City of Battle Creek

Meter Reading Systems

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METER READING HISTORY PRIOR TO 1985

- Manual in-home reads
  - Residential water meters were read every other month
    - These accounts were read by meter readers on foot, entering homes
    - As two-income families became the norm, estimated reads increased due to limited access
  - Commercial and industrial accounts were read monthly
    - Meter readers used vehicles to drive from one business to the next
    - Commercial and industrial accounts were read every month

TECHNOLOGY COMES TO METER READING,1985

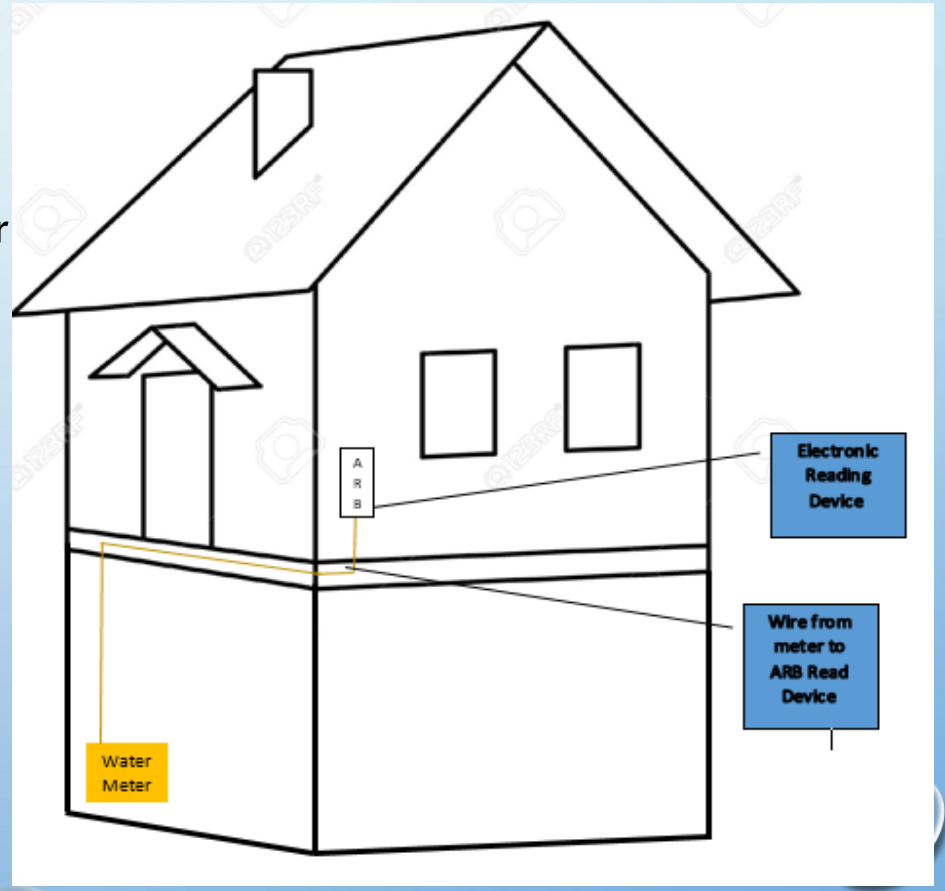
- City Commission approves contract for new read system
  - Automatic reading & billing system (ARB) rollout begins
    - The ARB system collected reads electronically
    - Meter in-home with wire connecting to a receptacle on the outside of building
    - Reads were downloaded into an interface that transferred reads to billing system
  - Reading efficiency & accuracy increased
    - ARB system eliminated human error and illegible handwritten reads
    - Savings in collecting reads without entering buildings
    - Eliminated data entry by importing reads into billing software

AUTOMATIC READING & BILLING SYSTEM IMPLEMENTED IN 1985 (ARB)

The ARB device was installed with a wire connecting it to the water meter

Water meters were upgraded for compatibility

Read data was collected by engaging a handheld device into the ARB on the outside of the building



NEW TECHNOLOGY COMES TO METER READING, 2001

- City Commission approves contract for new radio read system
  - Drive-by radio read system installation begins
    - The ARB is replaced with a radio transmitting device
    - Radio transmitters connected to water meters by the same ARB wire
    - Commercial and industrial meters replaced by Metron Farneir as part of project
    - Reads were collected monthly with vehicle equipped with receiver
  - Reading efficiency & accuracy increased
    - Drive-by system allowed for monthly readings of all accounts
    - Improved accuracy with files transferred from billing, to reading, and returned to billing

