

THE MINNESOTA ROAD FEE TEST (MRFT)

BEN PIERCE, BATTELLE



Enabling Legislation

2007 Legislature

**Mn/DOT
Appropriations Bill**

“\$5,000,000 is for a pilot project to demonstrate technologies that will allow for the future replacement of the gas tax with a fuel-neutral mileage charge.”

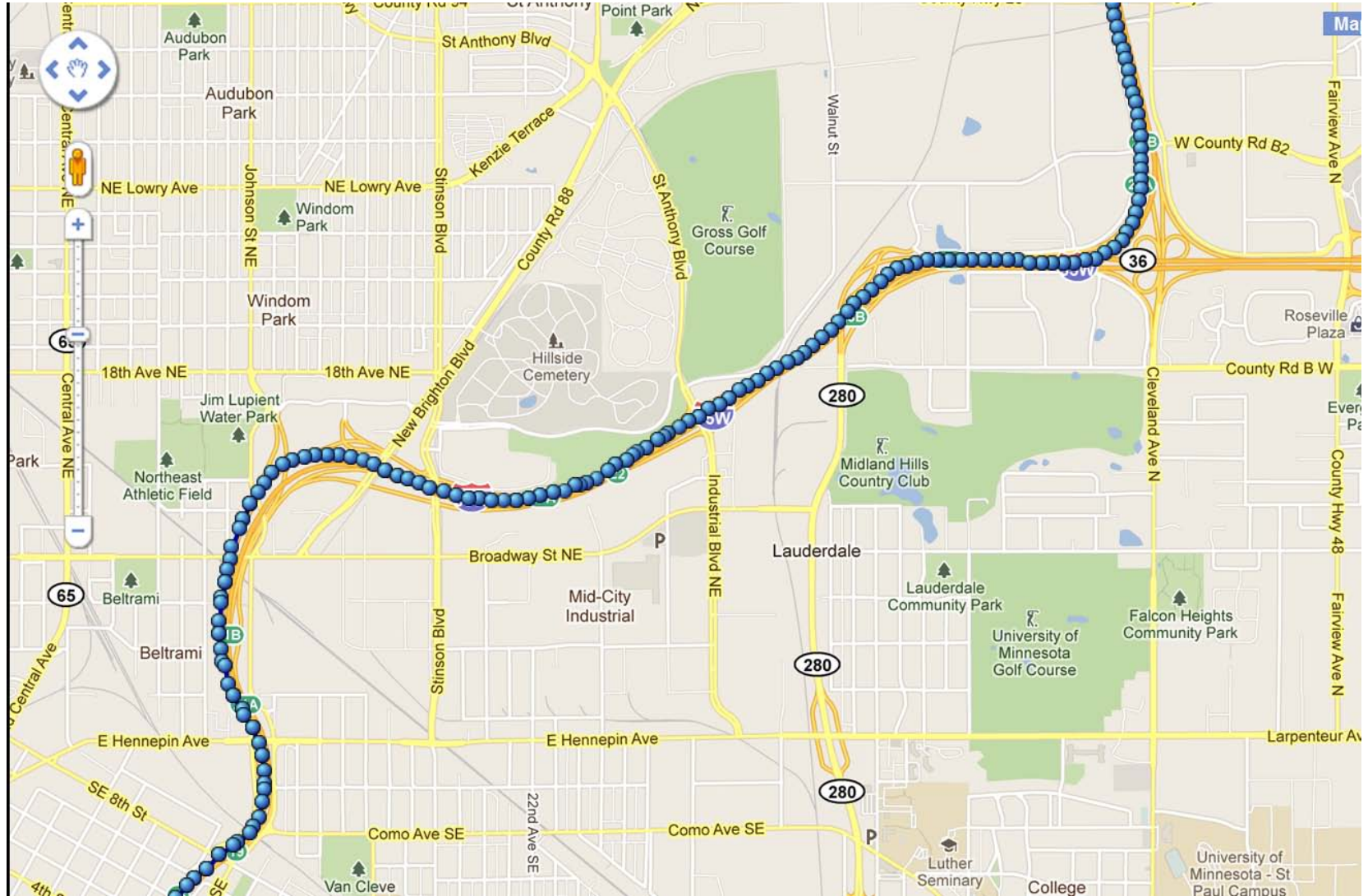
Battelle's Role

- Develop software and hardware systems to conduct a demonstration of mileage-based user fees (MBUF)
- Demonstration will:
 - Utilize Commercial Off-The-Shelf (COTS) hardware
 - Include 500 in-vehicle devices & back office processing system
 - Be deployed for a 1-year duration (split into 3 deployment waves)
 - Require extensive software development
 - Permit a comparison of technology vs. odometer readings

