Calgary

City Auditor's Office

Parks - Urban Forestry

July 13, 2016

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The City Auditor's Office completes all projects in conformance with the *International Standards for the Professional Practice of Internal Auditing.*

Executive Summary

The Parks Business Unit's Urban Forestry division (UF) is responsible for the implementation of the Parks Urban Forest Strategic Plan (the Strategic Plan). The Strategic Plan sets the framework for key urban forest management decisions, UF's goal of a sustainable urban forest, and a tree canopy goal of 20%. In addition to the Strategic Plan, The City's Citizen Dashboard tracks and monitors the canopy cover; it is a key indicator for Council's priority of 'a healthy & green city'. UF have estimated that the tree canopy has grown from 7% (2007) to 8.23% (2015). The tree canopy is made up of public trees and trees on private property. As of April 2016, The City's public tree inventory was approximately 591,000.

The objective of this audit was to provide assurance that the systems and processes in place are effective in managing public trees planted and maintained by UF. The audit's timeframe reviewed was January 1, 2010 to March 31, 2016. In September 2014, a late summer snowstorm (Snowtember) struck the City of Calgary and caused tree damage and losses. The public tree impact was estimated by Parks to be a loss of biomass equivalent to 240,740 trees. In 2015, The City provided a one-time budget net increase of $35.5 million (for the budget cycle 2015-18) to Parks' Urban Forestry for recovery and restoration efforts.

The audit confirmed the survival rates in the first five years after planting are reaching UF's expected rate of survival (85% or greater) which evidences support towards the canopy target. However, our audit could only provide limited assurance that public trees receive sufficient maintenance and monitoring throughout their entire lifecycle and that the costs of the urban forest are adequately managed.

Following Snowtember, tree activity has significantly increased as new trees have been planted, leading to associated increases in tree care and maintenance. For example, tree planting is 66% higher in 2017 compared to years prior to 2015. These trees require five years of scheduled maintenance to establish them by 2022. However, after 2018, UF budget is expected to return to pre-Snowtember levels. This increase in activity escalates the risk that UF's existing planning and budgeting lacks agility to effectively support the City's investment in public trees. Increased activity with limited budget and FTE resources creates a greater need to collect and evaluate activity data, and incorporate this data into planning and decision making.

Based on the existing tools and processes, we believe it is possible for UF to address this need without introducing new data collection systems. We have raised recommendations to utilize existing available data by collecting key data consistently and storing the data in a central location to allow evaluation. Increased UF oversight will provide rigor to this collection process by monitoring the data required, data collected, and identifying any gaps or discrepancies. Once in place, this will support UF's analysis of tree activity to be more effective, driving efficiency and cost effective solutions through activity based costs, as well as working towards the challenging tree canopy target by supporting trees to maturity through scheduled maintenance.

We raised five recommendations to support UF in their management of public trees following Snowtember. These recommendations address:
- Developing activity based forecasts;
- Capturing activity information alongside associated costs;
- Implementing a standard operating procedure for conducting quality assurance inspections of contractor work;

- Refining the monthly reporting on key performance standards; and
- Developing recording and reporting standards and definitions to support the tree hazard response process.

Parks has agreed to four of five recommendations and committed to implementing the recommendations by December 31, 2017. The City Auditor's Office will follow up on all commitments as part of our ongoing recommendation follow-up process.

1.0 Background

The Parks Business Unit (Parks) is responsible for growing and maintaining the City of Calgary's urban forest. Parks' Urban Forestry division (UF) is one of ten lines of services provided by Parks under the Community Services department. UF implements Policy CSPS028, the Parks Urban Forest Strategic Plan (the Strategic Plan). The Strategic Plan, since June 2007, has provided the framework for key urban forest management decisions. UF's goal is to achieve a sustainable urban forest. Through planning, planting, caring for, and protecting the forest, UF has currently achieved a planted urban forest of approximately 591,000 public trees within public parks and along roadways.

The Strategic Plan states trees in Calgary's urban forest require "active, consistent and continuing management". UF accounts for approximately 18% of the Parks budget. UF's 2015 budget was $22.72 million. UF's annual budget has received additional one-time funding over three years (2015-2017) of $35.5 million and an additional $11.9 million redirected from UF's operating fund to perform recovery and restoration work due to the damage caused by a late-summer snowstorm in September 2014, referred to locally as Snowtember. The 2015 budget includes a portion of the additional one-time funding. The Recovery and Restoration Spending Plan has allocated $35 million to recovery and $12.4 million to restoration. Recovery includes pruning and asset management activities and restoration involves tree removal, tree purchases, new tree care and establishment as well as citizen outreach. The UF budget is anticipated to return to its pre-Snowtember level of approximately 10% of the Parks budget in 2018 onwards.

