Street Maintenance Process Audit
February 2016

Lori Brooks, City Auditor
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City Auditor's Office

February 25, 2016

Honorable Mayor and Members of the City Council:

The City Auditor's Office has completed the Street Maintenance Process Audit Report. The purpose of the audit was to evaluate the current process established for selecting streets for repaving and repair, and to review operational efficiency and effectiveness.

Management's response to our audit findings and recommendations, as well as target implementation dates and responsibilities, are included following the report.

We would like to thank staff from the Public Works & Transportation Department for their full cooperation and assistance during the project.

Lori Brooks

Lori Brooks, CPA, CIA, CGAP, CRMA
City Auditor

Attachment

c: Trey Yelverton, City Manager
Theron Bowman, Deputy City Manager
Jim Parajon, Deputy City Manager
Gilbert Perales, Deputy City Manager
Keith Melton, Director of Public Works & Transportation

Street Maintenance Process Audit
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Executive Summary

The City Auditor's Office has completed an audit of the Street Maintenance Process. The audit was conducted in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. The audit objectives were to evaluate the current process established for selecting streets for repaving and repair, and to review operational efficiency and effectiveness.

The City Auditor's Office noted the following:

- CarteGraph and e-Builder are the primary systems used by the Public Works & Transportation (PW&T) Department for documenting street maintenance activity and asset inventory. Access to these systems is assigned appropriately to personnel responsible for the information.
- The Roadway, Water and Drainage (RWD) Committee provides a method for departments (PW&T, Water Utilities and Storm Water) to work together to develop an annual Work Plan. This process helps coordinate efforts and eliminate situations where, for example, PW&T repairs a street and it is then subsequently "torn up" to replace water/sewer lines.
- The change in maintenance philosophy in January 2013 from repairing "best-first" to "worst-first" appears to have had a positive impact on the overall condition of City streets. Based on inspection records over the past few years, the number of "red" segments (Overall Condition Index (OCI) < 50) has decreased. However, since this philosophy has only been in place for a couple of years, the impact is not yet significant. Obviously, as some streets are being repaired, others are falling below 50 OCI.
- Street maintenance expenditures are properly documented, necessary for continuing street maintenance activities, and properly authorized and approved prior to payment.

Opportunities for improvement include the following:

- Street segment OCI should be updated in a timelier manner.
- Citizen complaints (requests) should be documented in accordance with approved policy (e.g. citizen must be contacted within 24 hours of the complaint). Contact information should be properly documented in the file. Also, there should be consistency in the information retained for citizen complaints.
- More meaningful performance measures, which are relevant to key operations and measure the work being performed, should be developed and reported to evaluate and monitor operational efficiency and effectiveness.

Details of audit findings, conclusions and recommendations are included in the following report.

Audit Scope and Methodology

The audit was conducted in accordance with generally accepted government auditing standards. The following methodology was used in completing the audit.

- Interviewed personnel responsible for various Street Maintenance activities
- Reviewed operational processes established for Street Maintenance activities
- Reviewed information within the Lawson system (Financial/Accounting); the CarteGraph system (Inventory and Work Order Processing); and the e-Builder system (Project Tracking).
- Reviewed Street Maintenance policies and procedures
- Researched City Ordinances and State Regulations related to Street Maintenance
- Reviewed the Citizen Satisfaction Surveys for FY11 through FY14
- Obtained and reviewed OCI (Overall Condition Index) evaluation schedules from the consulting vendor, along with the current evaluation by City staff
- Performed a ride-along with Street Maintenance management staff to observe the process for evaluating street conditions
- Reviewed RWD (Roadway, Water, Drainage) Action Committee reports for FY13 through FY15
- Reviewed maintenance work plans for FY13 through FY15

Background

In 2003, the Arlington City Council passed the Sales Tax program that increased funding for street maintenance. With the increased funding, the Public Works and Transportation Department (PW&T) determined a comprehensive system was needed to assist with selecting streets for maintenance; reviewing the backlog of repairs; and tracking costs. As a result of reviewing several proposals, a vendor was selected to evaluate street conditions within the City.

The vendor's first evaluation of the overall condition index (OCI) of City streets was performed in 2008. Previously in 2006, the new Cartegraph software system was rolled-out. This software is used to maintain the data provided by the vendor. The initial evaluation by the vendor served as the baseline assessment for future evaluations. In subsequent years following the initial evaluation of the City street system, only one-third of the streets would be re-evaluated to provide updated information.

