Dane County EV Infrastructure Plan

Bill Holloway

Steering Committee

15 members representing:

- City of Madison
  - Sustainability Coordinator
  - Fleet Manager
  - Traffic Engineer
  - Mayor's Office
- Energy Utilities
  - MGE
  - Alliant
  - WPPI

- Nonprofit Organizations
  - MadREP
  - WI Clean Cities
  - Renew Wisconsin
  - Electrification Coalition
- Dane County
- WisDOT
- UW – Madison

Dane County EV Infrastructure Plan

Purpose

- Help Dane County communities prepare for the ongoing shift towards electric vehicles (EVs), and

- Provide them with the foundational information needed to secure grant funding for needed infrastructure.

Dane County EV Infrastructure Plan

Scope

Provide an overview of:

- Current and future trends in EV ownership and charging,

- Best practices to ensure that sufficient charging infrastructure for the increasing number of EVs in the county is available to everyone who needs it,

- The highest priority locations for different types of public charging infrastructure,

- Available grant-funding opportunities.

Terminology

Types of Electric Vehicles

- Battery electric vehicles (BEV) have a battery that is charged by plugging the vehicle in to charging equipment.

- Plug-in hybrid electric vehicles (PHEV) are powered by an internal combustion engine and a battery-powered electric motor. PHEVs can charge their battery by plugging into an electric power source.

- Hybrid electric vehicles (HEV) are powered by an internal combustion engine and battery-powered electric motor. HEV batteries are charged by the engine during the normal drive cycle and through regenerative braking.

This plan is focused on charging infrastructure that can be used by BEVs and PHEVs.

Terminology
Charging Stations

- **Station Location:** A station location is a site with one or more EVSE ports at the same address. Examples include a parking garage or a mall parking lot.

- **EVSE Port:** An EVSE port provides power to charge only one vehicle at a time even though it may have multiple connectors. The unit that houses EVSE ports is sometimes called a charging post, which can have one or more EVSE ports.

- **Connector:** A connector is what is plugged into a vehicle to charge it. Multiple connectors and connector types (such as CHAdeMO and CCS) can be available on one EVSE port, but only one vehicle will charge at a time. Connectors are sometimes called plugs.

1 Station Location

3 EVSE Ports

4 Connectors

6

Source: Alternative Fuels Data Center
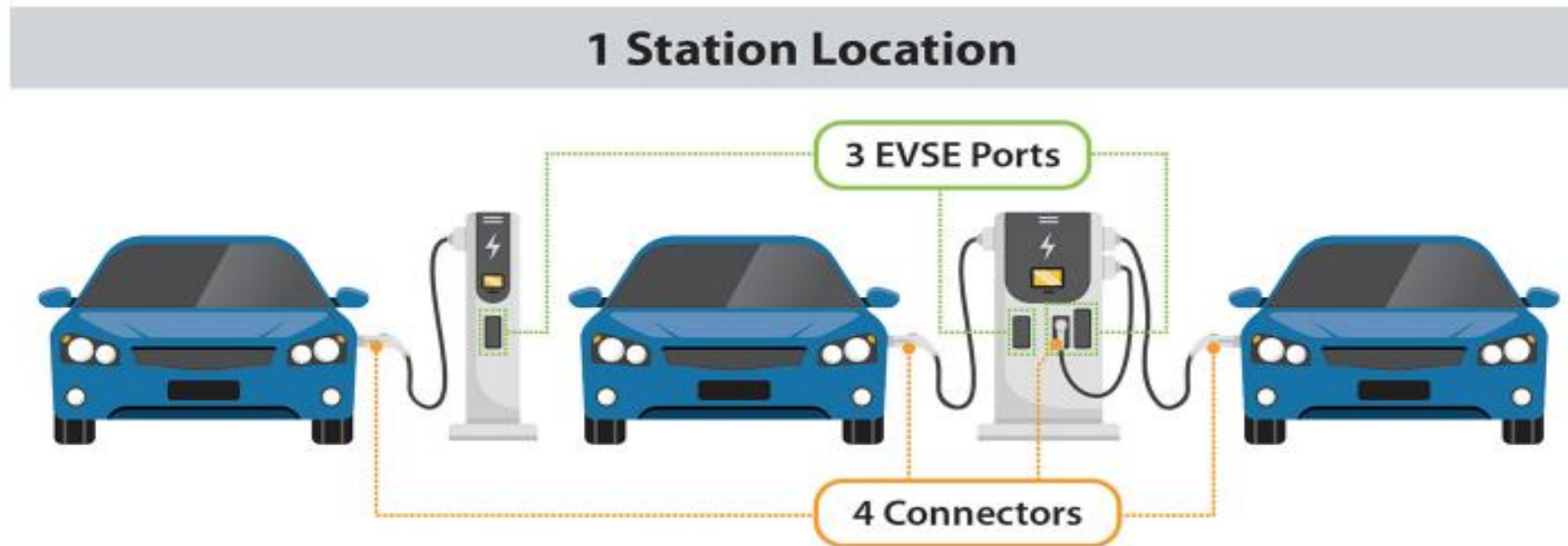
Charging Levels