RAMAR REGISTER & RAMAR TRANSMITTER

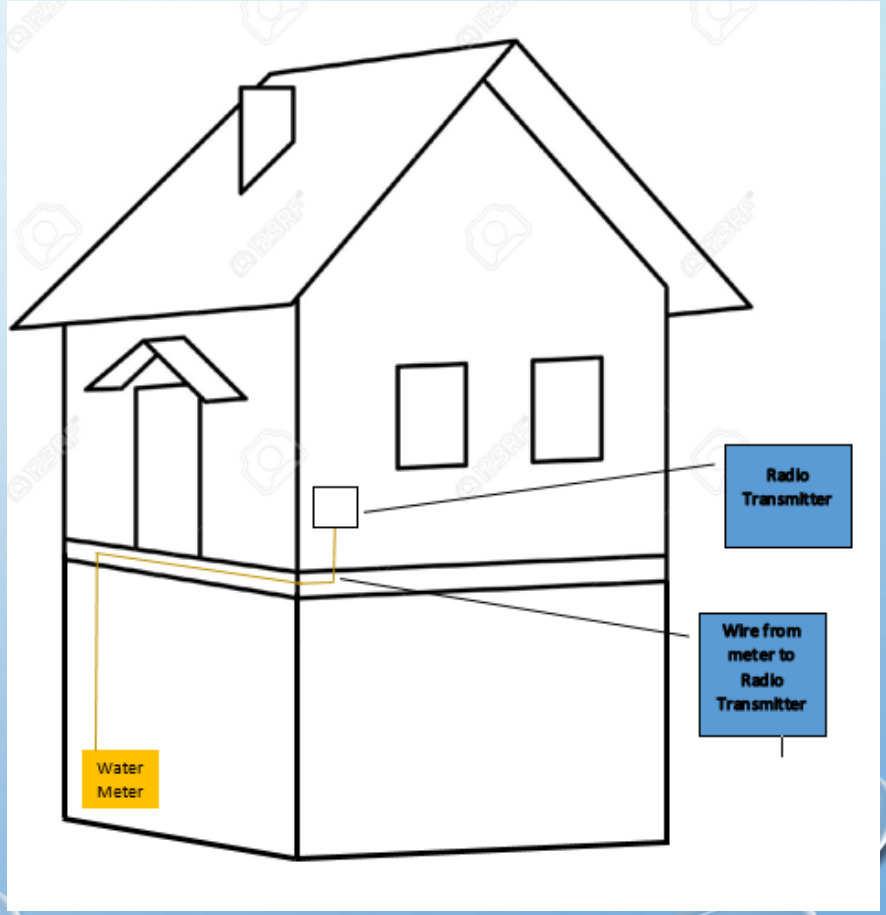
TRANSPARENT TECHNOLOGIES T2 TRANSMITTER

DRIVE-BY READING SYSTEM IMPLEMENTED IN 2001

The ARB device was replaced with a radio transmitting device

Read data was collected with a vehicle equipped with a receiver driving through billing cycles

Most meters were replaced, wire was not normally replaced, transmitter installed in the same location as the existing ARB in most installs



CHALLENGES WITH RAMAR, METRON & T2 PRODUCTS 2001- 2012

- Ramar read system found to be operating outside of specifications
- Repeated attempts to correct with vendor failed
- Customer confidence significantly damaged
- Inaccurate bills and make-up bills increase, credit process developed
- Credits and city provided labor to replace defective devices becomes excessive

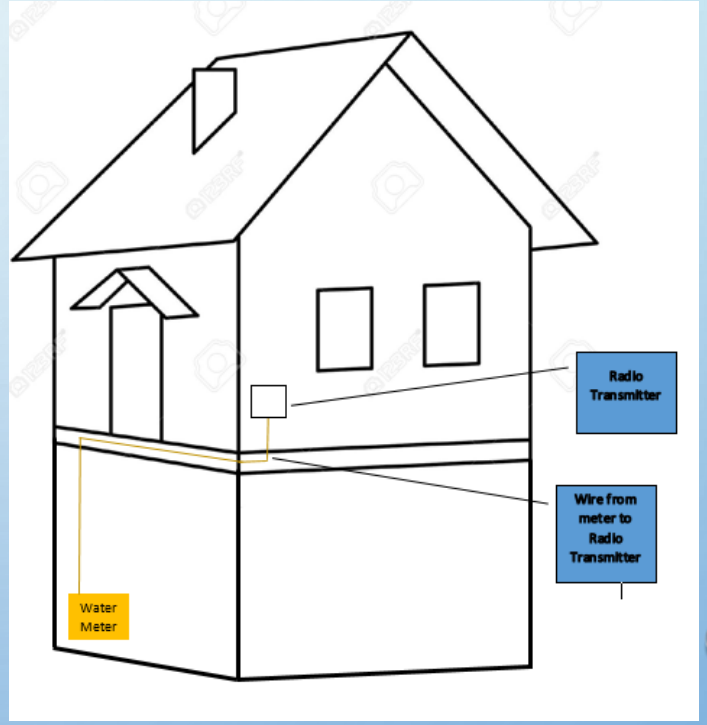
MIGRATION TO FIXED-READ SYSTEM IMPLEMENTED IN 2014