For the purpose of re-evaluation, the City of Arlington is divided into three (3) sections. These include:

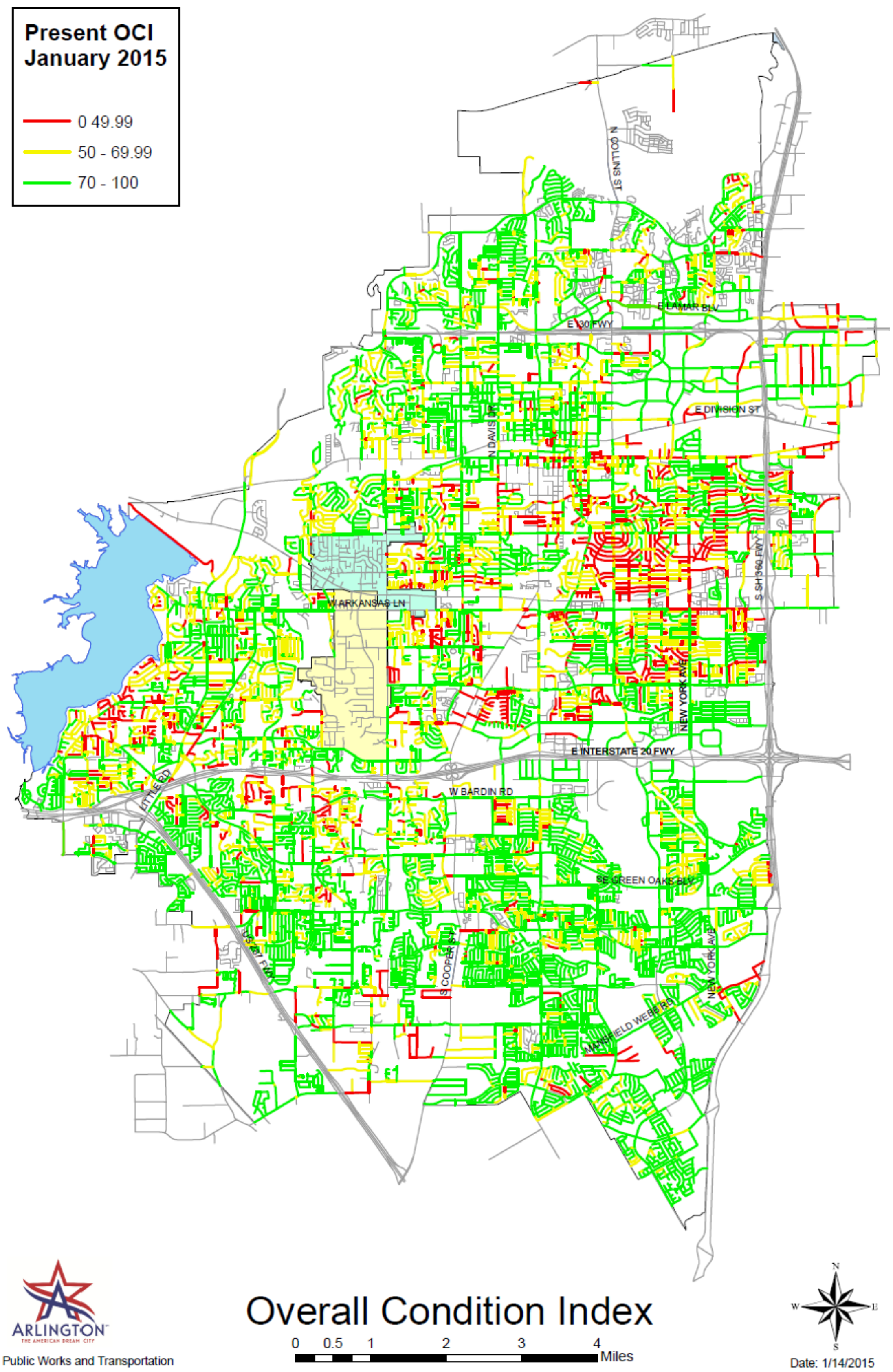
- North (covering the area between the northern city boundary and Park Row Drive)
- Central (covering the area between Park Row Drive and Green Oaks Boulevard)
- South (covering the area between Green Oaks Boulevard and the southern city boundary)