The size of the urban forest is measured by its "canopy", and trees planted on private and public land contribute to the canopy. The Strategic Plan set a target of 20% canopy coverage. In 2015, Parks reported the tree canopy was 8.23%, or approximately 6,989 hectares.

Trees clean and cool air, reduce storm water runoff and erosion, save energy, create wildlife habitat, and generally contribute to the quality of life of residents. Urban trees provide valuable environmental, economical, aesthetic, and social benefits to our community. The aforementioned benefits of urban trees aligns with Council Priority: A healthy and green city.

"*Calgarians recognize and appreciate that Parks, the urban forest and natural areas are significant to the environmental quality and recreational fabric of Calgary. Trees serve to define the long term character of the city as a whole and the individual communities within it.*"[1]

Given the importance of the urban forest and the investment in UF's programs, effective management of the investment is critical. This audit was undertaken as part of the City Auditor's 2016 Annual Audit Plan.

2.0 Audit Objectives, Scope and Approach

2.1   Audit Objective
The audit's objective was to assess the effectiveness of controls in place to ensure the following risks are appropriately mitigated:
- Trees do not receive sufficient maintenance and monitoring throughout their lifecycle;

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[1] Open Space Plan, The City of Calgary

- Tree incident response and recovery process is not timely and appropriately managed; and,
- Costs of the urban forest are not adequately managed.

2.2   Audit Scope

The audit scope covered public trees planted, maintained, or removed between January 2010 and March 31, 2016, in order to review a full cycle of new tree establishment. We did not look at systems and processes relating to trees on private property. We also did not examine processes around tree species selection, or the timing or location of planting.

2.3   Audit Approach

Our audit approach included review of controls related to UF's procedures, systems and processes that support effective urban forest monitoring and maintenance. We confirmed processes and controls in operation and reviewed supporting documentation from January 2010 to March 2016.

3.0 Results

We assessed UF's processes and associated controls around tree maintenance, tree incident response, and urban forestry cost management. Prior to 2014, tree activity followed a routine pattern, and UF's approach of using the previous years' budget as a baseline for planning activities by neighbourhood has fulfilled their needs; with trees surviving at expected rates.

Following Snowtember, overall tree activity significantly increased, particularly tree planting, and there will be associated demand in tree care and maintenance required to support tree survival. Increased activity amplifies the risk that UF's planned budget and activity are insufficient to support the urban forest, putting at risk the canopy target. UF faces an increased need to collect and evaluate activity data, and incorporate this activity information into budgeting, activity planning and decision making as the present tree activity has a direct impact on future activities and costs.

3.1   Monitoring and Maintaining trees

3.1.1   Maintenance to Increase the Likelihood of Survival

We assessed the survival rate of newly-planted trees under the responsibility of Urban Forestry, and compliance with scheduled maintenance.

UF is responsible to maintain trees it has planted in public parks and along roadways and trees that have been donated by developers. The survival rate of newly planted and young trees is related to the care received in the first five years after planting. We reviewed tree inventory data to calculate UF's tree survival rate. Trees planted or received through donation in 2010 were tracked through 2014. Our results showed public trees planted in 2010 had a survival rate of 89.74% and trees received through donation had a rate of 94.78%. The survival rate is within UF's Performance Standard of 85%.

UF has developed pruning schedules and watering cycles, specific to Calgary's climate, to support newly planted trees and mature trees. Trees are pruned every eight years and the watering cycle is as follows:

Tree age	Watering frequency over a 26-week watering season (May-October)
Year 1 (year of planting, or the year the tree was received from developers)	Weekly
Year 2	Bi-weekly
Year 3	Monthly
Year 4	Bi-annually
Year 5	Bi-annually

Our testing confirmed that UF maintains recorded tree inventory in the Work and Asset Management System (WAM). Tree inventory is also documented in the City's Geographic Information Systems (GIS). Tree maintenance activity (watering and pruning) are planned and completed on a neighborhood basis, using the "wheel of work"[2]. However, tree maintenance activities are not recorded completely and consistently in the WAM system or GIS. UF do not have a complete and consistent record of activities completed, or the data to plan in detail the activity required to keep trees appropriately maintained.

