



**DOWNTOWN PARKING METERS:**  
Meters and pay stations are working,  
but certain transactions can be challenging

A REPORT FROM THE CITY AUDITOR  
October 2007



Office of the City Auditor  
Portland, Oregon





CITY OF  
**PORTLAND, OREGON**

OFFICE OF THE CITY AUDITOR  
Audit Services Division

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October 30, 2007

TO: Mayor Tom Potter  
Commissioner Sam Adams  
Commissioner Randy Leonard  
Commissioner Dan Saltzman  
Commissioner Erik Sten  
Susan Keil, Director, Portland Office of Transportation

SUBJECT: Audit of Downtown Parking Meters, (Report #352A)

Attached is Report #352A containing our review of downtown parking meters. This is the first in a series of two audit reports on parking meters downtown. This report focuses on the function and operation of the meter machines. The second audit will focus on the purchase of new electronic meters. A written response to the audit from Transportation Director Susan Keil is included at the back of the report.

We ask that the Commissioner in Charge direct the Director of the Office of Transportation to prepare a status report in one year, or sooner, detailing steps taken to address the recommendations contained in our report. The status report should be sent to the Audit Services Division.

We appreciate the cooperation and assistance we received from the Parking Operations Division and staff in the Portland Office of Transportation as we conducted this audit.

  
GARY BLACKMER  
City Auditor

*Audit Team: Drummond Kahn, Fiona Earle, Jodi Brekhus, Kristin Johnson, Doug Norman, Kari Guy, Beth Woodward, Ken Gavette and Scott Stewart*

Attachment



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## DOWNTOWN PARKING METERS:

Meters and pay stations are working,  
but certain transactions can be challenging

**Summary** City parking meters are generally working accurately, but some transactions on the new SmartMeter pay stations can be complex and confusing to newer users. In some cases this confusion can lead to customers paying more than necessary.

The City of Portland has about 1,500 parking meters in the downtown area, maintained by the Portland Office of Transportation (PDOT), to control the use of more than 8,900 parking spaces. Parking meters are also a revenue source for the City, generating over \$13 million per year. We examined both the new SmartMeter pay stations and the older single-space meters downtown to determine whether they were working correctly.

Nearly 11 percent of the SmartMeter pay stations we tested did not provide receipts/stickers at first attempt. PDOT management told us that this is due to customers not watching and responding to the meter display messages about removing the payment card promptly. Receipts/stickers are needed to show that a person paid for parking. We also found that some SmartMeters accept payment for parking after 7:00 p.m. – the end of the paid parking day. This can happen if customers are not careful to watch the display messages when paying with a credit card using the “add time” button. These difficulties with the SmartMeters are affecting a significant number of meters, and the visitors and residents who use them.

Our audit identified a faulty memory card in the new type of pay station that the City is now buying. This memory card allowed one meter to charge auditors’ credit cards and not print a receipt/sticker. The meter failed to send the expected electronic message about this error to PDOT. PDOT management stated that they have taken action to correct this problem, which they do not expect to recur.

These findings are particularly important as the City begins to purchase and install at least 300 new SmartMeters. PDOT should consider and implement solutions to reduce the risk that these problems occur in more meters.

