothole Repair Process
OPPORTUNITIES FOR IMPROVEMENT

Summary of Hazardous Pothole Categories for January 16, 2002 - March 17, 2003						
Service Requests	Total Count	Total Open	Total Closed	Total Overdue	Avg Response (Days)	Set Duration (Days)
STS - Street Services Department, Pothole – Hazardous – STS	3,607	3	3,604	3	2.8	1
STS – Street Services Department, Street Repair – Hazardous – STS	1,032	N/A	N/A	N/A	N/A	1
STS – Street Services Department, Alley Repair – Hazardous – STS	135	N/A	N/A	N/A	N/A	1

N/A = CRMS is unable to provide statistics in this area.

The CRMS should provide managers with sufficient, relevant, reliable, and needed information. Development and implementation of the CRMS should have required input from all appropriate parties to provide a complete and accurate assessment of performance measurements needed and available from the system.

We recommend that the Director of the SSD coordinate with Communication and Information Services personnel to:

- A. Ensure that the CRMS is reevaluated and upgraded to provide needed performance measurement information on individual street repair types (e.g., potholes) within any group.
- B. Provide enhancements that allow the work completion date to be shown as the work order completion date within CRMS.
- C. Pursue enhancements to the current system to provide all information for hazardous pothole repairs in one summarized total for each performance measure.

Management’s Response:

- A. Pothole Repair Service Request will be configured to eliminate this problem. In addition an intake alert will be placed on the Street Repair Routine, Hazardous Street Repair, Alley Repair Routine, and Alley Repair Hazardous to place all pothole calls in the Pothole Service Request.
- B. The Departmental Configuration Manager will review the possibility of adding Mobile Data Terminals to the 13 Pothole Patch trucks so that calls can be handled in the field, thus allowing real live data to be captured.
- C. The Pothole Routine Service Request was not created because callers tend to choose this service request type for all street repair problems. However, with new enhancements in the CRMS System, the department is confident that this problem can be eliminated and real data can be used to show the number of potholes repaired versus other street repair problems.

OPPORTUNITIES FOR IMPROVEMENT

5. Current agreements with DART have not been implemented or consistently monitored.

DART buses are primary users of City streets and, therefore, contribute to the deterioration of City streets. Some of the relevant considerations are shown below.

A. DART passed a resolution in 1997 that called for the implementation of Transportation System Management (TSM) projects that included street repair projects. It is a five-year program. The TSM Street Repair Program agreement states that the City will expend \$16.5 for each dollar DART expends on street improvements. This program covers streets utilized on DART bus routes. In October 2001, the City submitted to DART cumulative projects that totaled \$10,340,076. The program manager stated that initially the City identified repairs to Elm and Commerce Streets for the total project amount. However, the City Council requested that areas within each council district be included in the total project amount. A new list was submitted with each council district represented. That list was returned because one of the requested projects was not on a bus route. A revised project listing has been submitted. The actual amount awarded each year was \$2.1 million. We asked if the City could submit a \$2.1 million street project listing each year. The program manager indicated that could be done; however, since the money needs to be apportioned equally to each district, the amount allocated to each district would be \$150,000. It would be difficult to complete any project for that amount of money. Projects prioritized on a Citywide basis and submitted on an annual basis provide the City with better use of the funds made available under this program.

DART contracted to expend \$2.1 million each year for five years for street repairs/improvements. However, as of the end of our audit, DART had not provided any documented evidence of any street repair. Since funds were not expended as stated in the contract, due to inflation, the City may not receive from DART the same level for street repairs. Delaying funding to the final year reduces purchasing power by \$600,000, using a 3% inflation rate.

B. All agreements with DART are not proactively monitored. We contacted various individuals to determine responsibility for on-going monitoring of the Inter Local Agreement with DART. We were unable to specifically determine individuals charged with the responsibility for various provisions within the agreement. One step in this process is to identify all the agreements with DART. Monitoring personnel should determine if any money is owed the City due to contractual provisions that deal with payments or contributions to the City, and they should also periodically review DART agreements to ensure that all provisions concerning payments/contributions to the City are being adhered to on a continuous basis.

OPPORTUNITIES FOR IMPROVEMENT

The cause for both conditions is the same. The City lacks administrative oversight and monitoring over the resolutions passed by DART and agreements made with DART.