As noted, since the initial complete evaluation of the entire city street system in 2008, one-third of the City streets are re-evaluated by the vendor each year to maintain updated information. The

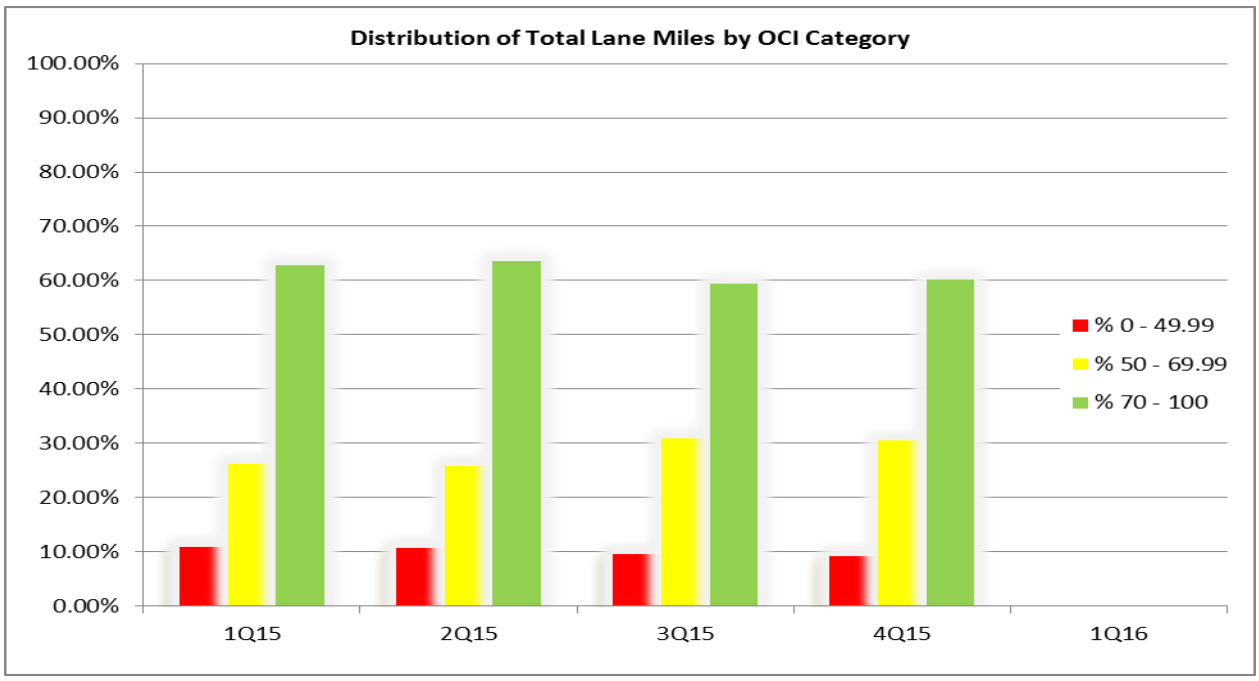
vendor rates the condition of the roads within each section based on 1) Distress - cracks, potholes, etc. and 2) Ride - roughness.

An Overall Condition Index (OCI) is then calculated, based on the two condition factors for each street segment, on a scale ranging from 0 – 100. Once the evaluation is completed, the vendor downloads the data directly into the City's CarteGraph system. From this information, a City map is prepared using color-coding to illustrate street conditions. For example, streets that are in bad condition and in need of extensive repair, such as rebuild, reclamation or mill and overlay (rated 0 – 49.99) are identified in red on the map. Streets that are in fairly good shape, but may need some type of repair, such as potholes, level-ups or a seal coat (rated 50 – 69.99) are highlighted yellow. Streets that are in good shape and do not need repairs (rated 70 – 100) are highlighted green on the map.

The 2015 street condition map is shown on the following page. Based on the OCI ratings as of September 30, 2015, approximately 60% of the streets in Arlington are rated green; 30% are rated yellow; and 10% are rated red. The majority of the red streets appear to be located in the area bordered on the north by Abram Street; the south by Arbrook Blvd.; the west by Bowen Road; and the east by Hwy 360. However, as stated in the Detailed Audit Findings section of this report, the map did not appear to be up-to-date with the current OCI ratings obtained from the Public Works & Transportation Asset Analyst (CarteGraph).