Software Applications

- Mileage Based User Fee
- Probe Vehicle
 - Use cellular phones to capture real-time traffic information anonymously
 - Latitude/longitude, speed, travel times, etc.
- In-Vehicle Signage
 - Traveler alert and notification system (road signs, advisory messages)
- CICAS - Cooperative Intersection Collision Avoidance System
 - In-vehicle alert of mainline traffic to crossing traffic in real-time
 - Only one intersection
 - Based upon Dedicated Short Range Communications (DSRC)

Software Visualization: Probe



Software Visualization: Signage

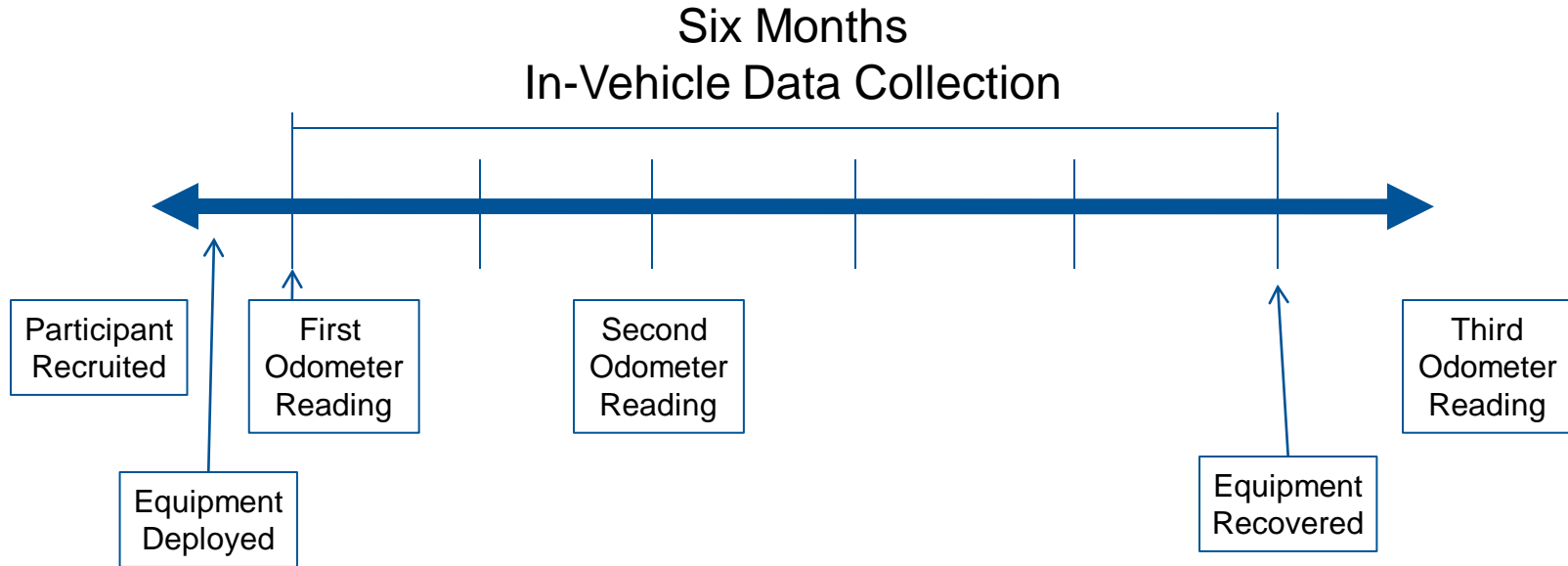


Mileage-Based User Fee Operational Concept

- **Discounting System**

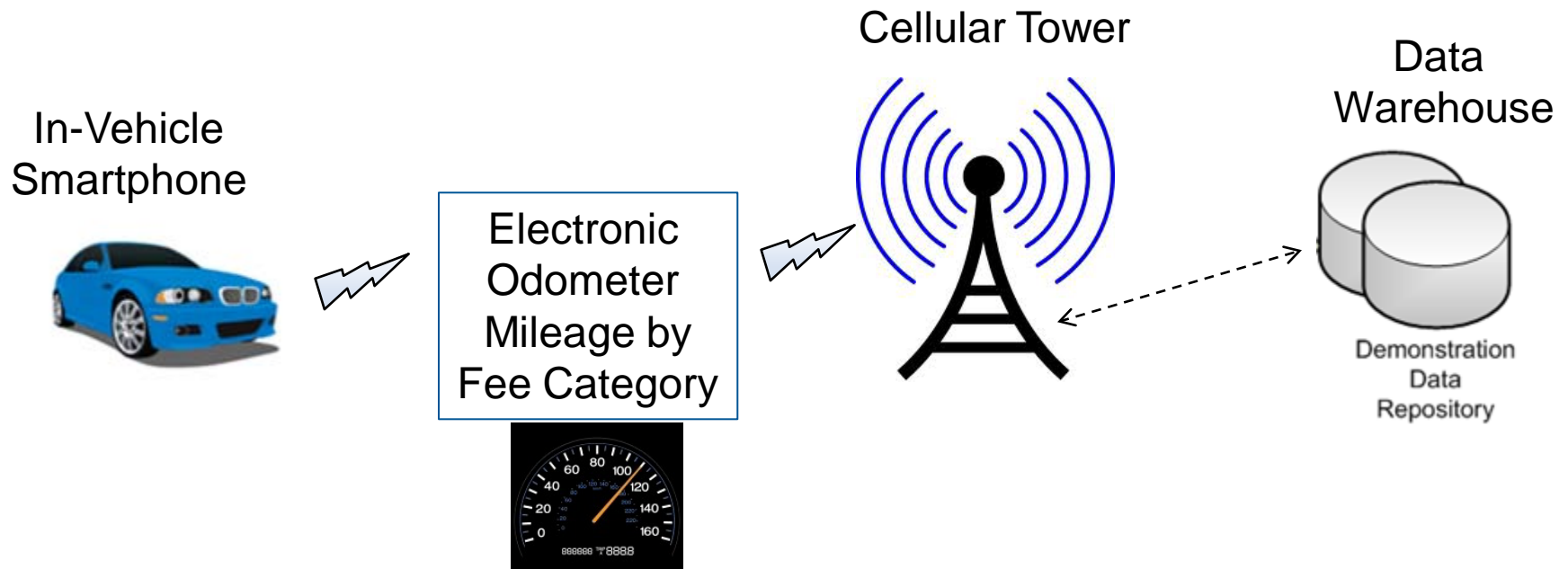
- Everyone has to pay a flat fee per mile driven based upon odometer readings (annual or at sale of vehicle)
- Technology used to discount from a flat fee per mile according for a fee system based upon:
 - Country (inside vs. outside the United States)
 - State (inside vs. outside Minnesota)
 - Large geo-zones (inside vs. outside a metropolitan area)
 - Roadway classification (Interstate vs. Non-Interstate)
 - Time of day
 - Day of week
 - Vehicle heading
 - Type of vehicle

Study Design Overview



- Participation is voluntary and can be changed on a trip-by-trip basis
- Will have before/after odometer readings to compare to GPS readings
- Will have information on the number of times user opted out

System Concept



GPS Position is NOT being transmitted for the Fee Assessment

MBUF Fee Assessment

- “Real” money will change hands
 - Demonstration includes invoicing and payment by participants through PayPal
- Each participant will be provided with an up-front incentive to participate
 - Incentive will be sufficient to “cover” approximately four months of travel
- No MBUF fees assessed until the third month of participation
 - Participant pays MBUF fees for months 3-6
 - Will never have to pay more than the initial incentive