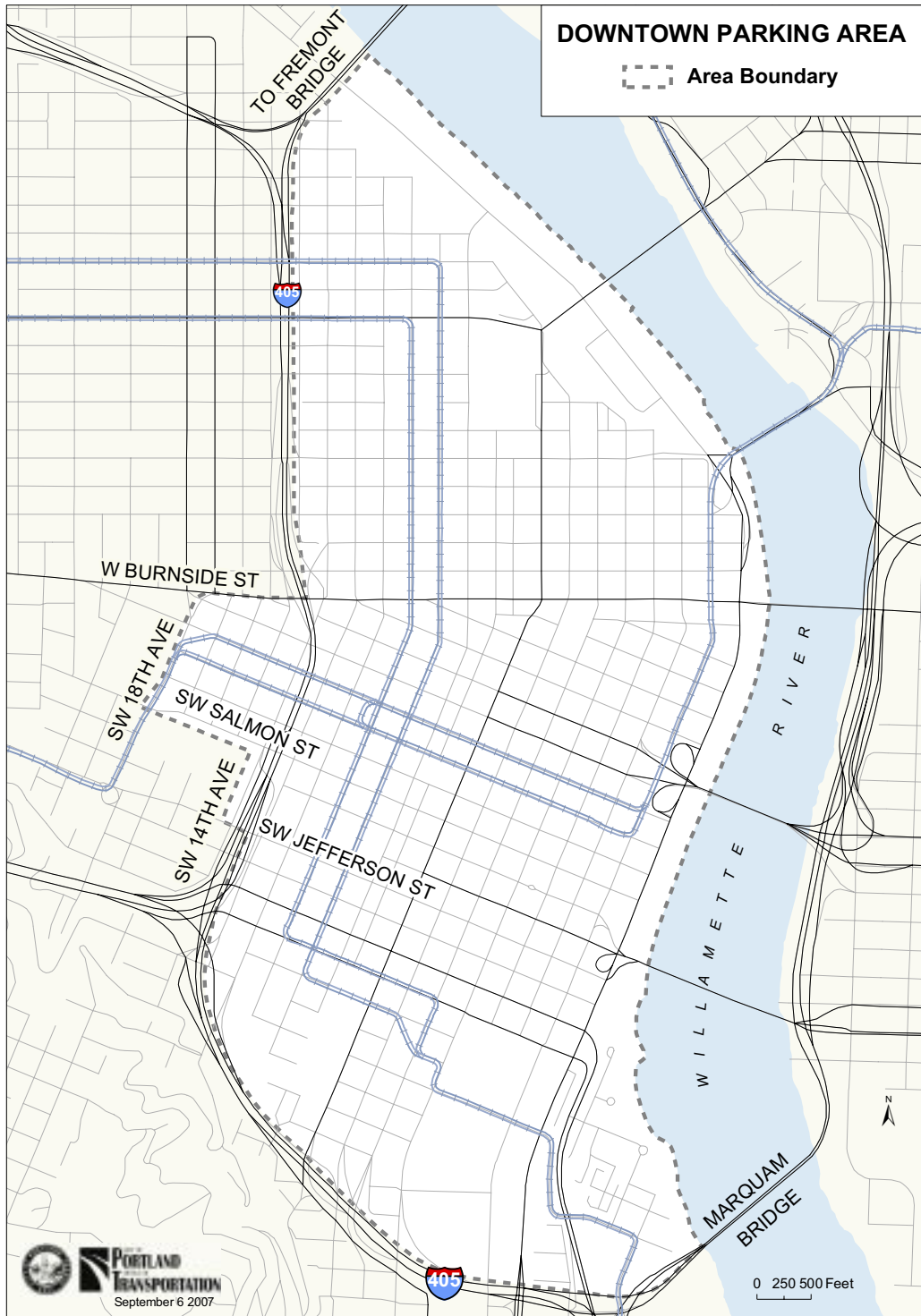
We also found that some of the parking meters selected for testing were not in the locations recorded on PDOT's parking meter inventory. They had either been physically removed or had been covered up to remove them from service due to construction work.

**Figure 1** General city map, showing the downtown parking area



Source: Audit Services Division

**Figure 2 Downtown Parking Area map**



Source: Portland Office of Transportation

**Background**

The Portland Office of Transportation (PDOT) manages the City's parking meters. The City has two types of parking meters: metal single-space meters which only accept coins and SmartMeter pay stations. SmartMeters are solar-powered, multi-space parking meters with the ability to accept credit or debit cards, or pre-paid smart card parking cards.

Prior to 2002, Portland had about 7,100 single-space meters, which were aging and breaking down frequently. According to PDOT, the single-space meters would jam with coins, and many parts were no longer available from the vendors. Therefore, the City adopted the modern pay station type of meter. By the end of September 2003, PDOT installed nearly 900 SmartMeter pay stations in Portland's downtown parking area, replacing most of the single-space meters.