We reviewed the watering documentation for five young trees that required watering in 2015 as per UF's watering cycle. The documentation we reviewed was not complete, and we cannot conclude if the trees received watering, or received the required frequency of watering. The watering schedule and monitoring was paper-based in 2015, and did not always contain details as to activity. For example, accounts payable records provided some information on watering costs and activities, but the watering invoices (known as Operator Machine Reports or OMRs) for completed watering routes infrequently indicate the community watered and never recorded the number of trees watered.

A multi-year planning approach, that considers the relationship between planting and a minimum five years of maintenance, must be in place to ensure that resources are adequate to provide care required to better the trees' chance of survival. Robust data on tree inventory, planting and maintenance activities is critical to support UF in their planning.

To provide assurance that the City's investment in trees is managed effectively, operational activities must provide assurance that UF carries out tree maintenance plans, and the budget for each activity is adequate to support maintenance plans. We discussed tree maintenance costs with UF staff, and it was confirmed that total tree establishment costs, including the cost of watering, are not known. Total tree establishment costs should be a leading consideration when determining budget capacity to increase tree planting and follow-up with five years of scheduled maintenance for planted and donated trees. As shown in Appendix A, there is a risk that UF's budget is insufficient to accommodate planned maintenance for newly planted trees.

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[2] The Wheel of Work is a systematic process whereby work is scheduled, by community for the entire city of Calgary. Work started in a community by planting trees, followed by watering in subsequent years and then pruning.

Tree growth and survival is limited by water availability and "inadequate water at critical plant life stages can ultimately lead to decreased tree health and death." [3] Costs will increase if trees don't survive and need to be replaced as studies have found "watering newly planted trees was less expensive than not watering trees when the costs of replacing dead (unwatered) trees was included in the total tree establishment cost."[4] Furthermore, The City has set targets of tree canopy coverage and the coverage target might not be reached if young trees do not establish and grow to maturity. Restoration and recovery activities following Snowtember have increased planned tree planting for 2015, 2016 and 2017 by 24.8% (7,488 trees), 50% (9,000 trees) and 66.7% (10,000 trees) respectively over average annual planting. Additionally, UF must provide care and maintenance to donated trees. In the timeframe of 2010 to 2014, UF received an average annual donation of 6,300 trees.

We recommend UF develop activity based budgets (Recommendation 1), which can be developed with key data activity that may be captured within their current process and systems. Activity-based forecasting allows UF to budget accordingly, and provides greater assurance that trees will receive necessary care to survive.

3.1.2   Inspection and Maintenance of Matured Trees

It is UF's practice to annually inspect 20% of trees over 20 cm in diameter in groomed parks and roadways for safety, health and structure. We reviewed 2015 pruning documentation for one community with 1,529 mature trees (diameter of trunk is 20 cm or greater) inventoried. The trees' GIS records were not updated to record completed inspection and pruning activity. We reviewed related documents to determine if 20% of matured trees were inspected and pruned where necessary. An Excel worksheet with records of contractor work in the community in 2015 indicated 163 trees were pruned. The trees' inventory numbers were not included in the worksheet. Due to lack of appropriate referencing in the spreadsheet, we were not able to confirm the number of trees inspected. While pruning and results are monitored through UF's quality assurance process (Section 3.2), UF does not consistently capture and document all urban forestry activity completed along with the associated costs. Without this information, UF have limited assurance that expected tree care and maintenance activity occurred or that resources are being effectively utilized. We recommended UF develop a process to capture and monitor activity information alongside associated costs (Recommendation 2) and develop standard operating procedures for conducting quality assurance inspections of contractors' work (Recommendation 3).

3.1.3   Key Performance Standards

As a result of a prior review and its recommendations in the Parks Business Unit, UF developed key performance standards and formalized, tracked and recorded the standards in 2015. We reviewed the Key Performance Standards that are within the audit's scope regarding tree maintenance and cost activity. While the key performance standards have been regularly tracked and monitored, the data collected may not provide sufficient information to fully support UF's performance targets. In Section 4.4

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[3] Scientific Journal of the International Society of Arboriculture (ISA): *The Costs of Not Maintaining the Urban Forest: A Review of the Urban Forestry and Arboriculture Literature*

[4] Scientific Journal of the International Society of Arboriculture (ISA): *The Costs of Not Maintaining the Urban Forest: A Review of the Urban Forestry and Arboriculture Literature*

there are examples of standards that need to be adjusted to ensure relevant data is collected and performance is managed in connection with the over-arching goal to sustain and grow the tree canopy (Recommendation 4).