Level 1

Overview:

- Uses a standard 120-volt wall outlet.
- Typically residential.

Charge speed:

- 40-50 hours to charge a BEV from empty and 5-6 hours to charge a PHEV from empty.

Installation costs:

- $0 - $2k

Level 2

Overview:

- Requires 240-volt (residential) or 208-volt (commercial) service.
- Residential, workplace, public.

Charge speed:

- 4-10 hours to charge a BEV from empty and a PHEV from empty in 1-2 hours.

Installation costs:

- $700 - $2k (home)
- $2k - $10k (public)

Level 3 / DCFC (50kW-360kW)

Overview:

- Requires 480-volt service.
- Typically public.

Charge speed:

- 20 minutes to 1 hour to charge a BEV to 80% from empty; most PHEVs currently on the market do not work with fast chargers.
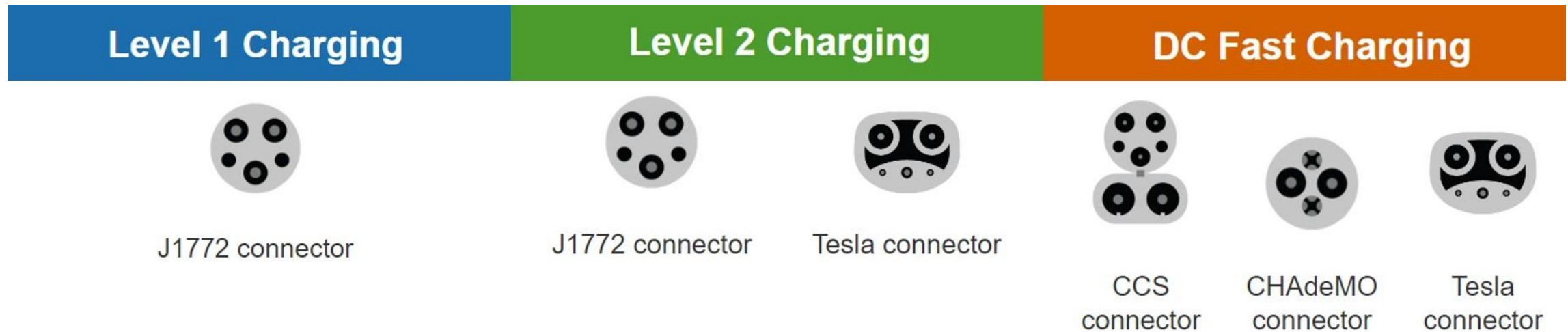
Installation costs:
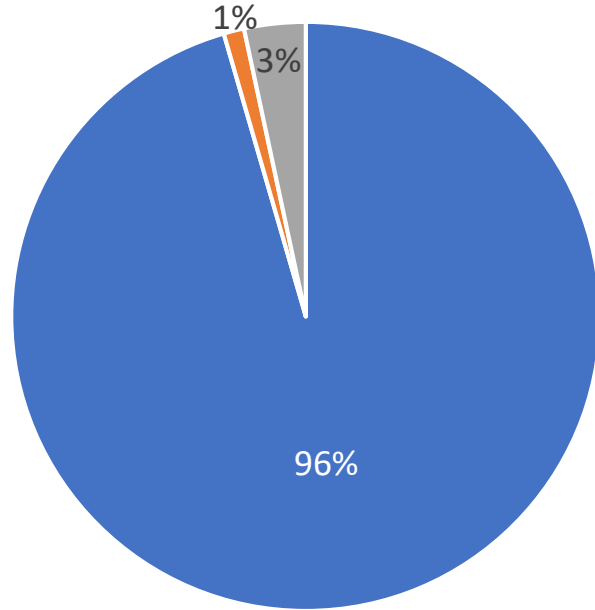
- $25k – $110k
- Costs increase with charging speed.
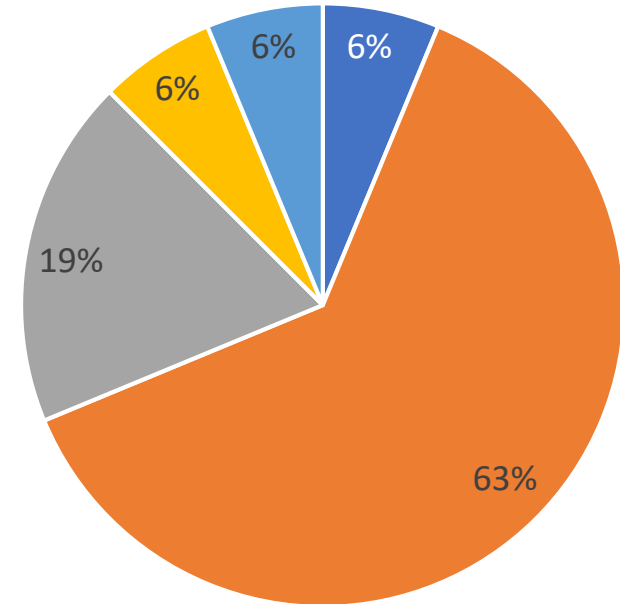
Terminology