Present OCI
January 2015
0 49.99
50 - 69.99
70 - 100
N COLLINS ST
E LAMAR BLV
E 30 FWY
E DIVISION ST
N DAVIS DR
S SH 360 FWY
W ARKANSAS LN
NEW YORK AVE
E INTERSTATE 20 FWY
LITTLE RD
W BARDIN RD
SE GREEN OAKS BLV
S COOPER ST
NEW YORK AVE
MANSFIELD WEBB RD
ARLINGTON
Public Works and Transportation
Overall Condition Index
0 0.5 1 2 3 4
Miles
Date: 1/14/2015

Further, the PW&T Department began tracking lane miles by OCI rating category on a quarterly basis in FY2015. The following chart illustrates the quarterly changes in the OCI categories during FY2015.



In years past, the PW&T Department had a philosophy of "do best first," which basically kept all of the good streets (OCI >70) maintained and not deteriorating. However, in January 2013, the philosophy was changed to "do worst first," which re-focused the department's attention on the worst streets in the City (OCI < 50), with the intention of improving the overall condition of the City's infrastructure.

Each year, PW&T begins planning the annual work program by preparing a list (from Cartegraph) of all street segments with an OCI below 50. Since there is most likely a 2-3 year time period since the streets have been evaluated by the vendor, these street segments are re-evaluated by the Street Maintenance Supervisors. They physically drive the streets and observe the condition, to ensure the recorded OCI is appropriate. There were instances where the OCI was revised significantly (i.e. 45 to 90). This usually occurs when there has been significant work performed on that street segment since the last evaluation. There were other instances where the OCI was revised only slightly (i.e. 45 to 55). In this case, the Maintenance Supervisor believes the street segment is in pretty good shape, but can be improved through the crack seal, pothole repair, or leveling up programs to extend the life of the street without reclamation or re-build. Once the streets have been re-evaluated and the OCI revised, discussions begin concerning which streets to include on the annual work plan.

Once the PW&T Department prepares their list of streets for reclamation/re-build, the RWD Committee convenes to discuss the list. The Water Utilities and Storm Water Departments have also developed a work plan for the upcoming year. The RWD Committee reviews these lists to coordinate work schedules. For example, if a street segment has been identified for both water/sewer line replacement and reclamation/re-build; both departments will coordinate their work.

This prevents a street from being replaced and then subsequently "torn up" again to perform underground water utility repairs.

There are several types of street maintenance methods that may be utilized, including:

- crack seal
- mill & overlay
- reclamation
- re-build

Crack seal is a rubberized material that is used to seal a crack in the street in order to keep moisture out. Crack seal is used for streets that are in fairly good shape and have some remaining life. This is a preventive measure and is fairly inexpensive to perform. The crack seal program is performed either by a contractor or by in-house maintenance staff.

Mill & overlay is a process by which 2-3 inches of the asphalt is removed from the roadway and replaced with new asphalt. Prior to replacing the asphalt, sometimes a "petromat" is installed. This helps to stabilize the asphalt and seals the subgrade from moisture. During a mill & overlay project, gutters and sidewalk ramps may also need to be replaced. Mill & overlay is also fairly inexpensive and is performed by a contractor.

Reclamation is a process used for roads that have an OCI of less than 50. During this process, the existing pavement is pulverized into the existing base and a new surface is applied. The curbs and gutters are spot repaired. With a re-build, the pavement is completely removed and replaced, along with the curbs and gutters. These two processes are expensive and are performed by a contractor.

Several resources provide funding for street maintenance. The street maintenance tax is a one-quarter cent sales tax first approved by the citizens of Arlington in 2002 to be used for street maintenance. It was subsequently re-approved in 2006, 2010 and 2014. During FY10 – FY12, the street maintenance tax provided an average of $12 million per year. For FY13 – FY15, the street maintenance tax provided approximately $13-14 million annually towards street maintenance projects. Additionally, the General Fund and other Inter Fund Transfers have provided about $2 million per year towards street maintenance over the past six years.

In addition to the Street Maintenance Tax Fund, the 2008 Bond Election provided an average of approximately $17 million annually for street maintenance projects. The 2014 Bond Election will provide an average of $32 million annually for street maintenance projects over the next five years.