3.2   Managing Costs

In order to obtain an estimate on cost reasonableness, we analyzed Urban Forestry's costs for 2015 and allocated them to major activity categories (Appendix B). The costs were then benchmarked, to the extent practicable, to an International Society of Arboriculture (ISA) review published in 2015: *The Costs of Maintaining and Not Maintaining the Urban Forest: A Review of the Urban Forestry and Arboriculture Literature.* The three categories that were possible to benchmark represent 60.9% of UF's spending in 2015. We reviewed spending in three categories:

1. Planting, Nursery, and Inventory

2. Pruning and Removal

3. Watering

The results of the analysis provided confirmation that the budget allocations were reasonable when compared to other municipal Urban Forestry operations. However, the analysis was for a single year (2015) and does not account for circumstances specific to Calgary, such as climate or increased watering needs due to an accelerated planting program (Section 3.1.1).

Pruning and Removal costs account for over 41% of the UF budget and UF relies on contractors to perform a large portion of the work. We reviewed UF's process to review the contractors' pruning work on the City's public trees. UF conducts quality assurance reviews for 20% of the work completed by contractors and it is UF's policy that pruning work is completed according to ISA standards, and incomplete or non-compliant pruning must be remediated before payment is issued. The process controls, as described by UF, are appropriate to ensure contractors are only paid for assigned work that has been completed to an expected level of quality. The procedure to apply the standards and record the results is not formalized; the documentation, applications of standards and results storage varies amongst employees. We recommend (Recommendation 3) UF develop a standard operating procedure for Quality Assurance. A standard operating procedure (SOP) will provide UF with a process for consistently documenting and collating data on their inspections of contractor work which will improve overall vendor quality, as well as assist in monitoring tree maintenance (3.1.2).

The audit plan included an assessment of the efficiency and effectiveness of using city-owned aerial trucks for tree maintenance versus hiring contractors. The audit confirmed the aerial trucks had been purchased in 2015 but were not yet ready for service. UF management has plans in place to review the use and cost of the trucks after two years of use.

Recommendations 1, 2, and 3 support capturing cost and activity information and data collection. When UF reviews the costs of operating and owning aerial trucks, the data and information will be available to determine if resourcing options were optimized and allocated appropriately.

3.3 Tree Hazard Response

UF is responsible to respond to and remediate public tree hazards (i.e. fallen branches, branches obstructing traffic signs, etc.). We reviewed the tree hazard response process and reviewed related 2015 complaint-intake and response data to assess if the hazards were addressed and remediated within the target response time: 24 hours for emergencies and within seven days for urgent hazards. We were not able to conclude as to whether or not the targets were met as hazard record data is not documented in a manner that allows for such analysis. However, our sample testing and review supported assurance that most hazards classified as an emergency (71%) are made safe by UF within a reasonable amount of time in 48 hours or less, which includes allowance for time committed to administrative work. We made a recommendation that will assist UF in ongoing measurement of tree hazard response and ability to improve attention and timeliness on the most critical hazards. (Recommendation 5).

We would like to thank staff from Parks for their assistance and support throughout this audit.

4.0   Observations and Recommendations

4.1   Activity-Based Forecasting and Budgeting

Urban Forestry's (UF) forecasting for tree care and maintenance is not activity based. Operating forecasts (and budget) are rolled forward for future years based on prior year activity levels.

Following Snowtember, tree planting is planned to increase with the objective of restoring the tree canopy to pre-2014 levels. UF plan to plant 9,000 trees in 2016 and 10,000 trees in 2017, a significant increase from their average planting prior to Snowtember of 4,200. Tree care and maintenance activities will not resume to levels associated with average annual tree plantings until 2022. However, UF tree care and maintenance forecasts and associated budgets are not linked to this increase in activity.

To ensure that newly planted trees grow to maturity, UF has developed pruning schedules and watering cycles, specific to Calgary's climate for the first five years following planting. UF has an internal performance target of 85% of newly planted trees being established after five years. Determining planned tree care and maintenance activity levels and using this data to establish activity based forecasts are vital to UF given the increase in trees planted. Without activity based forecasts for tree care, there is a risk tree care activities are insufficient, leading to possible misalignment of budget and forecast or increased tree mortality.