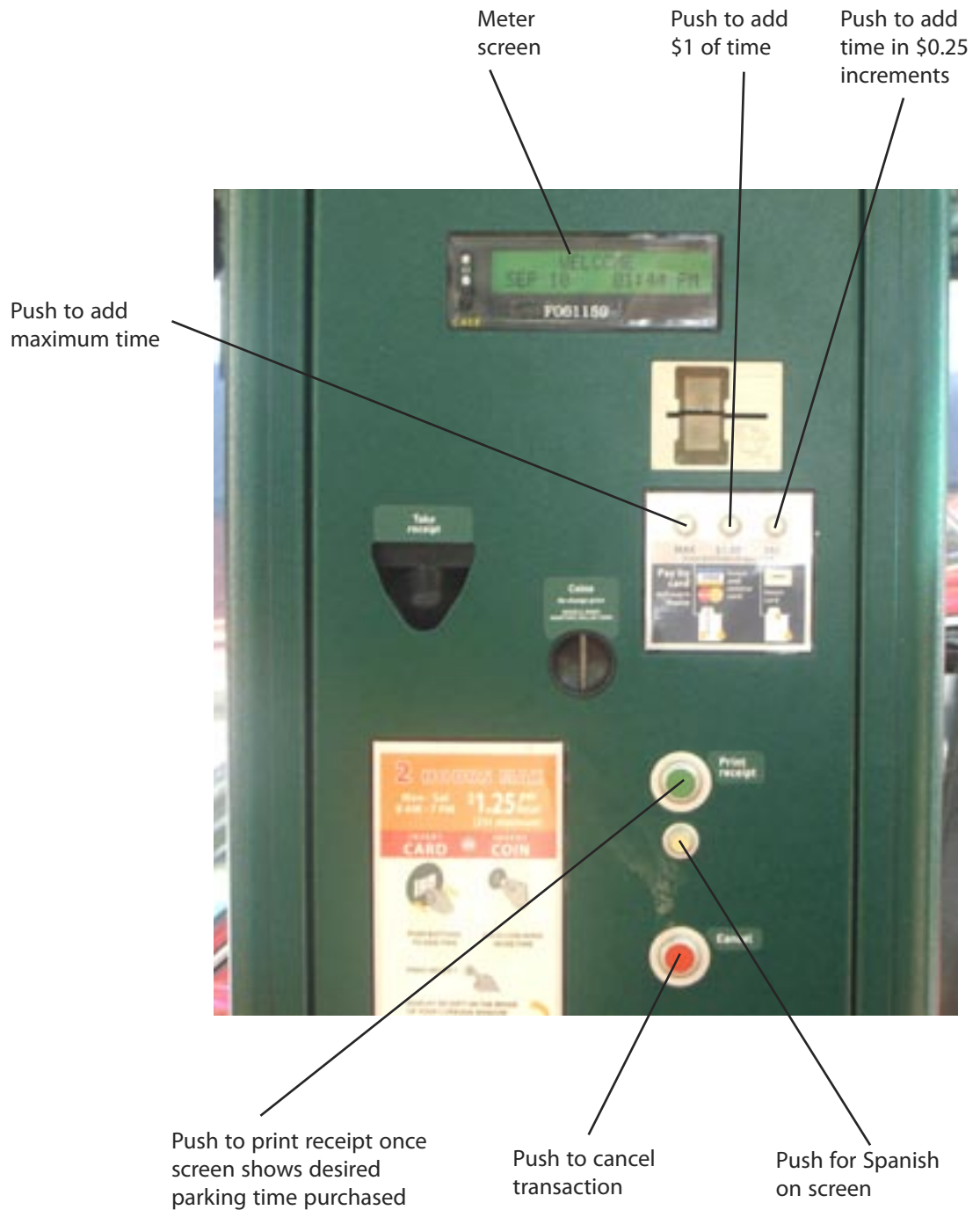
By the end of August 2007, the City had approximately 1,300 SmartMeters controlling more than 8,700 parking spaces and approximately 200 remaining single-space meters in the downtown area. In an average month there are 700,000 pay-to-park transactions made on the downtown SmartMeters. Parkeon and Cale are the manufacturers of the two SmartMeter makes owned by the City of Portland. See Figures 3 and 4.