Audit Results

Current Backlog of Maintenance

As of September 30, 2015, there were 1,219 street segments (approximately 275.6 lane miles) with an OCI < 50. This total is the result of a "snap-shot" of the CarteGraph database as of that date. The approximate dollar amount associated with achieving an OCI >50 for these street segments is $331 million. On a daily basis, segments are maintained (fill pothole, level-up, crack seal, reclamation, rebuild, etc.) and other segments are deteriorating and falling below 50 OCI. Therefore, the OCI ratings and number of street segments with OCI< 50 are not static and must be closely monitored.

Annual Citizen Satisfaction Survey

An Annual Citizen Satisfaction Survey is distributed to a random sample of citizens each year. The citizens are requested to provide their opinion about various aspects of City operations, including current street conditions. Approximately 8% (29,908) of all Arlington citizens (369,508) were randomly selected to participate in the FY 2014 Survey. The surveys were equitably distributed based on zip code, age, gender, years lived in Arlington, primary residence, type of dwelling and ethnicity. Postcards were mailed by the service provider (Decision Analyst, Inc.) to 5,000 citizens. In addition, emails were sent using a third party marketing platform to another 24,908 citizens. Each citizen received only one postcard or one email advising them they had been selected to participate in the survey. The time period for completing the survey was 2-1/2 to 3 weeks. Of the 29,908 citizens asked to complete a survey, a total of 996 (3.3% of the sample / 0.27% of the population) residents responded to the survey.

One statement that was consistently highlighted in the annual surveys between FY2011 and FY2014 (with some slight verbiage revisions over the years) was:

"Streets in Arlington continue to be perceived generally as an area where there is much room for improvement. Some of the most needed areas for improvement include road work/street repair services, overall condition of streets and roads, traffic signal timing, and management of traffic flow (including traffic flow in the Entertainment District) and management of traffic on the major thoroughfares during peak times."

The annual survey is a very subjective process, which could vary significantly based on the citizen's current mood or feelings and not necessarily facts. Also, the annual survey is completed by a very small percentage of the total population (as well as the citizen sample), which could result in statistics and statements about the infrastructure that are not adequately supported.

Performance Measures

Within each annual Budget document and Business Plan, departments identify specific performance measures they will track during the year. The performance measures for the Street Maintenance Fund are shown in the chart below.

Scorecard

Street Maintenance Fund Key Measures	FY 2012 Actual	FY 2013 Actual	FY 2014 Actual	FY 2015 Target
Citizen perceptions of road conditions as "good" or "mostly good" (annual survey)	50%	51%	46%	80%
In-House Signal Rebuilds and New Signal Construction	150%	114%	63%	100% of 2 new and 6 rebuilt
Sign Inspection to achieve an 11 year inspection cycle	New Measure in FY 2013	264%	200%	100% of 4,000 signs
Lane Miles with Overall Condition Index (OCI) <50 (FY2013 current: approx. 320 lane miles)	New Measure in FY 2014		320	Steady Reduction

Source: 2015 Adopted Budget and Business Plan

Two of the above performance measures, which relate specifically to street maintenance, were considered during the scope of this audit. One of the measures is based solely on the annual citizen satisfaction survey that, as discussed earlier, is very subjective and not necessarily based on fact. It is simply the citizen's opinion of the condition of City streets. The other measure is based on the overall condition of the entire street infrastructure. Although, after a period of time, this measure will illustrate changes in the condition of streets (OCI), it does not necessarily reflect the volume of work performed. For example, as the condition of some streets are improved through re-build, reclamation, level-up, filling potholes, etc., the condition of other streets are declining due to normal wear-and-tear and deterioration. Also, the measure and the target (steady reduction) are not very specific. The goal is not clearly defined. A more specific measure, for example, would be the percent decrease (year to year) in lane miles with OCI<50 and a specific percentage (%) as the target.

Additionally, there may be an opportunity to establish additional informative and relevant performance measures. The following is important to note when establishing performance measures:

1. Focus on what is important. Avoid measuring everything, as this may result in a waste of limited resources used for collecting and analyzing data that may never be used.
2. Do not simply measure what others are measuring. Identify critical management questions and focus on those areas.
3. Choose the right measures. There is much information retained within the CarteGraph system relating to street maintenance. Select information that is relevant to the organization, and meaningful to management and the public.
4. Be specific. Make sure goals and the target are clearly defined and focus on attaining those goals.
5. Be realistic. Understand your capacity and make goals attainable.

Citizen Complaints

The majority of citizen complaints relating to street maintenance are received by the PW&T Department either by phone or email. A small percentage of complaints come through the Action Center, the Mayor and City Council offices, and Dispatch Services (911). In addition, information relating to street problems may also be reported by other City personnel.