Recommendation 1

Develop activity based forecasts by:
* Determining the key activity data required;
* Evaluating activity data available, and making determinations regarding any estimations or additional data required; and,
* Applying activity data to the forecasting and budgeting process.

Management Response:

Agree.

Action Plan	Responsibility
There is a cost to monitor all activities on individual trees, and the technologies did not support this in the past. UF is currently in a much better position to monitor individual trees due to improvements in GIS. Activity costs will be developed and reviewed on a regular basis as part of the ongoing Urban Forestry work. Activity based costs will be used to forecast various activity levels within established budgets and	Lead: Urban Forestry Lead Support: Urban Forestry Superintendents, Parks Finance Lead, Parks Operations Strategist Commitment Date: February 28, 2017

Action Plan	Responsibility
to adjust targets for revised budgets to support meeting UF long term strategic objectives. Urban Forestry will: • Determine what key activity data will be required; • Evaluate activity data available and make determinations regarding any estimations; and, • Utilize this information for forecasting and budgeting processes.	

4.2   Use of Resources

UF does not consistently capture and document all urban forestry activity completed, along with associated costs. Without this information UF do not have assurance that expected tree care and maintenance activity occurred, or have information on whether resources available to them are being effectively utilized.

During 2010-2015, UF recorded tree inventory in the WAM system. Tree inventory is also documented in the City's GIS mapping system. Tree maintenance activity (watering and pruning) are planned and completed on a neighborhood basis, using the "wheel of work". Tree maintenance activities are not recorded in the WAM system or GIS, and UF do not have a complete and consistent record of all tree care and maintenance activities completed.

Watering schedules and monitoring were paper-based in 2015. We reviewed the watering documentation for five young trees that required watering in 2015 as per the City's watering cycle. The documentation was not complete, and/or insufficient to conclude if the trees received necessary watering according to the scheduling plans, nor is there is data available to determine cost per watering.

We reviewed 2015 pruning documentation for one community with 1,529 mature trees inventoried. We were able to verify that pruning was completed for 163 trees through inspection of contractor quality assurance records. Although the GIS inventory record contains fields for tree pruning activity specifics, the records' fields are not populated. As well, tree inventory numbers are not recorded in the quality assurance records. As a result, the cost of tree pruning over the trees' life could not be determined based on the pruning data collected by UF as records are not maintained to indicate how many times each tree has been pruned in its lifetime or the date of the last pruning, and cost.

Activity-based cost information would also support business decision making. As an example, UF purchased four aerial trucks in 2015 with a one-time budget allocation of $700,000. The purchase was intended to increase UF's ability to respond to tree emergencies in a timely manner, as they would no longer be solely dependent on contractors with aerial trucks to prune trees in emergencies. UF also plans to use the trucks to prune trees rather than assign the work to contractors. Prior to the purchase, UF did not conduct a cost-benefit analysis, however, such an analysis will be beneficial for future

decision making. Activity and cost information of this nature would allow UF to evaluate the aerial trucks after a year of operation to ensure that the trucks have provided the expected benefit for the cost.

UF create estimates in the WAM system. Expenditure is recorded in the City's finance system (FSCM), with some data fields capturing information about the type of expenditure. However, categorization of costs in these two data sources are not aligned. In monitoring costs at an activity level, UF personnel state they identify trends, irregular, or misstated items because of long standing knowledge of UF's operations.

Capturing activity information and associated costs would support UF with improved information to enable them to evaluate their use of resources, and to give assurance that their approach to maintaining and increasing the tree canopy is effective.

Recommendation 2

Develop a process to capture and monitor activity information alongside associated costs:
- Identify key activity data required for monitoring of tree planting, pruning, watering and retirements;
- Determine an approach to capture accurate and timely data, where available, or utilization estimation as required; and,
- Develop a process for capturing associated cost information by activity.

Management Response:

Agree.

Action Plan	Responsibility
UF will use the Work Asset Management System (WAM) to better capture costs. The process intends to fully utilize WAM system so that all costs are captured in the systems and reflects the full costs of every activity. Urban Forestry will: • Identify key activity data requirements for monitoring of tree lifecycles; • Determine an approach to capture accurate and timely data when available or utilization estimation as required, which will include but not limited to credit cards, contract costs; and, • Develop a process and Standard Operating Procedure (SOP) for capturing associated cost information by activity. This will include but not be limited to credit card statements and contract costs.	Lead: Urban Forestry Lead Support: Urban Forestry Superintendents, Parks Finance Lead, Business Operations Analyst, Inventory Technician Coordinator Commitment Date: December 31, 2017

4.3   Inspection and Monitoring Contractor Quality

UF does not have a process for consistently documenting and collating data on their inspections of contractor work.

