Calgary

City Auditor's Office

Water Metering Audit

September 6, 2024

Table of Contents

Audit Objective

The objective of this audit was to assess the effectiveness of The City's water meter installation processes.

Why it Matters

Effective water meter installation processes support accurate measurement of the amount of water consumed by each property, allowing for fair billing, and promoting water conservation efforts.

Calgary has seen a surge in new properties over the past decade, both in new and existing communities. This trend, which aligns with The City's Housing Strategy, is anticipated to continue, thereby escalating the need for effective and timely water meter installations.

What We Concluded

Water meter installation processes are generally effective in design and operation to support the current volume of installations required. However, improvements in the design of installation processes and controls will better support the future effectiveness of installations as demand increases.

New buildings requiring water meter installations are identified through building permit data. Our analysis of data comparing permits in final inspection status with meter installation dates for the period January 1, 2023, to March 31, 2024, showed that 96 % of new meter installations were completed within one day. All 25 locations sampled had a new billing account created, and reconciliations are conducted every month to compare water meter data against the billing contractor data to identify any meters without an account. Standard Operating Procedures are used to guide meter installations, and new employees are trained on the job through job shadowing and training courses.

We raised five recommendations to support on-going effectiveness of processes and controls as volumes of water meter installations increase in the future. Our recommendations focused on improving the efficiency of the process to identify commercial meter installations required, establishment of key performance indicators to monitor installation performance, implementing a risk-based spacer inventory management process, follow up on new account reconciliations, and establishing an oversight process over the training and development plan.

Background

Calgary has experienced growth in new properties in the last 10 years, both in new communities and within existing communities. This growth is expected to continue as part of The City's Housing Strategy and increases the demand for water meter installation. According to the 2021 Census of Canada, there were 206 communities in 2021, up from 197 in 2016[1]. In 2022, Council approved the initiation of eight new community areas[2].

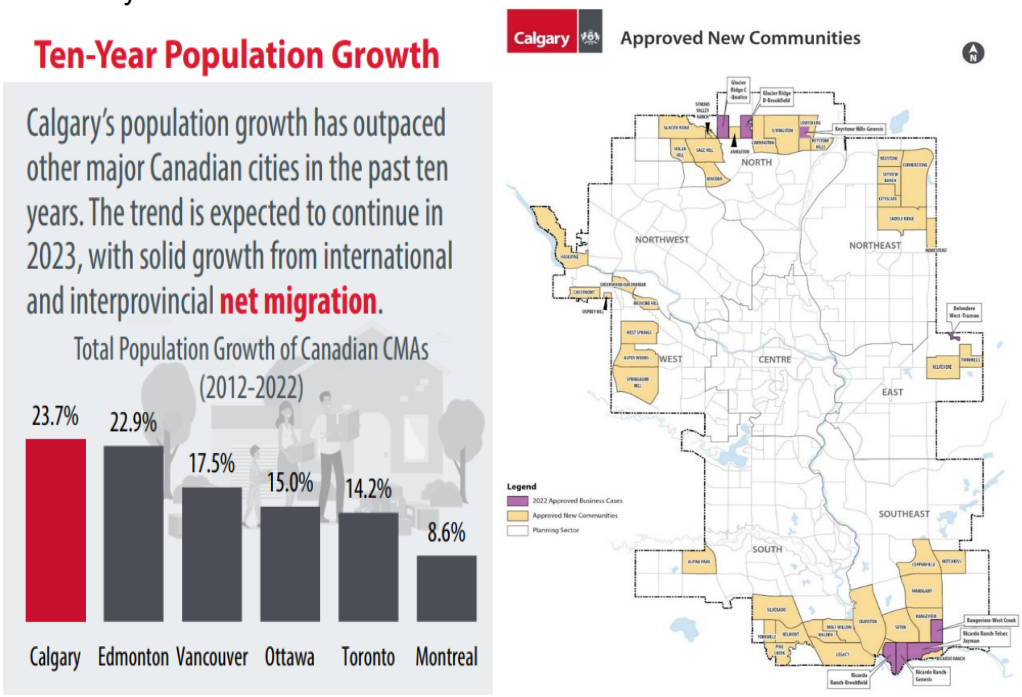

Figure 1: Source- Calgary and Region Economic Outlook 20232023-2028 (Fall 2023), 2022 Citywide Growth Strategy Monitoring Report (IP2023-0581).

According to CMHC the annual number of housing completions in Calgary has seen a steady increase year over year since 2020[3].