For the City's SmartMeter pay stations, customers must park their car, go to the pay station (one per block "face"), and pay for parking. The SmartMeter is supposed to print a receipt, which is a sticker that the customer attaches to the inside of the car window so that Parking Enforcement can tell that the customer paid for parking through the expiration time printed on the receipt. The receipt/sticker also provides a detachable portion so the customer has a record of the time they need to move their car and a receipt of the amount they paid for parking.

Since July 1, 2005, the rate charged for parking in downtown Portland has been \$1.25 per hour, and parking must be paid for between the hours of 8:00 a.m. and 7:00 p.m., on Monday through Saturday, excluding public holidays.



**Figure 3 A Cale SmartMeter**



Source: Audit Services Division photography and explanation of the labels placed on SmartMeters by PDOT

Note: The Cale pay station displays the minimum time of 12 minutes automatically when a credit card is inserted.

**Figure 4 A Parkeon SmartMeter**



Source: Audit Services Division photography and explanation of the labels placed on SmartMeters by PDOT

Note: Minimum time is 12 minutes, which costs \$0.25. Maximum time varies by meters.

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**Management  
Initiatives - The  
SmartMeter Upgrade  
Project**

In November 2006, the City entered a contract to enhance the Parkeon SmartMeters to eliminate two problems with these pay stations: the processing of credit card payments in batches once a day rather than immediately, and the acceptance of excess payments past the paid parking period at the end of the day.

The upgrade to prevent payment beyond the “true maximum amount” at the end of day will be applied to all the City’s Parkeon meters, approximately 1,135 pay stations. PDOT management has demonstrated that the upgraded pay stations have the additional programming to prevent over-payment of a Parkeon meter towards the end of the paid parking day:

- When coins are inserted to pay for time beyond 7:00 p.m., the message “Over Payment, Ticket or Cancel” appears on the meter’s screen and the coin-insert slot closes.
- When a credit card is used with the “add time” button, before the customer can add time to go beyond 7:00 p.m. the meter displays the warning message “Maximum Amount Reached”. The upgraded meter will only display and charge for, to the cent, the minutes remaining to reach 7:00 p.m., no matter how much the customer presses the “add time” button.

The upgrade for real-time processing of credit card payments instead of batch processing will be applied to 650 Parkeon pay stations, about half of the 1,300 downtown SmartMeters.

PDOT management began to test this upgrade project during our fieldwork. We found that one of the 57 meters we tested had a sign on it stating that it was not accepting credit cards. PDOT management advised that this was due to problems with their testing of the upgrade. When we returned eight days later it was accepting payment by credit card accurately.

According to PDOT management, the project to upgrade the Parkeon SmartMeters started in earnest in September 2007, and will continue through November 2007. PDOT management advised that by the end of August 2007, 61 of the downtown SmartMeters had been upgraded.

**Objectives, Scope and Methodology**

Our objective was to determine whether downtown parking meters are working accurately.

We tested the accuracy of statistical, randomly-selected samples of both the old single-space meters and the SmartMeters in downtown Portland by inspection, and by depositing coins and/or credit cards in them to check the accuracy of the parking time displayed by the meters and on the parking permit/sticker issued by the SmartMeters.

We split the parking meters into two groups, the SmartMeters and the single-space meters and randomly selected a statistical sample to test for each group. To make them representative of the population of downtown parking meters, the samples were stratified for:

- maximum parking time allowed
- the collection area code within the downtown parking zone
- meter age, and
- historical usage levels, based on transaction data

In addition, we ensured that a proportionate number of Parkeon SmartMeters and Cale SmartMeters were selected.

Six auditors tested 57 randomly-selected SmartMeters downtown, in May, 2007.