The spreadsheets used during 2015 to track inspection activities and results by neighbourhood were completed on an ad hoc basis and not consistently completed:
- There was no centralized list of all quality inspections completed during 2015.
- The contractor's name did not appear in seven of eight (88%) of the neighbourhood tracking spreadsheets reviewed.
- Spreadsheets are not stored in a central location - some are kept exclusively in email folders assigned to individual employees.
- Various spreadsheet formats were used for inspection tracking. A consistent format for the tracking spreadsheet is expected to be used for all neighborhoods in 2016.

UF personnel are trained to conduct inspections of contractors' work according to arboricultural standards (i.e. International Society of Arboriculture (ISA); however, there is no documented program that describes how these standards should be applied, and what results should be documented in the tracking spreadsheets.

Without this data, UF management has limited assurance that contractor work is to the quality required, and that any performance deficiencies are corrected prior to payment. Tracking and centralization of inspection activity data would support UF in monitoring trends in deficiencies discovered during inspections so proactive steps could be taken to prevent their reoccurrence and improve overall vendor quality. "A key to successful incorporation of private contractors is developing definitive specifications that are inspected for compliance and enforced by city staff."[5]

Recommendation 3

Develop, document, and implement a standard operating procedure for conducting quality assurance inspections of contractors that ensures consistent completion and recording of inspection activities.

Management Response:

Agree.

Action Plan	Responsibility
Urban Forestry will develop and implement a Standard Operating Procedure (SOP) for conducting quality assurance inspections of pruning contractors that ensures consistent completion and accurate recording of inspection activities. This will include	Lead: Urban Forestry Lead Support: Urban Forestry Superintendents, Parks Finance Lead, Business Operations

[5] Scientific journal of the International Society Arboriculture (ISA): The Costs of Maintaining and Not Maintaining the Urban Forest: A Review of the Urban Forestry and Arboriculture Literature.

Action Plan	Responsibility
development of an electronic program that allows for accurate checking of completed work by inspectors.	Analyst, Inventory Technician Coordinator Commitment Date: February 28, 2017.

4.4   Key Performance Standards

UF have developed a monthly summary of key performance standards that have been in use for approximately 12 months. Based on the scope of our audit we evaluated those standards relating to service requests, tree planting and tree pruning. The standards evaluated do not fully align to UF's current priorities, and therefore may not effectively support UF's oversight monitoring and decision making.

To support the overarching goal of maintaining and increasing the tree canopy, UF has expressed the importance of watering newly planted trees according to their schedule. In reviewing the support data used for the watering standard we noted it is measured on an estimate of the number of trees in each neighborhood scheduled for watering, rather than the actual number of tree waterings. Watering activities are directly impacted by planting activity (as trees require more intensive watering in their early years and should be watered multiple times a season). However, in the monthly summary, the activities are not connected – the total number of trees watered is estimated, but this is not related to the number of times trees should have been watered based on their lifecycle.

We also noted the survival rate target standard is specifically for trees planted by UF. However, UF is responsible for the care and maintenance of donated trees as well as removal and replacement costs if the donated trees do not survive. By excluding donated trees from the overall survival rate, UF will not know the impact of retired donated trees on the tree canopy coverage. Furthermore, budgeting for tree removals and replacements cannot be estimated if only UF-planted trees are tracked.

Recognizing that these standards have only been formalized in the last year, this may provide an opportunity for UF to reassess the standards, and evaluate what information is available to support their oversight, decision making and planning.

Recommendation 4

Review and refine the monthly reporting on key performance standards ensuring that:
- Chosen standards capture key information needed by UF management for oversight, planning and decision making on a month by month basis;
- Standards are supported by accurate and complete data collection; and,
- A supporting process of monitoring results, follow up and corrective action where variances are identified is implemented.

Management Response:

Agree.