Year	Province	Centre	Singles	Semis	Row	Apartment and Other	Total
2020	AB	Calgary	3,750	1,140	1,635	4,180	**10,705**
2021	AB	Calgary	4,085	1,118	1,389	4,182	**10,774**
2022	AB	Calgary	4,929	1,194	1,543	5,975	**13,641**
2023	AB	Calgary	5,822	1,620	2,407	5,262	**15,111**

Figure 2: Source- CHMC Housing Completions: By Dwelling Type

The type and size of meter installed is dependent on the consumption requirements whether residential, commercial, or multifamily. The City of Calgary's (The City's) Water Metering team, within the Water Services Business Unit, are responsible for meter installation. Most water meters have a transmitter that is

[1] The City of Calgary releases community and ward profiles
[2] https://pub-calgary.escribemeetings.com/filestream.ashx?DocumentId=245472
[3] CHMC: Housing Completions by Dwelling Type (cmhc-schl.gc.ca)

remotely read for billing purposes. A contractor is responsible for collecting meter readings and billing customers. Legacy locations without meters are billed a flat rate.

In 2018, Water Metering conducted an exercise to verify whether all locations provided with City water were either metered or being charged a flat rate. This point in time exercise identified inconsistencies between Water Metering data in The City's Meter Management System (MMS) compared with actual inventory, and locations without meters. Results of the exercise showed an estimated $400,000 in unbilled water usage. Water Metering has since been developing solutions to mitigate the risk of unmetered properties.

Based on consultant metering strategy recommendations the Advanced Metering Infrastructure (AMI) program was launched in 2023 to replace the current water metering system. The process of installing water meters in homes or properties will remain unchanged. The AMI program will utilize technology to provide real-time data on water consumption, allowing both residents and City officials to track usage patterns and identify potential leaks or meter anomalies (e.g. meter not registering consumption). This data is crucial for managing the City's water resources efficiently and ensuring sustainable water management practices. This is a multi-year program that will span over six years.

Scope & Approach

To assess the effectiveness of the water meter installation process, we completed a risk assessment and identified the associated processes that would mitigate the risks (see Appendix). We reviewed the design and operation of these processes during the period January 1, 2023, to March 31, 2024.

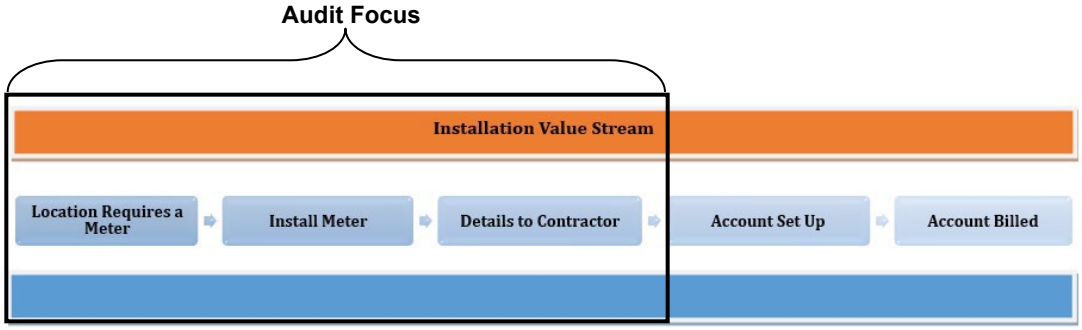

Figure 3: Meter Installation Value Stream based on the Water Metering Team's Installation Current State Process Mapping

Meter maintenance and lifecycle management, and customer billing were not part of this audit project's scope.

Results

The results are set out below under the following sections: New Meter Locations, Meter Installations, New Account Creation, and Training and Development. Processes and controls in place during the audit period were generally effectively designed and operating to meet the current level of water meter installations. However, we identified five improvements and raised associated recommendations that will better support risk mitigation given the projected future growth in water meter installations. During our audit fieldwork we also identified opportunities to

increase efficiency which we shared verbally with the Water Metering team to support their continuous improvement as demand for the service increases.

New Meter Locations

Effective processes to identify unmetered locations mitigate the risk of lost revenues.