The existing radio transmitter is now being replaced with the new R900 transmitter

Read data now collected by drive-by method during migration

Read data collected from fixed network as read cycles are completely converted to the R900 transmitters

Meters replaced as needed, original ARB wire used if functional



INFORMATION ON THE NEW FIXED-READ SYSTEM

The Neptune R900 that is replacing the previous radio transmitters operates in the same frequency ranges of 902 mhz – 928 mhz

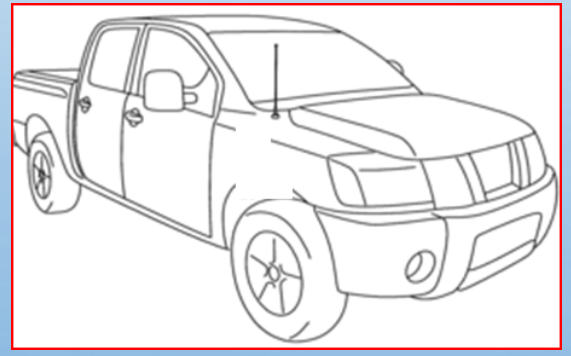
This technology has been in use in Battle Creek since 2001

The Neptune R900 transmitter broadcasts less often then the previous transmitters; every 14 seconds compared to every 8-10 seconds on the T2

The Neptune R900 transmits for less than one minute total per day and for 7 milliseconds at a time. A millisecond is equal to .007 seconds.

The exposure to radio frequency energy at a distance of 1 foot from the meter is never more than 0.08 mw/cm2 for the fixed network messages. This is approximately 8 times lower than the exposure limit set by the FCC. Standard mobile reading messages for the drive-by operation are even lower.

R900 INFRASTRUCTURE



UTILITY BILLING SOFTWARE

READ SYSTEM HEALTH DASHBOARD

City of Battle Creek fixed-network meter reading system: one year into migration

R900 TRANSMITTER INSTALLATION & METER REPLACEMENT

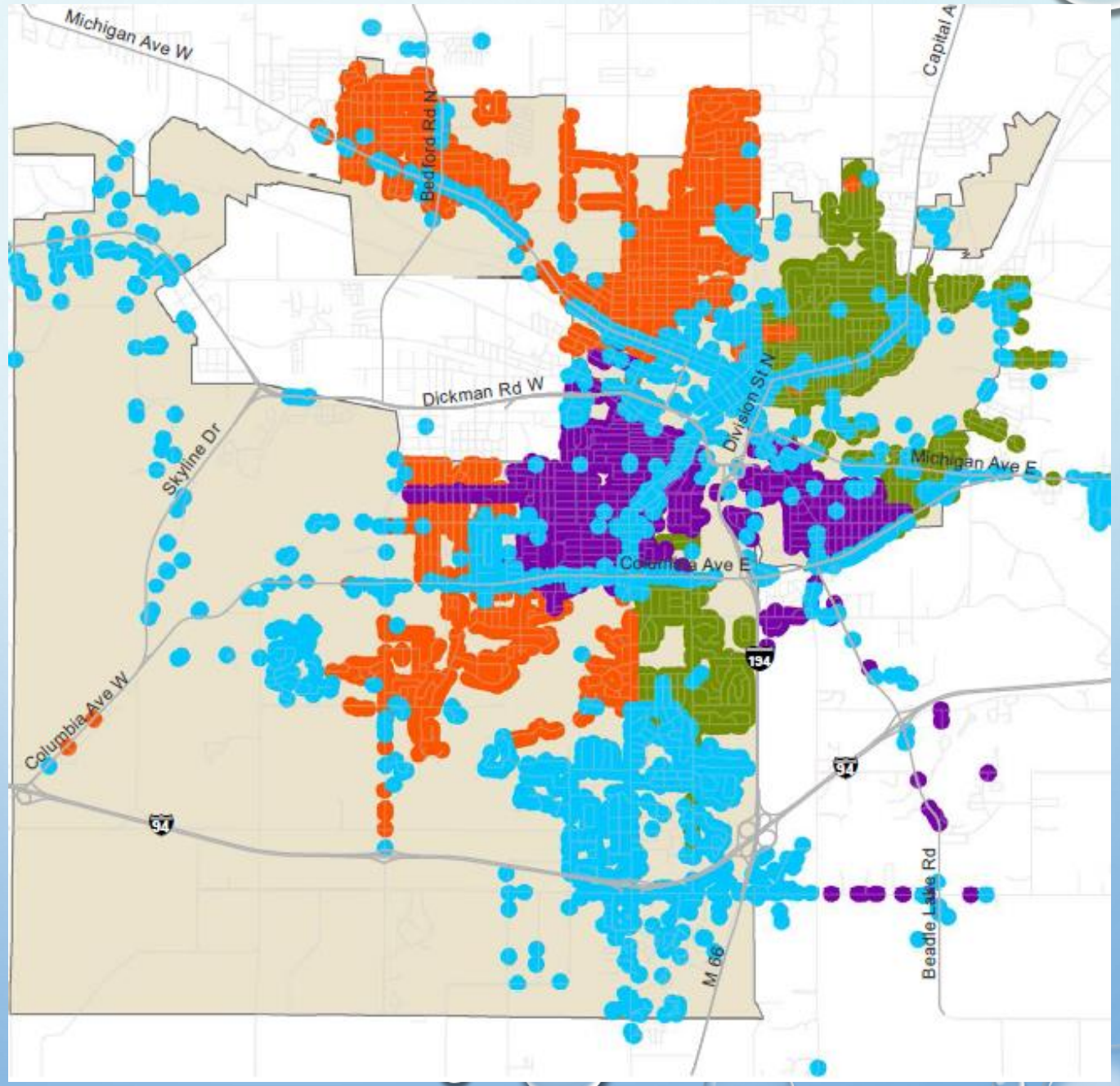
- There will be two work orders for each water meter
  - One work order for the installation of the new transmitter
    - The first work order can be completed without anyone home
    - Staff will check to see if anyone is home prior to doing any work
  - The second work order is for evaluating the meter or troubleshooting a no-read or non-transmitting R900
    - The second work order requires access to the water meter and wiring
    - Work may include meter replacement, securing the meter & documenting installation