- For each SmartMeter tested, we inserted a credit card, pressed the button to give maximum parking time, compared the time displayed to the maximum marked on the meter, noted any difference, and cancelled the transaction.
- For each SmartMeter tested, with a credit card inserted, we then pressed the button to give parking time in increments up to the maximum time allowed. We compared the time displayed to the maximum marked on the meter, noted any difference, and noted any difficulty with the button sticking or counting increments twice. We accepted the maximum time and processed the transaction, gathering the printed receipt/sticker.
- We checked the printed receipts/stickers for accuracy of the amount paid and the time for parking allowed.

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- For 30% of our sample we made an additional test of the payment for parking by coins, by inserting two quarters and observing that the parking time purchased was 24 minutes (parking rates downtown being \$1.25 per hour).

Meter age data was not available for the single-space meters, but the meters in the collection area north of Hoyt Street were more recently installed than the meters in the other downtown areas. Therefore, we sampled single-space meters from the older collection areas downtown, since older meters are more likely to break down.

Transaction data per machine was not available for the single-space meters, but we drew more of our sample from the areas between West Burnside St. and SW Market St. which have enough transactions to be collected twice as often as the single-space meters in the other downtown areas.

We did not test the SmartMeters for payment using the pre-paid smart cards, because payment for parking by parking cards accounts for about 1 percent of the revenues from parking meters.

We conducted our work in accordance with generally accepted government auditing standards.

## **Audit Results**

City parking meters are generally working accurately, but some transactions on the SmartMeters can be complex and confusing to newer users, possibly leading to people paying more than necessary. Difficulties including the meters not printing the receipt/sticker needed to show that a person paid for parking, and difficulties with meters accepting payment for parking after 7:00 p.m., are affecting a significant number of meters (and the visitors and residents who use them).

### **SmartMeter pay stations**

SmartMeter pay stations accurately display parking time paid, but do not always give receipts/stickers at the first attempt (12.3 percent of meters tested), and can charge beyond the end of paid parking time (3.5 percent of meters in our first test) if customers do not carefully watch the meter's screen when paying with a credit card using the

“add time” button. In addition, our testing revealed to PDOT, and to the meter’s manufacturer, a faulty memory card in the new type of pay station that the City is now buying. The details of these results are set out below.

**Credit card charged without a printed receipt/sticker**

One of the two Cale meters we tested charged for parking without printing a receipt/sticker when two different auditors tested it, on two different days, and failed to send an error message to PDOT. PDOT management told us that this problem was caused by the use of a cheaper computer memory card, and that this was the first instance of this problem recorded for the Cale meter. These are the new type of pay stations that PDOT is buying for the City. PDOT management stated that they have ordered computer memory cards from a different supplier to use on these meters.

**Difficulty obtaining printed receipts/stickers**

In addition to the meter with the faulty memory card, we had difficulty obtaining printed receipts/stickers from nearly 11 percent of the Parkeon meters we tested. These meters charged the tester’s credit cards only when they produced a receipt/sticker, however we found that it took two attempts to do this in more than 5 percent of the meters tested. No receipt/sticker was produced in another 5 percent of meters tested, leaving the testers unclear as to whether or not their credit cards had paid for parking, just as a parking customer could be uncertain if they had paid if no receipt appeared.

Accurate receipt printing is critical for the SmartMeters to work effectively in selling parking time to customers. Without a receipt, some customers might believe that the meter had charged them for parking but without giving them a record to show Parking Enforcement that they paid. Some customers could park without the receipt/sticker, potentially being cited for not paying, while other customers would undergo the inconvenience of repeating the transaction at the same or another pay station until they got a receipt/sticker.

Our testers’ experience reflected the difficulty reported by the City’s parking customers, according to PDOT management’s description of

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routinely handling complaints about this from the public. This problem arises from the 8 second cut-off control programmed into the pay-stations. The meter's display tells the customer to remove their card quickly, but if the customer is not watching the display screen or does not remove their credit card promptly, the meter will cancel the transaction and display a message that the transaction was not processed. Customers need to watch the meter's display screen carefully and to move fast to complete transactions and obtain receipts/stickers.