Mitigating Controls & Processes Tested	Results
• Foreman pulls current list of permits to identify buildings requiring meters. • Foreman pulls list of final inspections from building approvals to identify buildings requiring meters. • Site visits to identify buildings requiring meters or completed installations. • Where a location does not have a meter- there is a sub process of sending a letter to customer requesting to place meter and/or ability to charge customer a flat rate.	🟢 🟡 🟢 🟢

🟢 **Effective Control/Process**
🟡 **Partially Effective Control/Process**

To assess the meter installation process in new build properties, we reviewed a sample of 25 residential and 25 commercial locations with building permits in 'final inspection' status. The process involves the Foreman extracting daily data on buildings in final inspection status from the Building Permits Dashboard, recording locations on a Meters Worksheet for tracking, and assigning locations to a Meter Serviceman for installation. The Servicemen conducts site visits to assess work in progress. Where a meter install was missed, a letter is sent to the customer requesting access to place a meter. We verified that these identified controls were working as designed in residential locations.

For commercial locations, we noted that the Foreman was unable to extract data on new builds in the final inspection phase from the Building Permits Dashboard. Instead, the Foreman manually reviews this status in the Public One Stop Service Application (POSSE) to clarify the permit type being inspected. This manual review process impacts efficiency. Our sample review of 25 locations from POSSE revealed that only five were related to new buildings. The remaining 20 locations were for alterations/renovations. We recommend that Water Metering explore the feasibility of adding additional filters to the dashboard to accurately identify new commercial buildings (Recommendation 1).

Meter Installations

An efficient meter installation process mitigates the risk that new buildings have water turned on before a meter is installed, resulting in lost revenues/financial loss to the City. POSSE provides data on building permit application status and the Meter Management System (MMS) is a repository for meter information such as meter numbers and locations.

Mitigating Controls & Processes Tested	Results
• Foreman pulls listing for issued permits and, ○ Reviews MMS to see if work is complete,	🟢

○ Reviews SharePoint to see if permit has been recorded in SharePoint. • Meter Serviceman document's locations under development and compares with listing of issued permits. • Dedicated teams for meter installations. • Sufficient meters in stock to meet demand. • Foreman allows for a spacer to be installed when a builder requires water for construction purposes, but the site has not yet been completed to allow for the proper installation of a water meter.	🟢 🟢 🟢 🟢 🟡

🟢 **Effective Control/Process**
🟡 **Partially Effective Control/Process**

Meters has Servicemen dedicated to commercial and residential meter installations. The Meters Foremen allocates Servicemen to jobs based on daily requirements. Meter inventories are maintained based on projections and lifecycle requirements.

To assess whether new meter installations were completed in a timely manner, we used data analytics to compare the POSSE Final Inspection date with the MMS meter installation date for the period January 1, 2023, to March 31, 2024. We observed that 96 % of meter installations were completed within one day. To support future achievement of business objectives, we recommended that Water Metering establish key performance indicators and corresponding targets (Recommendation 2).

A spacer is used for setting up a plumbing system prior to water meter installation and can be re-used from site to site. Spacers are provided to customers that make requests through the 3-1-1 system. Spacers are removed when a new meter was installed. We sampled 3-1-1 requests for spacers and noted that there is no process to maintain spacer inventory. We recommended that Water Metering implement a process for managing spacer inventory, focusing on the highest value spacers (Recommendation 3).

New Account Creation

A third-party contractor is responsible for billing. Timely and accurate communication of meter installation information to the third-party contractor mitigates the risk of delays in collecting revenues and lost revenue.

Mitigating Controls & Processes Tested	Results
• System-generated reports and flags to check for entry errors. • Integrated communication between SAP/Meter Management System (MMS). • Manual research and review process for locations that do not have an account holder identified.	🟡 🟢 🟢

🟢 **Effective Control/Process**
🟡 **Partially Effective Control/Process**

We evaluated the effectiveness of Water Metering's process for sharing meter information with the contractor. We noted that a meter installation data file extracted from MMS is transmitted nightly to the contractors SAP system via secure file transfer. File transfer errors are flagged for review. We sampled 25 residential and six commercial locations in final inspection status and confirmed that data from all sampled locations was transferred to the contractor. New accounts were subsequently created by the contractor.

A system generated monthly data transfer reconciliation is conducted that compares City data in MMS with Contractor data in SAP. We reviewed a sample of 12 errors identified through these reconciliations. We identified one location where a change relating to a mismatched dial configuration was not updated by the contractor. Unresolved errors could impact billing account accuracy and could lead to financial loss and reputational damage. We recommend implementing a tracking process to regularly review reconciling items and ensure timely resolution of identified issues (Recommendation 4), this will better support risk mitigation as the number of meters installed increases.

We noted that a manual research and review is conducted to resolve issues where an account holder has not been identified or is incorrect for new meter locations.

Training and Development

Effectively trained employees mitigate the risk of incomplete or improper meter installations, and support employee safety and development. We reviewed the design and operating effectiveness of Water Metering's training and development strategies through staff interviews and documentation review.