When a complaint is received, the information is entered into the CarteGraph system by an administrative aide. The aide assigns the complaint to a Crew Leader, responsible for the section of the City where the complaint originated. After the work is completed, the Crew Leader updates the status of the job within the system, along with a description of the work performed.

According to the Field Operations Policies and Procedures, after a complaint is filed, it is a requirement that the citizen filing the complaint be contacted either by phone or email within 24 hours of the request. The purpose of the contact is to inform the citizen that the complaint was received and let them know what action has been (or will be) taken. During the testing of this process, deficiencies were noted and are discussed in the following Detailed Audit Findings section of the report.

Detailed Audit Findings

1. CarteGraph is not updated in a timely manner.

CarteGraph is the system used to track all street maintenance activities. For management and staff to obtain accurate information from the system, or to prepare accurate reports relating to assets, work orders, etc., the information must be updated timely. Additionally, management and citizens (via the internet), have the ability to access the color-coded map of the City (as illustrated in the Background section of this report) and view the condition of the City's infrastructure. If CarteGraph information is not updated regularly, viewers will not see an accurate depiction of current City street conditions.

During the audit, we reviewed and compared the OCI, according to prior inspections, and subsequent work performed to evaluate the accuracy of the data within CarteGraph and Virtual Maps. We noted instances in which the current OCI did not appear to match the work performed. A couple of examples include:

- Country Green Lane project (included 28 segments) - The inspection in August 2013 showed an average OCI of 67.86. The average OCI per CarteGraph on 4/15/15 was 66.74. The average OCI per the virtual map on 6/23/15 was 62.93. Street maintenance was completed in 2014; however, the OCI had not been updated at the time of the audit.
- Wild Rose Court project (included 12 segments) - The inspection in August 2013 showed an average OCI of 57.18. The average OCI per CarteGraph on 4/15/15 was 55.98. The average OCI per the virtual map on 6/23/15 was 51.91. Street maintenance was completed in 2014; however, the OCI had not been updated at the time of the audit.

The delay in updating CarteGraph with new maintenance information is the result of the update process. If a certain contractor is performing work on several ongoing projects (as with the two projects listed above, along with other projects), the OCI does not get updated until all of the contractor's projects are completed. When all projects are completed, they are inspected and a Letter of Acceptance is sent to the contractor. A copy of the letter is also sent to the Asset Analyst, who then contacts the inspector to determine what work was performed. At that time, the Asset Analyst enters the new information and updates the OCI rating in CarteGraph. If a contractor is working on several projects at the same time (as mentioned above), a project may be completed for several months or longer before it is updated in CarteGraph. Once CarteGraph is updated, the Asset Systems Administrator runs a program that then updates the OCI information in Virtual Maps.

A new process could be developed, whereby individual projects are inspected and updated in CarteGraph as they are completed. The result would be timely updates of the City's assets and more current information in CarteGraph.

Recommendation:

1. ***The City Auditor's Office recommends that the Director of Public Works and Transportation ensure data is updated timely within CarteGraph and Virtual Maps.***

2. Written policy related to citizen complaints is not being followed.

Citizen complaints are one way in which a city obtains feedback from its population in order to determine if services are being provided properly and adequately. When a complaint is received, it is essential that the City react to the complaint in a timely manner and also advise the complainant of the status.

The majority of citizen complaints relating to street maintenance are received by the PW&T Department either by phone or email. A small percentage of complaints come through the Action Center, the Mayor and City Council offices, and Dispatch Services (911). In addition, information relating to street problems may also be reported by other City personnel. When a complaint is received, it is entered into the CarteGraph system and assigned to a crew leader or supervisor within the district from which the complaint originated. According to policy, once a complaint is received, the citizen must be contacted by phone or email within 24 hours regarding the request.

Information entered into CarteGraph relating to complaints includes items such as: citizen name and contact number, date/time of complaint, location of complaint, employee assigned to the complaint, a description of the complaint, the associated Work Order and the final resolution. However, if a citizen files the complaint on-line, he/she might not enter all of the requested information for the complaint (i.e. name and contact number).