MBUF – How it works

- Designed as a “thick client”
- MBUF application accumulates mileage driven by fee category (roadway type, geography, etc.)
- Every 24 hours accumulative mileage by fee category transmitted via cellular to data warehouse
- Invoice generated monthly based upon aggregate miles in fee categories

In-Vehicle Design Overview

Samsung Galaxy S

In-Vehicle
Computational
Device and
Display Unit



OBD-II Diagnostic Tool

ELM327
With Bluetooth
Data Connection



Mounting Hardware and Cables



Installation Pictures



Minnesota Road Fee Test Main



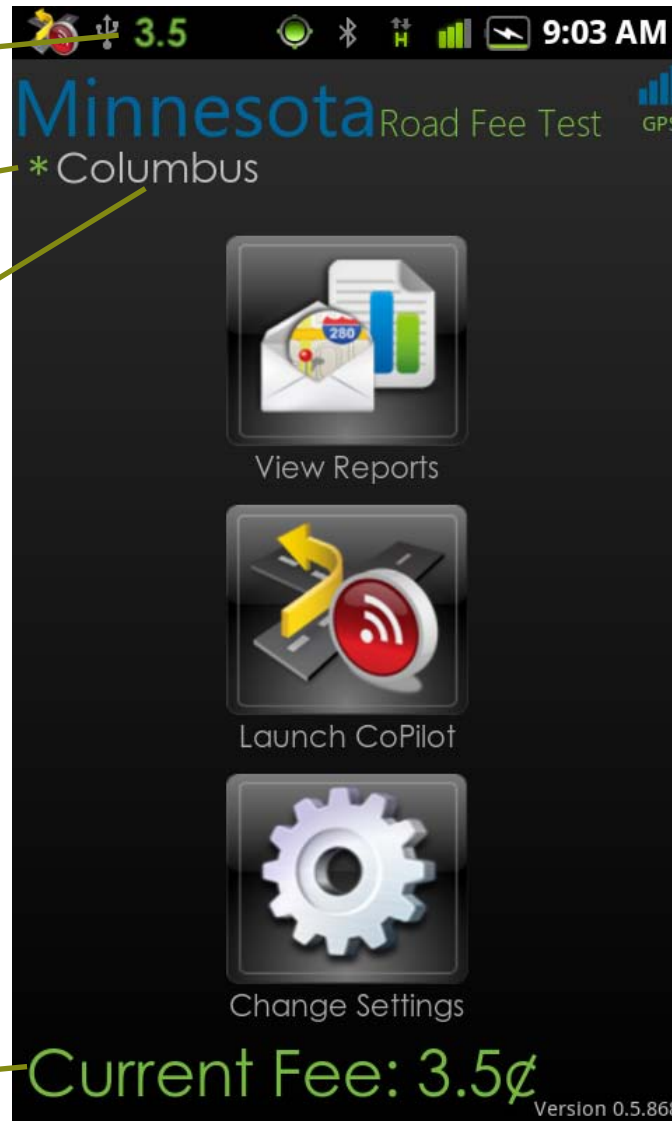
Minnesota Road Fee Test - Running

MBUF Rate

Interstate Notification

MBUF Geography

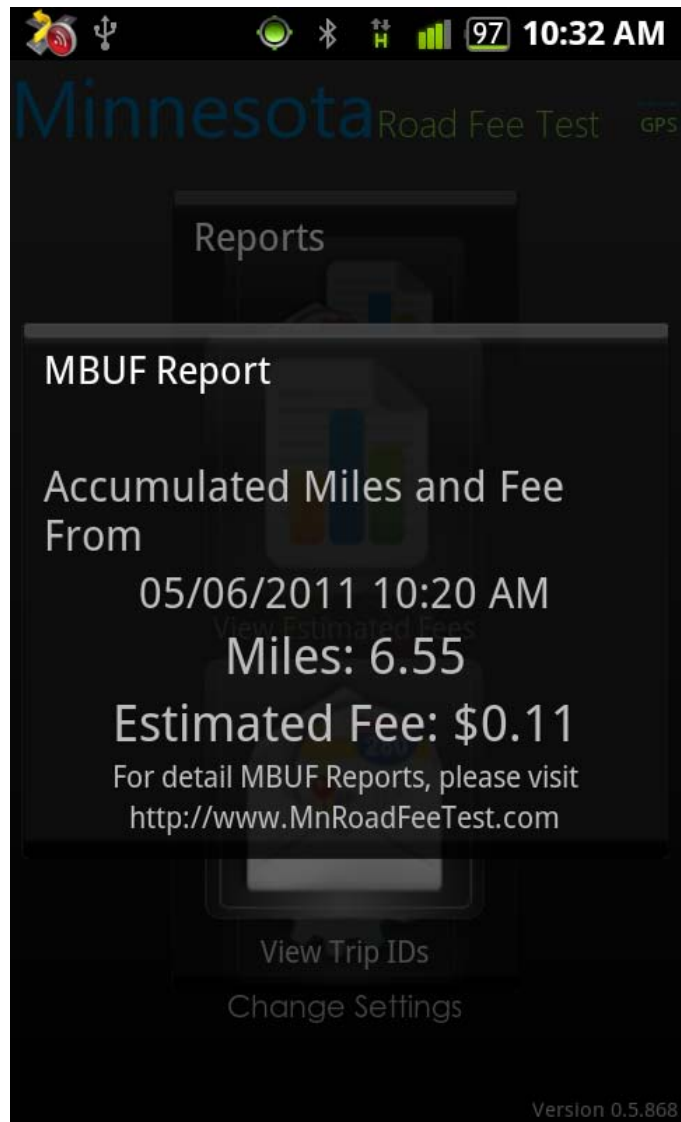
GPS Status




MBUF Rate

Version

MBUF In-Vehicle Trip Report



Participants Have Web-Access




Welcome, **business1** | Log Off

participant portal

Navigation Menu

- Home
- Account Information
- View Invoices
- View Trips
- Schedule Odometer Reading
- Request Assistance
- FAQ
- Guides / Videos



Invoices

Invoice Number	Invoice Date	Due Date	Invoice Amount	Amount Paid	Remaining Balance	Status	Action
2	4/22/2011	5/5/2011	\$0.13	\$0.13	\$0.00	Payment Complete	View PDF
3	4/25/2011	5/8/2011	\$0.24	\$0.24	\$0.00	Payment Complete	View PDF
16	4/29/2011	5/12/2011	\$0.59	\$0.59	\$0.00	Payment Complete	View PDF
23	5/1/2011	5/14/2011	\$0.32	\$0.32	\$0.00	Payment Complete	View PDF
25	5/2/2011	5/15/2011	\$0.21	\$0.21	\$0.00	Payment Complete	View PDF
482	5/4/2011	5/17/2011	\$0.73	\$0.73	\$0.00	Payment Complete	View PDF