R900 TRANSMITTER INSTALLATION & METER REPLACEMENT

- Install R900 while completing service work orders such as new accounts, move-ins and move-outs
- Install R900 where we have a no-read, indicating a failed existing device or other meter issue
- Install the R900 transmitters by cycle, working through #3, #2, #4 & #1. We have staff installing the R900 on the outside of buildings -- if the device connects and transmits data, our staff will move on to the next address.
- Accounts where the new R900 transmits data will be contacted in the future for access to evaluate the water meter
- If the newly-installed device does not transmit data, a card will be left to scheduled an appointment for access to the meter and wiring for trouble shooting

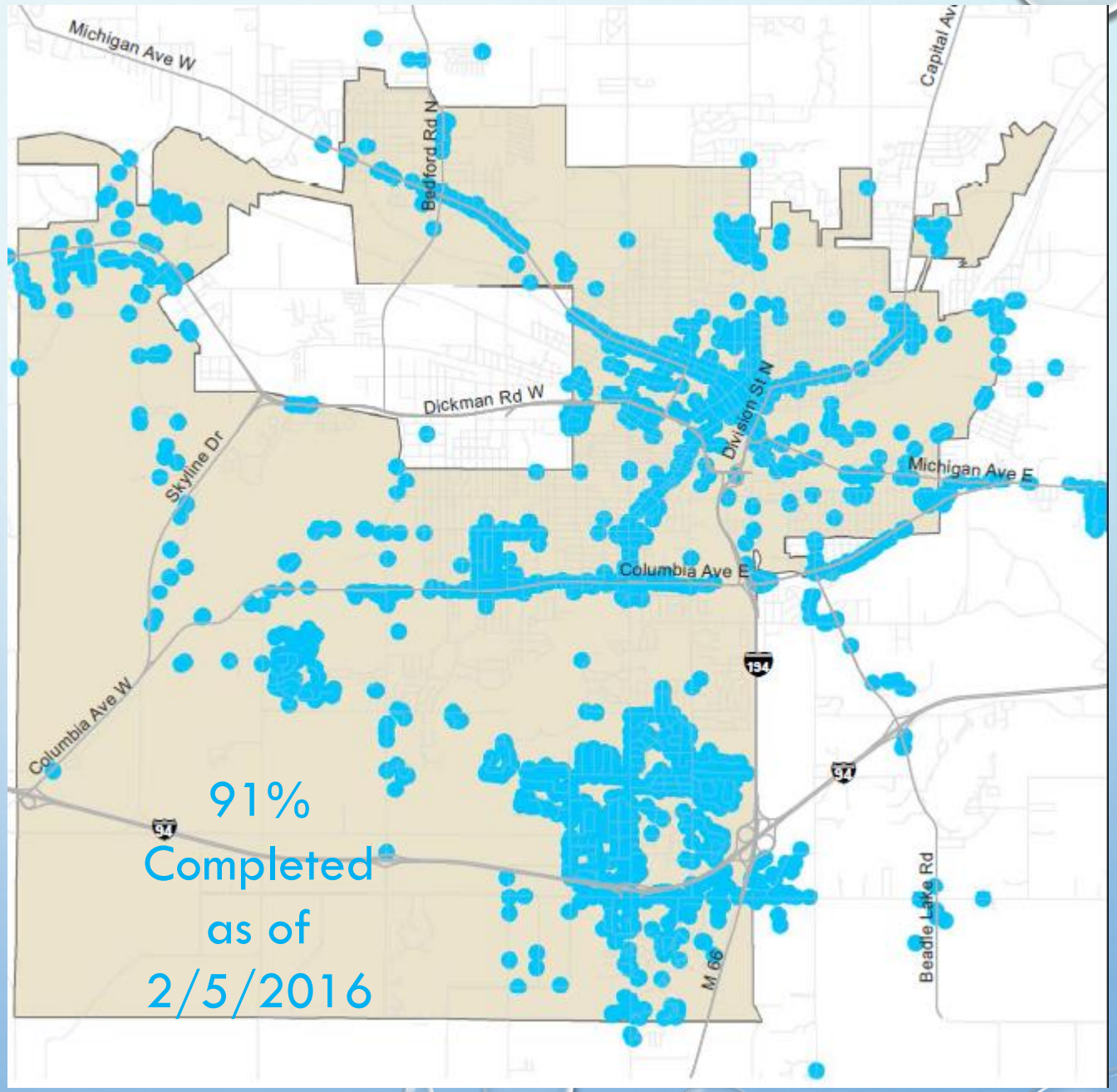
Cycle 1
Cycle 2
Cycle 3
Cycle 4
Municipal Boundary