Action Plan	Responsibility
Urban Forestry will review and identify key performance indicators and ensure that they are meeting the goals of the Urban Forestry Strategic Plan. Indicators may include tree planting; tree survival, and pruning, as well as, development review and inspections. Urban Forestry will: • Capture key information needed by management staff for the oversight planning and decision making on a month by month basis • Standards are supported by accurate data collection • A supporting process of monitoring results, follow up and corrective action where variance are identified is implemented	<u>Lead</u>: Urban Forestry Lead <u>Support</u>: Urban Forestry Superintendents <u>Commitment Date:</u> August 31, 2017

4.5   Tree Hazard Response Procedure

Processes are in place to support that tree hazards are being responded to in a manner that supports public safety. In our sample testing of 80 3-1-1 reports we identified an opportunity to improve data collection and reporting to give UF greater assurance that responses to tree hazards are occurring within target. The City's Urban Forestry Strategic Plan includes a target of a response within 24 hours to "emergency" hazards, and a response within seven days to "urgent" hazards.

Tree hazard complaints are received by the 3-1-1 Call Centre. The complaint is recorded by 3-1-1's Customer Services Requests (CSR) IT system and routed to UF's WAM system. Responses are recorded in the WAM system, which updates 3-1-1's CSR IT system.

UF's procedures to respond to and remedy tree hazards are not fully supported by underlying procedures and systems:
- The scripts used by the 3-1-1 Call Centre to determine the severity of the tree hazard reported by the reporter do not fully align to UF's definitions of "emergency" and "urgent" hazards;
- There is no common definition of what constitutes when a hazard has been "addressed" (made safe versus completely remedied) and can be closed in the 3-1-1 system;
- UF staff state that target response times are for "business days" (although they respond to emergencies during non-business hours) but this clarification is not included in either the Urban Forestry Strategic Plan or 3-1-1 scripts; and
- The WAM system cannot be updated at the hazard site, and relies on data entry when personnel are back in an office setting. In our sample, UF mitigated 51.5% of

emergencies within the target 24 hour timeframe, which increased to 71% when allowing for an additional 24 hours for data entry.

To support timeliness of response, systems should assist in the identification of the most critical hazards for the fastest responses, and contain up-to-date information on responses and remediation. Accurate and timely system data also provides key performance information to management.

<u>Recommendation 5</u>

Develop recording and reporting standards and definitions to support the tree hazard response process (i.e. "emergency", "urgent", "addressed" response targets) and work with 3-1-1 and IT to refine system data entry that ensures alignment throughout the process.

<u>Management Response:</u>

Disagree.

UF will not address recording and reporting standards as UF believes the possible cost to system changes outweighs the potential benefits. Urban Forestry (UF) will review its emergency response procedures, with a focus on after-hours emergency management ensuring that staff understand the importance of mitigating and documenting hazard responses.
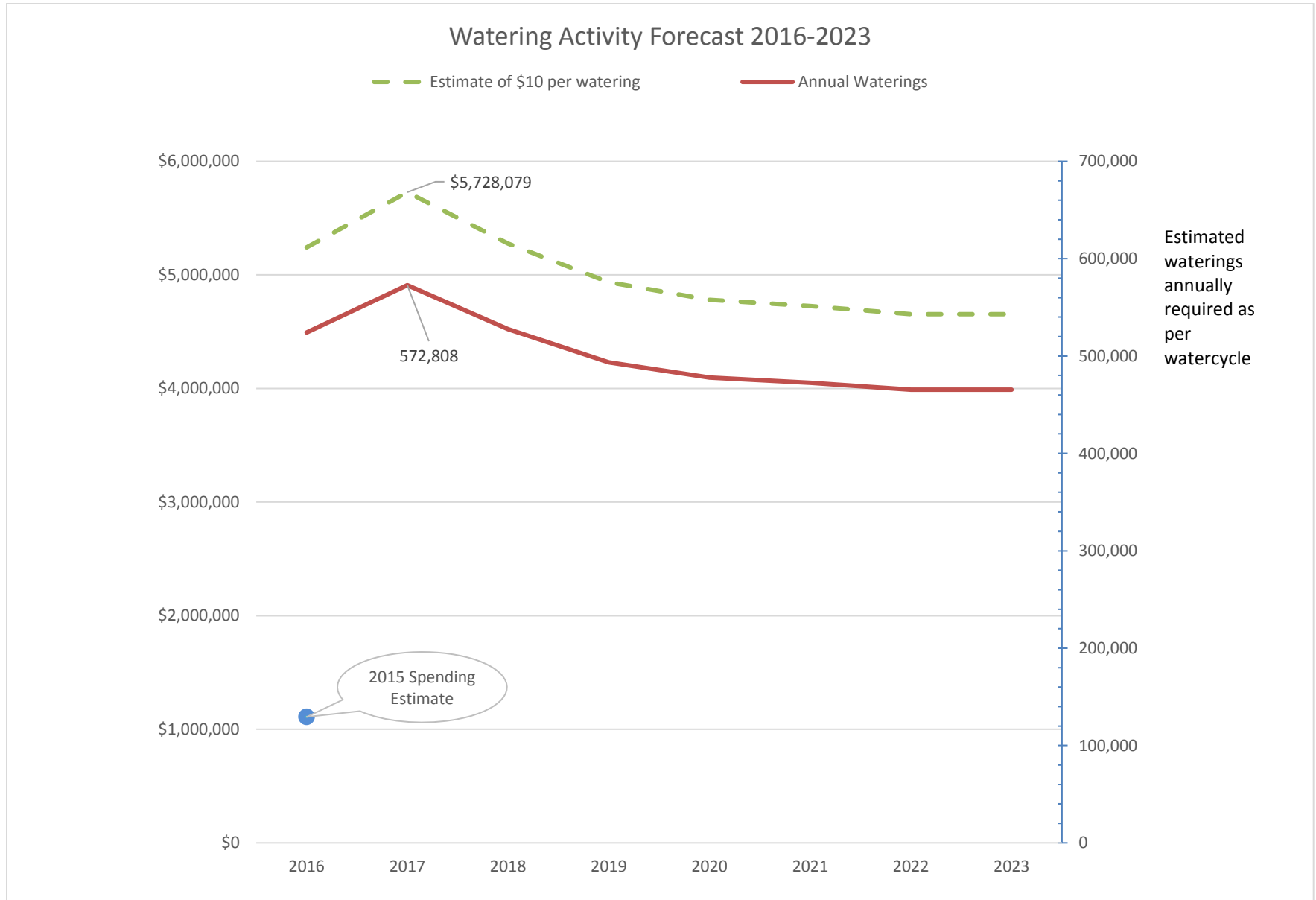
Appendix A