590	5/5/2011	5/18/2011	\$0.47	\$0.47	\$0.00	Payment Complete	View PDF
611	5/6/2011	5/19/2011	\$0.23	\$0.23	\$0.00	Payment Complete	View PDF
632	5/7/2011	5/20/2011	\$0.00	\$0.00	\$0.00	Payment Complete	View PDF
653	5/8/2011	5/21/2011	\$0.00	\$0.00	\$0.00	Payment Complete	View PDF
694	5/9/2011	5/22/2011	\$0.54	\$0.54	\$0.00	Payment Complete	View PDF
979	5/17/2011	5/30/2011	\$0.00	\$0.00	\$0.00	Payment Complete	View PDF
1017	5/18/2011	5/31/2011	\$0.22	\$0.22	\$0.00	Payment Complete	View PDF
1055	5/19/2011	6/1/2011	\$0.47	\$0.47	\$0.00	Payment Complete	View PDF
1196	5/20/2011	6/2/2011	\$0.71	\$0.71	\$0.00	Payment Complete	View PDF
1578	5/26/2011	6/8/2011	\$0.18	\$0.18	\$0.00	Payment Complete	View PDF
1615	5/27/2011	6/9/2011	\$0.39	\$0.00	\$0.39	Canceled	View PDF Pay Invoice
1690	5/29/2011	6/11/2011	\$0.00	(\$0.26)	\$0.26	Overdue	View PDF Pay Invoice
1764	5/31/2011	6/13/2011	\$0.00	\$0.00	\$0.00	Payment Complete	View PDF
1838	6/2/2011	6/15/2011	\$0.10	\$0.00	\$0.10	Canceled	View PDF Pay Invoice
1875	6/3/2011	6/16/2011	\$0.49	\$0.00	\$0.49	Payment Due	View PDF Pay Invoice
1912	6/4/2011	6/17/2011	\$0.37	\$0.00	\$0.37	Payment Due	View PDF Pay Invoice
1986	6/6/2011	6/19/2011	\$0.14	\$0.00	\$0.14	Payment Due	View PDF Pay Invoice
2023	6/7/2011	6/20/2011	\$0.43	\$0.00	\$0.43	Payment Due	View PDF Pay Invoice
2099	6/9/2011	6/22/2011	\$0.46	\$0.00	\$0.46	Payment Due	View PDF Pay Invoice
2175	6/11/2011	6/24/2011	\$0.28	\$0.00	\$0.28	Payment Due	View PDF Pay Invoice
2251	6/13/2011	6/26/2011	\$0.00	\$0.00	\$0.00	Payment Complete	View PDF