Display of all read cycles



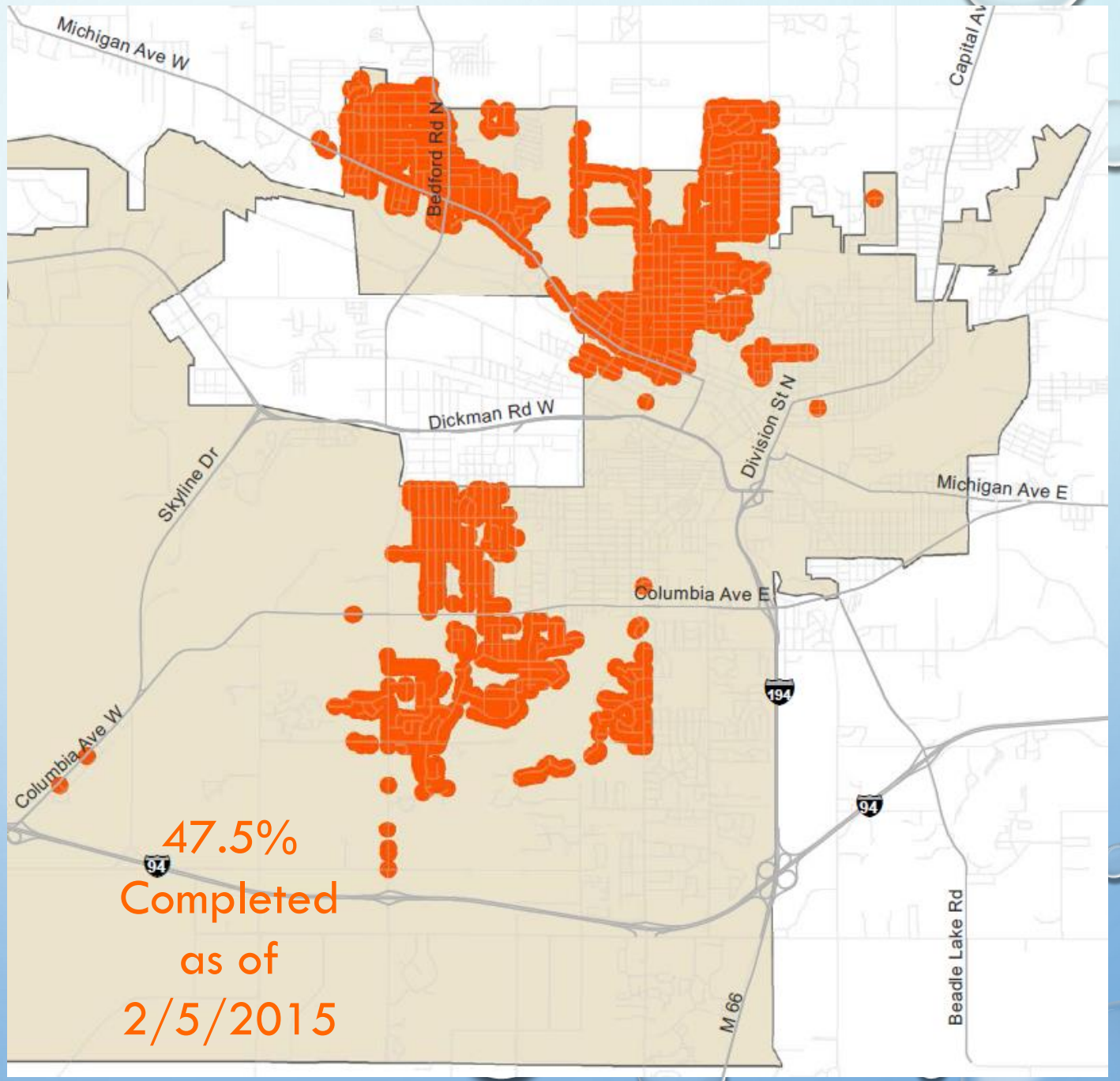
Cycle #3

- First priority
- Commercial and Industrial accounts
- Apartments, condos and residential accounts
- Most inefficient cycle to read using drive-by system