During FY2014, there were 758 complaints received within Public Works & Transportation, of which 334 were associated with street maintenance-type issues. The following was noted during a review of 49 of these complaints:

- For 7 complaints, in which the name and contact number was given, there was no documentation that the citizen was contacted.
- The amount or type of information retained concerning complaint resolution is inconsistent (i.e. very little or none to very detailed information).
- How citizen contact information is recorded is also not consistent. In some instances, it was recorded in the "resolution" section of the work order and other times it was recorded in the "contact citizen" section of the work order.

Due to inconsistencies with the reporting of citizen complaints, it was sometimes very difficult to determine the exact resolution to a complaint. According to the Street Maintenance Supervisors, they are trying to re-train their staff to record the contact information within the "contact citizen" section of the work order and maintain consistency regarding the information recorded within CarteGraph.

***Recommendations**:*

2. ***The City Auditor's Office recommends that the Director of Public Works & Transportation ensure that contact is made with citizens according to policy; and the contact information is documented in a consistent manner within the "contact citizen" section of the work order.***

3. Performance Measures can be enhanced and improved.

Performance measures are a key, powerful tool used by management to help track performance and navigate their way to success. Performance measures should answer the important questions relating to the activities of the department. However, it is essential that the correct measures be identified in order to adequately measure success. Useful performance measures should be specific, relevant to the organization and objective.

During this audit, it was noted that the Street Maintenance Scorecard included two Key Measures:

- Citizen perceptions of road conditions as "good" or "mostly good" (annual survey)
- Lane Miles with Overall Condition Index (OCI) < 50 (FY2013 current: approx.. 320 lane miles)

The citizen perception of the road conditions is based on the citizen's individual experience with road conditions that he/she travels. This measure is very subjective. Further, the rating is based on the perception of a very small percentage of citizens. Approximately 8% of the population (29,908 in 2014) is invited to complete the survey, and only 3.3% of the sample (996 in 2014) actually completed the survey. This results in a survey of only 0.3% of the total population. Additionally, the current target of 80 percent does not appear to be realistic, as the actual result is around 50% annually. It is important that established goals be achievable.

The other reported measure is based on the overall condition of the entire street infrastructure. Although, after a period of time, this measure will illustrate changes in the condition of streets (OCI), it does not necessarily reflect the volume of work performed. For example, as the condition of some streets are improved through re-build, reclamation, level-up, filling potholes, etc., the condition of other streets are declining due to normal wear-and-tear and deterioration. Also, the measure and the target (steady decline) are not very specific. The goal is not clearly defined. A more specific measure, for example, would be the decrease (year to year) in lane miles with OCI<50 and a specific percentage (%) as the target; or simply define a specific target (i.e. acceptable number of lane miles with OCI<50).

Good performance goals should be meaningful, relevant, measurable and achievable. Performance measures and targets should be specific.

Recommendation:

3. The City Auditor's Office recommends that the Director of Public Works and Transportation should further develop performance goals that are meaningful, relevant, measurable and achievable; and ensure performance measures and targets are specific.

AUDIT RECOMMENDATION	CONCUR/DO NOT CONCUR	MANAGEMENT'S RESPONSE	RESPONSIBLE PARTY	DUE DATE
1. ***The City Auditor's Office recommends that the Director of Public Works and Transportation ensure data is updated timely within CarteGraph and Virtual Maps.***	Concur	A process has recently been implemented to ensure data is updated in a timely fashion. This process will be documented in a Standard Operating Procedure to establish roles and responsibilities.	Mindy Carmichael	June 2016
2. ***The City Auditor's Office recommends that the Director of Public Works & Transportation ensure that contact is made with citizens according to policy; and the contact information is documented in a consistent manner within the "contact citizen" section of the work order.***	Concur	The current Standard Operating Procedure (SOP) for Public Works Field Operations states contact must be made with the citizen within 24 hours of the concern being entered as a work order. Due to the nature of field work, crews only perform "office work", such as returning phone calls, on a limited basis. The SOP will be revised to allow 2 working days to make contact with citizens. In addition, a report has been created within Cartegraph to assure the "contact citizen" section of the work order is completed within the timeframe stipulated in the policy.	Mindy Carmichael	May 2016

3. ***The City Auditor's Office recommends that the Director of Public Works and Transportation should further develop performance goals that are meaningful, relevant, measurable and achievable; and ensure performance measures and targets are specific.***	Concur	As part of the annual budget/business planning process, the Public Works Department will reevaluate current performance measures and targets.	Mindy Carmichael	August 2016