We recommend that the Director of PWT:

- A. In consultation with the City Council, submit a Citywide project to DART's Street Repair Program as appropriate. All funding programs should include mechanisms to eliminate the loss of purchasing power caused by inflation.
- B. Ensure that all agreements with DART are identified and that contract provisions are being adhered to.

Management's Response:

- A. The report discusses the difficulties encountered in identifying projects for the DART Street Repair Program, obtaining Council approval to submit projects to DART, and delays in project implementation by DART. PWT Transportation Programs works with several agencies (e.g., Texas Department of Transportation, Dallas County, Collin County, Denton County, North Central Texas Council of Governments, and DART) to develop funding partnerships for transportation projects. These partnerships allow the City to extend the purchasing power of its capital improvement programs and influence the selection of transportation projects by other agencies. Unfortunately, delays often occur with these projects because of the difficulties inherent in coordinating projects between agencies; the City cannot ensure that other agencies will assign the same high priority to a project that the City of Dallas places on it. These delays can sometimes affect the purchasing power of the funding identified for projects. In most funding programs, an inflation factor is built into the program based on the year that the project is expected to be implemented. An inflation factor was not built into the project estimates for the DART TSM projects. However, given the state of the economy, it is not clear whether the delays will adversely affect DART's ability to deliver the proposed project within the current budget. In the future, it would be appropriate to incorporate an inflation factor into the project cost estimates based on an implementation schedule negotiated with DART.

The report recommends that the City should consider submitting a "citywide" project to DART. This was a strategy proposed by management during the first round of briefings on this program with the Council Transportation and Telecommunications Committee. However, the Committee directed the staff to develop a program that included a project from each Council district. The rationale for distributing the funds around the City was that DART's buses have an impact on streets throughout the City. The selection of a "citywide" project versus multiple smaller projects might speed up the project selection process, but would not necessarily mean that project implementation would be expedited. The speed at which the project(s) is

OPPORTUNITIES FOR IMPROVEMENT

implemented depends on many factors including the level of resources applied to the project and the complexity of project(s). In summary, each round of project selection for the DART Street Repair Program will reflect the opportunities and priorities available at that time; a decision to utilize a strategy of selecting one project or several projects should not be made in advance.

B. Finally, management does not concur that agreements with DART are not proactively monitored. Since 1990, the City and DART have jointly approved a Master Interlocal Agreement and six supplemental agreements to the Master Agreement:

1. Master Interlocal Agreement: General Provisions and Interagency Relationships
2. Supplemental Agreement #1: Planning and Development
3. Supplemental Agreement #2: Design and Construction
4. Supplemental Agreement #3: Union Station
5. Supplemental Agreement #4: Veterans Administration Easements
6. Supplemental Agreement #5: Operations and Maintenance
7. Supplemental Agreement #6: Pearl Street Connection

The Master Agreement and supplemental agreements #1, #2, and #5 are intended to formally establish an interagency framework to assign certain responsibilities and coordinate and expedite the individual work programs of the two agencies toward the development of the public transportation system. Supplemental agreements #3, #4, and #6 are project specific agreements. Only the Union Station agreement stipulates an ongoing payment to the City of Dallas. PWT staff has confirmed with Convention and Event Services that this payment is being received and is current.

The Regional Mobility Coordinator (RMC) with PWT is responsible for maintaining a complete and final copy of all interlocal agreements between the City and DART. In addition, a Senior Engineer is assigned to coordinate with DART on a daily basis regarding interdepartmental review of engineering plans.

When the City makes a DART Board appointment, that Board member is provided a copy of all current agreements and briefed on the critical issues within the agreements. As issues arise in the course of the City's work with DART, the agreements are checked to provide decision-making guidance. This often includes consultations between departments and, when necessary, the City Attorney's Office is contacted to help interpret a specific application of the agreements.

For the most part, the agreements do not require "proactive" monitoring. However, since staff turnover can reduce the level of understanding that departments have regarding DART and City responsibilities on specific issues, management suggests that it would be beneficial to identify a DART liaison in those departments that frequently interact with DART. The liaisons would be a defined point of contact

OPPORTUNITIES FOR IMPROVEMENT

when DART issues arise for that department and could direct questions to the PWT RMC and/or City Attorney's Office when necessary. The RMC would be responsible for keeping the liaisons up-to-date on any modifications to the interlocal agreements.