- Spread out over the entire system



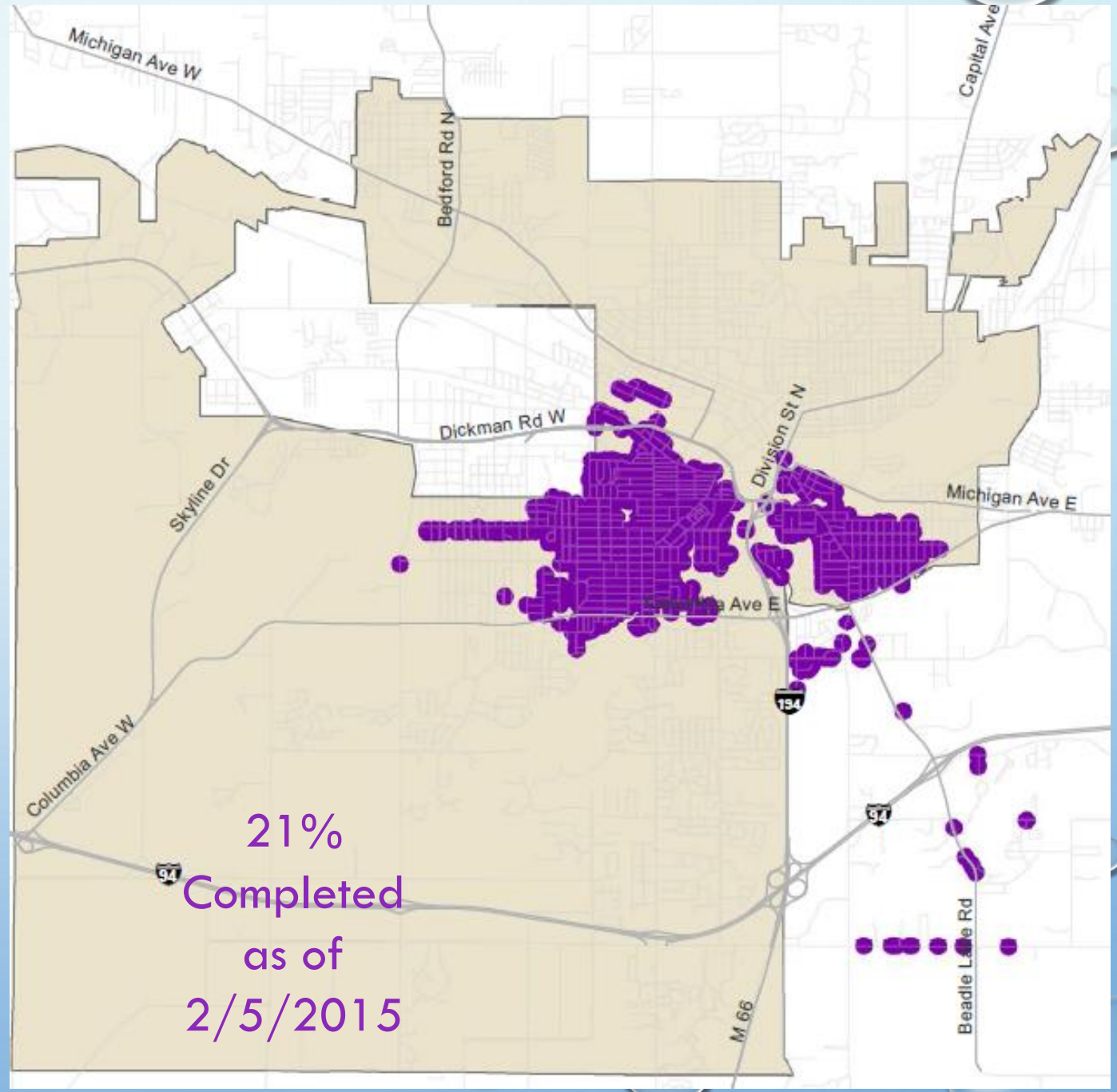
Cycle #2

- Second priority
- Residential
- Highest number of failed transmitters
- Dense population, smaller parcels
- Difficult to read using drive-by system because of meter density