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Electronic and Paper Invoices

Minnesota Road Fee Test

Monthly Invoice

Matthew G Burns
505 King Ave
Columbus, OH 43201

Invoice #: 2099
2002 VW Passat

Invoice Date: 6/9/2011

Due Date: 6/22/2011

Total Amount Due: \$0.46

Mileage Detail

Criteria	Mileage	Rate (\$)	Rate Effectivity Date	Total Charge
Columbus-NonInterstate-OFF-WEEKDAY	20.23	0.010	6/8/2011	\$0.20
Columbus-NonInterstate-AM-WEEKDAY	6.95	0.020	6/8/2011	\$0.14
Ohio-NonInterstate-OFF-WEEKDAY	5.46	0.010	4/20/2011	\$0.05
Ohio-NonInterstate-AM-WEEKDAY	3.70	0.010	4/22/2011	\$0.04
Bartholomew North-NonInterstate-AM-WEEKDAY	0.19	0.080	6/5/2011	\$0.02
Bartholomew South-NonInterstate-OFF-WEEKDAY	0.20	0.070	6/5/2011	\$0.01
Columbus-Interstate-AM-WEEKDAY	0.04	0.035	4/22/2011	\$0.00
Columbus-Interstate-OFF-WEEKDAY	0.03	0.035	4/22/2011	\$0.00
Columbus-NonInterstate-PM-WEEKDAY	0.01	0.020	6/8/2011	\$0.00
Battelle Parking Lot-NonInterstate-AM-WEEKDAY	0.03	0.050	5/9/2011	\$0.00
Battelle Parking Lot-NonInterstate-OFF-WEEKDAY	0.09	0.050	5/9/2011	\$0.00

Payment Detail

Last Payment Amount Last Payment Date
\$0.47 5/24/2011

To make a payment using PayPal, logon to <https://www.mnroadfeetest.com>.

Payments also may be made by appointment by calling (612) 708-7288.

For questions about this invoice, call (612) 708-7288 or email billing@mnroadfeetest.com

Cloud-Based Data Warehouse

Welcome burwsm | [Log Off](#)

Minnesota
Road Fee Test

administrator portal

- Home
- Reports ▾
- Participant ▾
- System Administration ▾
- Invoice Management ▾
- Management ▾

Participant

Yogi Bear
123 Jellystone Dr
Jellystone, MT 87652
Email: bear.yogi@mnroadfeetest.com
Home: (757) 321-4567

User Name: beary
Work: None

Received Startup Funds: False
Cell: None

Preferred: Home

- Edit
- Manage Portal Access
- Vehicle and Device
- View Trip Data

Odometer Readings

Vehicle: 2010 Toyota Sienna **Devices:** 353650049047348

Odometer Reading	Status	Detail	Action
First Reading	Not Scheduled		Schedule
Second Reading	Not Scheduled		Schedule
Third Reading	Not Scheduled		Schedule

Send Administrative Message to this Participant

Current Status and Schedule

- Current Status

- Final System Testing and Validation