Based on current planting plans and anticipated donations, we calculated the number of tree waterings required for the years 2016 through 2023[6], depicted by the red line. Actual cost per watering, once determined, should follow the slope of the red line. UF management conducted preliminary work in 2016 to calculate the cost per watering. The preliminary estimate suggests the cost per watering may be $10 or less.

- The dashed green line forecasts the watering budget assuming $10 per tree watering. We have not conducted work to validate if $10 per tree is the actual cost; however, the forecast relates to the number of tree waterings and follows the curve of Annual Waterings.
- For reference, the blue dot shows UF's 2015 estimate of spending on watering, $1,108,547.

Through activity-based cost analysis, UF will be able to determine the watering budget based on the amount of tree waterings required. The cost per watering will also provide input to calculate the total tree establishment cost which will assist in forecasting tree planting budgets.

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[6] Costs and estimates have not been adjusted for inflation.

Watering Activity Forecast 2016-2023

- - - Estimate of $10 per watering   ——— Annual Waterings

Estimated waterings annually required as per watercycle

$5,728,079

572,808

2015 Spending Estimate

Appendix B

We reviewed UF's 2015 cost information. Based on activity information included with some costs, we estimated the proportion of budget spent on activities that have been benchmarked based on data collected on other municipalities and provided for information in *The Costs of Maintaining and Not Maintaining the Urban Forest: A Review of the Urban Forestry and Arboriculture Literature*.

Cost Category	UF's 2015 Costs (%)[7]	Benchmark Data
Planting/Nursery/Inventory	15.4%	14%
Pruning/Removal	41.4%	48-65%
Watering	4.1%	4%
Pest Control	2.6%	n/a
Inspection & General Maintenance/Repair	10.5%	n/a
General Admin/Misc. Materials/Supervision	17.3%	n/a
Other	8.7%	n/a
TOTAL:	100%	

As identified in Section 3.2, there are circumstances specific to Calgary that must be considered when comparing benchmark data to UF's 2015 costs. For example, based on accelerated planting schedules, the watering budget would be expected to be higher over the next six years. The benchmark data was compiled from the results of surveys collected from 400 cities in the United States, in a 1990 study.

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[7] Although actual Urban Forestry costs for 2015 were used, this analysis should be treated as an estimate of spending. The "n/a" in the chart identifies the categories for which equitable benchmarking data was not available, within the ISA study.