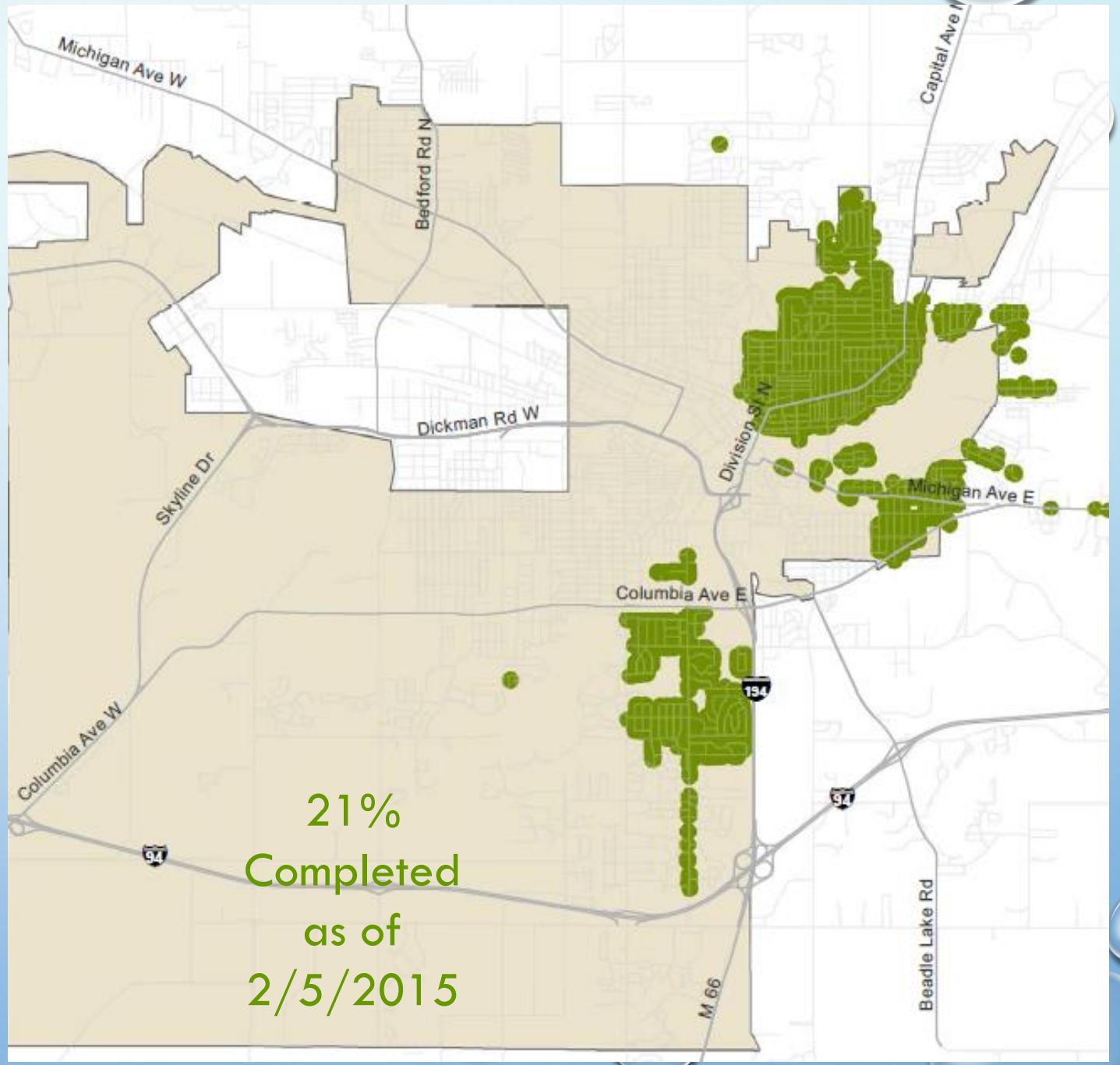
Cycle #4

- Third priority
- Residential
- Dense population, smaller parcels
- Difficult to read with drive-by system because of meter density