Once the pay-stations are upgraded, the customer will have to remove their credit card before they can select the parking time required. The 8 second cut-off control will be replaced with a longer one in the upgraded meters. These upgrade changes should eliminate the problem with obtaining printed receipts/stickers.

#### **Credit cards charged beyond end of paid parking time**

Parkeon SmartMeters (most of the downtown pay stations) that have not been upgraded are accepting overpayment, when parking customers pay for it with credit cards by adding time in increments that run past the end of paid parking at 7:00 p.m. We found two SmartMeters (3.5% of those initially tested), both Parkeons, which allowed overpayments like this at the end of the day.

The time displayed on the face of the meter was an accurate calculation of the time remaining between the time of our afternoon tests and the end of paid parking at 7:00 p.m. However, the display shows the parking purchased instead of the expiration time. The expiration time and the amount paid (and charged to our credit card) appeared on the receipts/stickers. The receipts/stickers showed we were paying for time beyond 7:00 p.m.

The message that flashes on the screen for "Maximum amount reached" can be missed (and was missed by the auditor) since it is displayed for only a moment. Even if seen, it might be impractical for the customer to cancel the transaction. There's no sign on the meter or on the display to say that this problem can be avoided by using the "Maximum" time button.

We found that when we used the “Maximum Time” button to buy parking time at the end of the day the pay station only charged our credit cards for the amount required to pay for the time remaining up to 7:00 p.m. PDOT management advised that parking customers typically choose to select for full time by using the “Maximum” button, instead of the “add time” button.

PDOT is upgrading all the Parkeon pay stations to eliminate the end of day overpayment problem. When the upgrade is in place the “add time” button will calculate to the penny when the customer chooses to increment to full parking time. PDOT management also stated that end-of-day overpayment had never been a problem with the Cale meters which the City is now buying.

**Meter inventory records not updated in a timely manner**

We found two meters out of our original sample of 59 (over 3 percent) that were not accurately reflected in the inventory records kept by PDOT’s Office of Transportation System Management.

- We found that one had been removed due to construction on January 4, 2007. This removal was not reflected on the PDOT inventory from which we selected our sample.
- We found that another’s maximum parking time had been reduced to 90 minutes from the 3 hours recorded in the inventory.

PDOT management stated that there are sometimes delays between changes occurring on the street and the update to PDOT’s meter inventory.