Mitigating Controls & Processes Tested	Results
• SOPs for meter installation. • On the job training program • Training and Development plans	

 **Effective Control/Process**
 **Partially Effective Control/Process**

Meter Installation Standard Operating Procedures (SOPs) have been created and are used as process guidelines. New staff are trained on the job through job shadowing. We noted that the Water Services Business Unit is collaborating with Learning & Development to create specific training programs. Water Metering is also implementing a Quality Assurance program to proactively address training needs. We confirmed that performance reviews were conducted at the three- and six-month interval for the three Meter Serviceman hires in 2023.

We reviewed the 2023 4th quarter Corporate Training Records and noted that more than 40 required courses had either not been taken or were expired. To continue to support effective training for water meter installation, as demand for services increases, Water Metering should periodically review and update the training matrix to maintain course relevance and follow up on outstanding training (Recommendation 5).

Observations & Recommendations

#1: Commercial Meter Installations	
OBSERVATION	**RECOMMENDATION**
The process to identify commercial buildings in "Final Inspection" status does not support efficient identification of new buildings requiring meter installation. The Meters Foreman cannot identify commercial locations in final inspection in the Building Permits Dashboard. The Foreman uses POSSE to identify commercial buildings in Final Inspection status. We noted that the POSSE extract shows all locations in final inspection status, which can include new buildings and alterations such as renovations. The Foreman must manually review the listing to identify the relevant new buildings. This manual review process impacts efficiency. Based on our sample review of 25 locations from POSSE, only five were related to new buildings. The remaining 20 locations were for alterations/renovations.	1. The Manager Customer & Business Support to investigate the feasibility of adding additional filters to the dashboard to ensure accurate identification of new commercial buildings. **MANAGEMENT RESPONSE** Agreed. Meters will connect with POSSE team to explore options to improve the Final Inspection report output to Meters. **LEAD** Manager Customer & Business Support **SUPPORT** • Leader, Meters • Meters QA Team, • Manager–CBS • IT Dept. Management **COMMITMENT DATE** March 31,2025
#2: Key Performance Indicators	
OBSERVATION	**RECOMMENDATION**
Water Metering has not developed any Key Performance Indicators (KPIs) and target thresholds to measure meter installation performance. KPIs provide a clear focus for both strategic and day-to-day operations, serve as quantifiable measures that facilitate data-driven decisions, and help focus attention on critical aspects of performance. Without KPIs, it is challenging to assess performance and make informed decisions. For example, to assess whether new meter installations were done in a timely manner, we matched the POSSE Final Inspection date against the Meter Management System (MMS) meter installation date for the period January 1, 2023, to March 31, 2024.	2. The Manager Customer & Business Support to establish key performance indicators and associated targets that will assist in achieving their business objectives. **MANAGEMENT RESPONSE** Agreed.

We noted that 96% of the installations were completed within one day, indicating that most installations meet timely expectations. However, 4.2% of the installations had delays, ranging from 30 days to over 90 days, which may impact efficiency and revenue. Water Metering has not established a threshold to assess whether these delays are acceptable. Timely installation of meters supports fair billing and prevents potential revenue loss.	Meters will develop initial KPIs and targets for new meter installations. **LEAD** Manager Customer & Business Support **SUPPORT** • Leader, Meters • Meters QA Team **COMMITMENT DATE** March 31, 2025
#3: Spacer Inventory	
OBSERVATION	**RECOMMENDATION**
Water Metering has not established a robust process to maintain an inventory of spacers. Spacers are provided to customers who request them directly from Water Metering or through the 311 system. Spacers are subsequently removed when a new meter is installed. We sampled ten 311 requests for Spacers and noted that: • There is no process to maintain an inventory of spacers. Spacers are either kept on the serviceman trucks or in Stores. • We confirmed that six of ten spacers had been replaced with a meter. However, we could not verify that spacers replaced with meters were placed back into inventory as no records were maintained. Spacers have a monetary value over $350 per unit depending on the unit type. Without proper tracking, there is an increased risk of financial loss through mishandling of these assets.	3. The Manager Customer & Business Support to implement a spacer inventory management process focused on the highest value spacers. **MANAGEMENT RESPONSE** Agreed. a) Meters will perform a Risk Assessment on the value of the spacers and required inventory quantities. b) Meters will review existing spacer tracking and inventory procedures and refine as needed. **LEAD** Manager Customer & Business Support **SUPPORT** a) Meters Supervisor b) Meters Foremen–Pre-Installs, Shop & Large **COMMITMENT DATE** a) December 31, 2024 b) December 31, 2024