Cycle #1

- Last priority
- Residential
- Least amount of issues with current devices



Completed Installations

8,000 - R900 Transmitters

R900s

24 - V4 Gateway Data Collectors

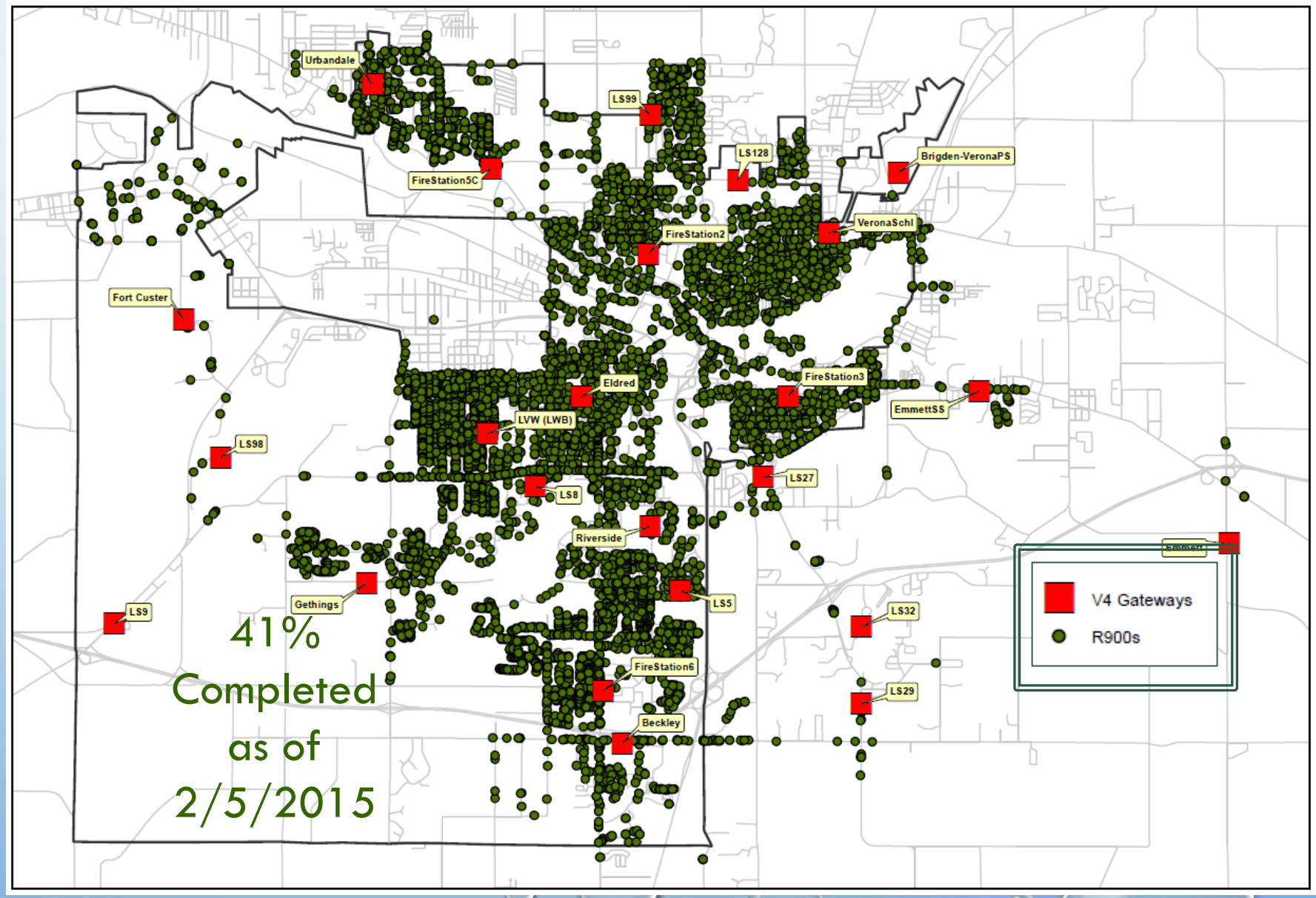
V4 Gateways

Transmitter installations

41%

Gateway Data Collectors

100%



R900 TRANSMITTER INSTALLATION & METER REPLACEMENT

- Installations are on schedule
- It is difficult to determine when we will be in specific neighborhoods because of the need to address old transmitters as they fail and the installs done while doing service-related work orders
- Water Division representation will be at Neighborhood Planning Council meetings as needed
- Frequently asked question document will be maintained on city's website – www.battlecreekmi.gov

ADVANTAGES OF FIXED-READ SYSTEM

- With full implementation of the fixed-read system we plan to provide
  - Better customer site leak detection
  - Final reads without sending staff on-site
  - More precise billing cycles; routes read in minutes rather than days
  - Low consumption, high consumption, consumption on vacant buildings, theft detection
  - Historic read data for resolving billing concerns
  - Customer access to billing and consumption information