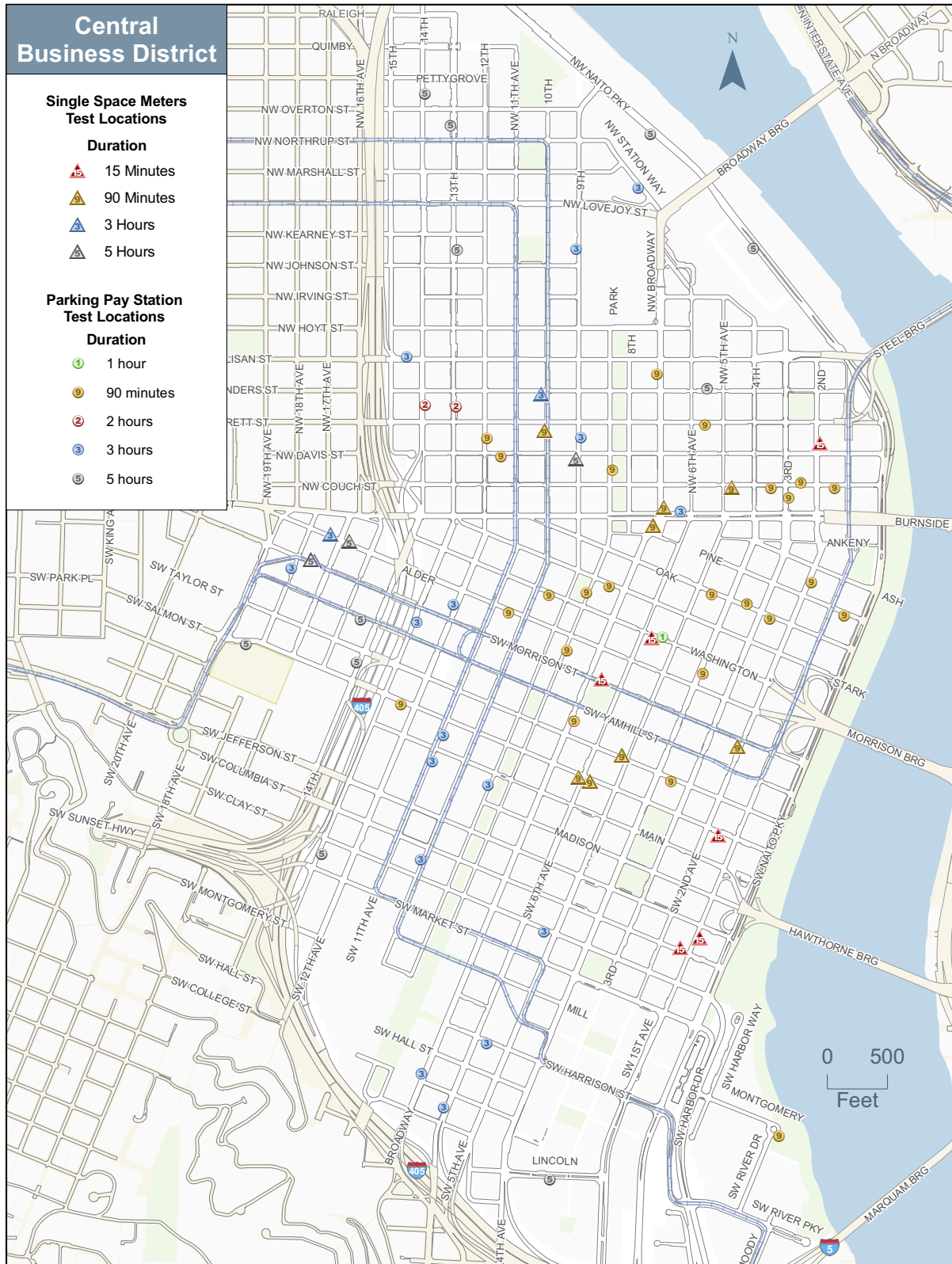
When physical changes to the SmartMeters are not reflected timely in the inventory this could hamper PDOT’s management of the City’s parking meter system.

**City SmartMeters are generally working accurately**

- Parking time purchased was accurately displayed on the meter face. We concluded that the meters’ calculations of the maximum parking time displayed on the face of the meters was accurate in all cases, given the reasonable programming adjustments set up by PDOT.



**Figure 5 Map of the meters tested downtown**



Source: Portland Office of Transportation, using sample meter data provided by Audit Services Division.

- The receipts/stickers printed by the pay stations were accurate records of the test transactions processed by the SmartMeters.
- Payment by coins was trouble-free. All 17 of the SmartMeters we tested for payment with coins accepted two quarters without jamming. The pay stations displayed and printed the accurate amount of time purchased by coin.

**The downtown single-space meters are functioning accurately, without jamming.**

The single-space meters downtown are accurately calculating the parking time paid for up to the maximum parking time allowed at the meter location. However, on-street parking customers need to be aware that this type of meter cannot give change if they “overfeed” the meter beyond the maximum parking time allowed.

We randomly selected a sample of 20 of the single-space meters which was representative of the stratified audit population of 158 single space meters located in the downtown parking area.

Two auditors tested these meters in May, 2007 by inserting sufficient coins, mostly in quarters, to buy the maximum parking time allowed at that meter, taking into account any time remaining on the meter from an earlier customer. We compared the time displayed to our calculation of the time that should have been bought by the coins inserted to check the accuracy of the time displayed. All the meters tested accepted coin payment without jamming.

Physical changes in the location of single-space meters downtown, during construction or for other reasons, are not always reflected in a timely manner in the inventory records kept by PDOT’s Office of Transportation System Management. We found one meter missing from SW Salmon between 5th and 6th Avenues. PDOT management told us that this meter had been struck by a truck and was not replaced due to transit mall construction. This removal was not reflected on the PDOT inventory from which we selected our sample.