#4: Monthly Data Transfer Reconciliations	
OBSERVATION	**RECOMMENDATION**
The monthly data transfer reconciliation process does not confirm or track whether identified errors have been resolved. We reviewed a sample of 12 errors from the monthly reconciliation conducted between MMS and the billing contractors SAP system. We confirmed that 11 of 12 reconciling items had since been resolved. We identified one location where the billing contractor did not complete the change. Specifically, this issue relates to a mismatched dial configuration. This exception was not flagged as an unresolved issue as there is no process to review or confirm that outstanding items have been corrected. Unresolved errors could impact billing account accuracy and could lead to financial loss and reputational damage.	4. The Manager Customer & Business Support to establish a tracking process to regularly review the reconciling items to ensure issues identified are resolved in a timely manner. **MANAGEMENT RESPONSE** Agreed. An Issues Brief that will form the basis for an SOP that addresses this issue has been developed and submitted to the SAP contractor for approval and implementation. **LEAD** Manager Customer & Business Support **SUPPORT** • Leader, Customer Experience • Leader Meters, • Third Party Contractor Billing **COMMITMENT DATE** June 30, 2025
#5: Training & Development	
OBSERVATION	**RECOMMENDATION**
The Water Metering training plan is not designed effectively as it does not include processes to support consistent completion of relevant training in a timely manner. Water Metering uses a training matrix based on specific job roles. For each job role, training requirements are identified and assigned to individual employees. The training includes both mandatory corporate courses (such as Code of Conduct and Respect in the Workplace) and role-specific training. The Learning and Development group provides quarterly reports to Water Metering, detailing completed, pending, and expired training. We reviewed the fourth quarter 2024 training report and noted that there were 40 instances of incomplete or expired training. Out of the 40 training instances: • Twenty-five employees still need to complete their required training.	5. The Manager Customer & Business Support design and implement processes to: a) Periodically review and update the training matrix to ensure the relevance of assigned courses; and b) follow up on outstanding training. **MANAGEMENT RESPONSE** a) Meters will Implement review process for training matrix

• Sixteen employees have training that has already expired. We interviewed staff to understand the status of the training plan and noted that there was no consistent process to follow up on outstanding training identified by Learning and Development. Staff also indicated in interview that some courses such as Transportation of Dangerous Goods and Environmental Awareness may no longer be relevant to current operations. Failing to complete mandatory training can affect employee safety, development, and overall performance.	annually confirm course validity. b) Meters will develop a follow up process for incomplete or expired training (add to monthly Ops mtg agenda). **LEAD** a) Manager Customer & Business Support b) Manager Customer & Business Support **SUPPORT** a) Leader, Meters L&ED, Safety Advisors b) Leader, Meters Meters Supervisor **COMMITMENT DATE** a) December 31, 2024 b) January 31, 2025

Acknowledgements

The City Auditor's Office conducts projects, including this audit, in conformance with the International Standards for the Professional Practice of Internal Auditing.

The City Auditor's Office would like to thank staff from Water Metering for their cooperation and support during this audit.

APPENDIX – Risk Matrix

Risk	Mitigating Controls and Processes
Inability to identify unmetered locations resulting in lost revenues. (Incomplete meter asset repository)	• Foreman pulls current list of permits to identify buildings requiring meters. • Foreman pulls list of final inspections from building approvals to identify buildings requiring meters. • Site visits to identify buildings requiring meters or completed installations. • Where a location does not have a meter- there is a sub process of sending a letter to customer requesting to place meter and/or ability to charge customer a flat rate.
New buildings have water turned on before a meter is installed, resulting in lost revenues/financial loss to the City.	• Foreman pulls listing for issued meters and, • Reviews MMS to see if work is complete, • Reviews SharePoint to see if application has been recorded in SharePoint. • Meter Serviceman document's locations under development and compares with listing of issued permits. • Dedicated teams for meter installations. • Sufficient meters in stock to meet demand. • Meters Foreman allows for a spacer to be installed when a builder requires water for construction purposes, but the site has not yet been completed to allow for the proper installation of a water meter.
Operating Effectiveness: Meter installation information not passed on to third party billing contractor, insufficient resources leading to delays in collecting revenues and lost revenue.	• System-generated reports and flags to check for entry errors. • Integrated communication between SAP/Meter Management System (MMS) • Manual research and review process for locations that do not have an account holder identified.
Inability to employ, train and retain a skilled and competent workforce which impacts operational efficiency and increases reputational risk	• SOPs for meter installation. • On the job training.