Auditor's Comment:

We believe that the actions proposed by PWT may address the audit report issues. However, PWT should frequently evaluate whether current procedures adequately provide reasonable assurance that DART is adhering to all relevant contract provisions. If deficiencies are identified, an action plan should be developed and implemented.

**Exhibit: Street Services - Street Pothole Repairs and Related Issues
Survey of Other Cities**

City, State	Cost of Potholes	Cost Exclusions	Outside service providers	Life of filled potholes	Number of Potholes	Performance Measures				Comment
						Number of Potholes reported	Number of Potholes completed	Number of Potholes reported	Turnaround Time	
1 Dallas, TX	Not Known	N/A	No	May last life of surface	Number of Potholes	How fast to get to citizens request- Routine 90% w/ 6 working days and critical/hazardous w/ 24 hours				
2 Austin, TX	\$68/Pothole	Indirect and depreciation	No	Range is 1 Week to 2 Years	Number of Potholes filled at the end of each shift		Number of potholes completed	AMZ Spray Injection Vehicle is praised COFW encourages all city workers to report potholes and also Neighborhood Associations		
3 Fort Worth, TX	\$5-\$6.50/Pothole	Overhead,Fuel and indirect	No	15 days - Permanent	Number of Potholes		Turnaround Time			
4 San Antonio, TX	Not Given	N/A	No	No Range Given	Timeliness-% of responses in 48 hours		Number of Requests	Rosco Spray Injection praised	Cellphones used to communicate with citizens directly	
5 San Jose, CA	\$50/pothole	Indirect	No	As long as road lasts	% of pothole complaints responded to in 30 days		Number of Calls	Roving Crews only rove during certain times of year. Remaining time use internet, community boards, and politicians	Pre-Id potholes to determine exact nature and better deploy manpower	Have their own asphalt plant. Their asphalt is made of 40% of their own recycled asphalt.
6 New York, NY	\$25/pothole repair	Overhead, Indirect, Equipment	No	Don't Know	Number of repeat pothole repairs			Each section has 1 emergency person that patrols the Major and Collector streets for potholes and other traffic hazards.	Also when we do have a rainy day in Phoenix all of our regular street repair crews load their trucks with coldseal and are assigned an area to patrol	
7 Phoenix, AZ	\$75/pothole repair	Overhead, Indirect	No	Local streets could be indefinite and Major streets could be from days to years.				Harry Lomick of LA Consulting is developing a new management information system for their pothole repair section	UPM mix is praised	
8 Ventura, CA	None	N/A	No	As long as road lasts	No					
9 Detroit, MI	None	N/A	No	Range is 1 Week to 3 Months	No					
10 Indianapolis, IN	\$220/Ton	Overhead	No	Up to 3 Years	Open Work Orders	Claims paid out		All City Employees report potholes observed,Police, Bus Drivers,etc.	Praise for UPM cold mix very elastic	Hanson Management upgrading their management information system for potholes
11 Baltimore, MD	None		No	6Mos-1Year	None					
12 Memphis, TN	None	N/A	No	Cold Patch - Next Rainfall: Hot Patch - Permanent	Time to Respond	Average Number of crews/day		2 Roving Crews accounted for 90% of all potholes filled,54,888 potholes filled last year.		
13 Milwaukee, WI	None		No	Cold Mix-3Mos;Hot Mix-3-4years;Pothole patcher 6-9Years	Number of calls	Timeliness to respond		Praise for Spray Injection Road Patcher. Cost of \$170,000		
14 Columbus, OH	None	N/A	No	Cold Mix-6Mos to 1 Year;Hot Mix-2 Years	None			Use investigators as roving crew not actual Asphalt Trucks	Very Happy with Rosco and AMZ Spray Injection Trucks	
15 San Diego, CA	\$22-\$27/pothole	Indirect and Overhead	No	15 days - Permanent	Number of Potholes	Timeliness-Immediately-Standard-24 hours;Routine-72 hours		Rosco Spray Injection praised	No Roving Crews	OPR Bagged Asphalt Praised