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**Recommendations**

We recommend that the Commissioner-in-Charge direct the Portland Office of Transportation to:

- 1. Ensure the integrity and accuracy of the programming in all SmartMeters after any re-programming or after any change in computer memory cards.**

This could include an on-street test of all the Cale pay stations that had to be re-programmed after receiving the corrupting computer memory card and tests of the upgraded Parkeon pay stations before they are returned to the streets.

- 2. Ensure that the SmartMeters print a receipt/sticker at the first attempt by a customer to buy parking time.**

This could include improving PDOT's ongoing education of the parking public about how to obtain receipts/stickers from the SmartMeters by removing credit cards promptly. The public needs to be reminded that the lack of a receipt/sticker means that the customer has not paid to park. In addition, we urge PDOT to carefully consider the benefit of upgrading all the SmartMeters to reduce the problem of parking purchase transactions timing-out without the pay station printing a receipt/sticker.

- 3. Complete the upgrade of the SmartMeters that will stop them from accepting overpayment by credit card when parking is purchased with the "add time" button towards the end of the paid parking day.**

- 4. Ensure that the parking meter inventory records are updated promptly for all changes to the physical locations or to the maximum parking time of any parking meter on the streets, to allow the efficient management of the City's parking meters.**



# RESPONSE TO THE AUDIT





CITY OF  
**PORTLAND**  
 OFFICE OF  
**TRANSPORTATION**



Sam  
 Adams  
 Commissioner

October 23, 2007

Susan D.  
 Keil  
 Director

TO: Gary Blackmer, City Auditor

Lavinia  
 Gordon  
 System  
 Management

FROM: Susan D. Keil, Director, Portland Office of Transportation

Don  
 Gardner  
 Engineering &  
 Development

SUBJECT: Response to Audit Report #352A – Downtown parking meters: Meters and pay stations are working, but certain transactions can be challenging

Sam M.  
 Irving, Jr.  
 Maintenance

Thank you for your report on the workings of our downtown parking meters. Periodic performance reviews on important Transportation programs are an important part of ensuring good service delivery and I appreciate and accept your report and recommendations.

John  
 Rist  
 Business  
 Services

We have been working hard over the past few years to implement a new parking meter technology and we are pleased with your finding that "City parking meters are generally working accurately". In addition to working accurately, the new parking meter technology offers more payment options for our downtown visitors and makes it easier for visitors to comply with parking regulations. The results show more visitors parking on the street, more visitors shopping for longer time periods, and fewer overtime parking citations being issued to our downtown visitors. All of this contributes to a productive downtown environment

Paul  
 Smith  
 Planning

Your report also includes four specific recommendations for improvement. I'm pleased to say that we currently have plans and procedures in place to address each recommendation. As a matter of fact, most of the issues that are detailed in your report have already been identified and your recommendation to resolve them is currently being implemented. You noted our actions in your report and we appreciate that acknowledgment. Our goal is continuous improvement and we practice that by receiving and responding to customer service issues and updating our operations systems, as required.

We will continue to implement the required changes and document our progress as we move forward. This information will be maintained for your review upon your request.

An Equal  
 Opportunity  
 Employer

Sincerely,







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*Downtown Parking Meters: Meters and pay stations are working, but certain transactions can be challenging*

Report #352A, October 2007

Audit Team Members: Fiona Earle, Jodi Brekhus,  
Kristin Johnson, Doug Norman, Kari Guy,  
Beth Woodward, Ken Gavette, Scott Stewart

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Gary Blackmer, City Auditor  
Drummond Kahn, Director of Audit Services

**Other recent audit reports:**

*City Computers: Computers found with difficulty, tracking systems need to be improved (#350, October 2007)*

*City Recruitment Process: Monitoring needed to ensure balance of flexibility and fairness (#356, October 2007)*

*Ending Homelessness: Many short-term goals met; now long-term success should be defined (#336, August 2007)*

*Portland Parks Facility Maintenance: Tracking, assessment and measurement have improved (#353, July 2007)*