Plug/Connector Types

Level 1 Charging	Level 2 Charging		DC Fast Charging		
J1772 connector	J1772 connector	Tesla connector	CCS connector	CHAdeMO connector	Tesla connector

Plug Types

Level 2 Charging Location Plug Types

1%
3%
96%

■ J-1772   ■ J-1772 + Tesla   ■ Tesla

Level 3 Charging Location Plug Types

6%
6%
6%
19%
63%

■ CCS   ■ CHAdeMO/CCS
■ Tesla   ■ Tesla/CCS/CHAdeMO
■ CHAdeMO

Tesla vehicles come equipped with adaptors that allow them to charge using J-1772 plugs.

About 1/2 of all DCFC ports are equipped with Tesla plugs but they are concentrated in a small number of large stations.

9

*Charging infrastructure that is not available to the general public is excluded.

Charging Networks

Level 2 Charging Networks in
Dane County

Network	Charging Locations	Ports
AmpUp	1	2
Blink	2	3
ChargePoint	64	182
Non-Networked	19	35
SemaCharge Network	1	1
Shell Recharge	1	4
Tesla	1	2

Level 3 Charging Networks in
Dane County

Network	Charging Locations	Ports
Blink Network	1	4
ChargePoint	6	8
Electrify America	1	4
eVgo Network	2	2
Non-Networked	2	2
Tesla	3	19
Tesla/Shell Recharge	1	16

*Charging infrastructure that is not available to the general public is excluded.

Fee Structures

Level 2 Charging Location Fee Structures

Fee Structure	Charging Locations	Ports
$2/hr 50% discount for MGE Owner Group Members	19	56
Free (may have restrictions)	11	24
Paid/permit parking, free charging	12	32
Paid parking, paid charging	3	14
Other fee structure	9	21
Unknown	35	82

Level 3 Charging Location Fee Structures

Fee Structure	Charging Locations	Ports
$0.30 – $0.32/minute	3	6
$5/hr (most offer 50% discount for MGE Owner Group members)	6	22
Other fee structure	5	24
Unknown	2	3

Additional Charging Station Information

ADA Access & Non-Public Charging Infrastructure

ADA Accessible Charging

- About 10% of charging locations have at least one charging port serving an ADA parking space.

Public vs Employee/Customer Charging

- About 10% of the charging locations identified on PlugShare.com are restricted—to hotel guests, employees, etc.*

- It is likely that there are other non-public charging locations at workplaces and businesses that are not reflected in publicly available data.

*These are not included in the previous statistics.

Current Station Locations

With:

- Employment land uses* (2016 & 2050)

- Employment density (2016)

- Multifamily residential land use (2020)

- Multifamily housing (2020) and household density (2016)

*Includes mixed commercial residential, commercial (retail and services), office, civic / institutional, and industrial / warehouse areas.
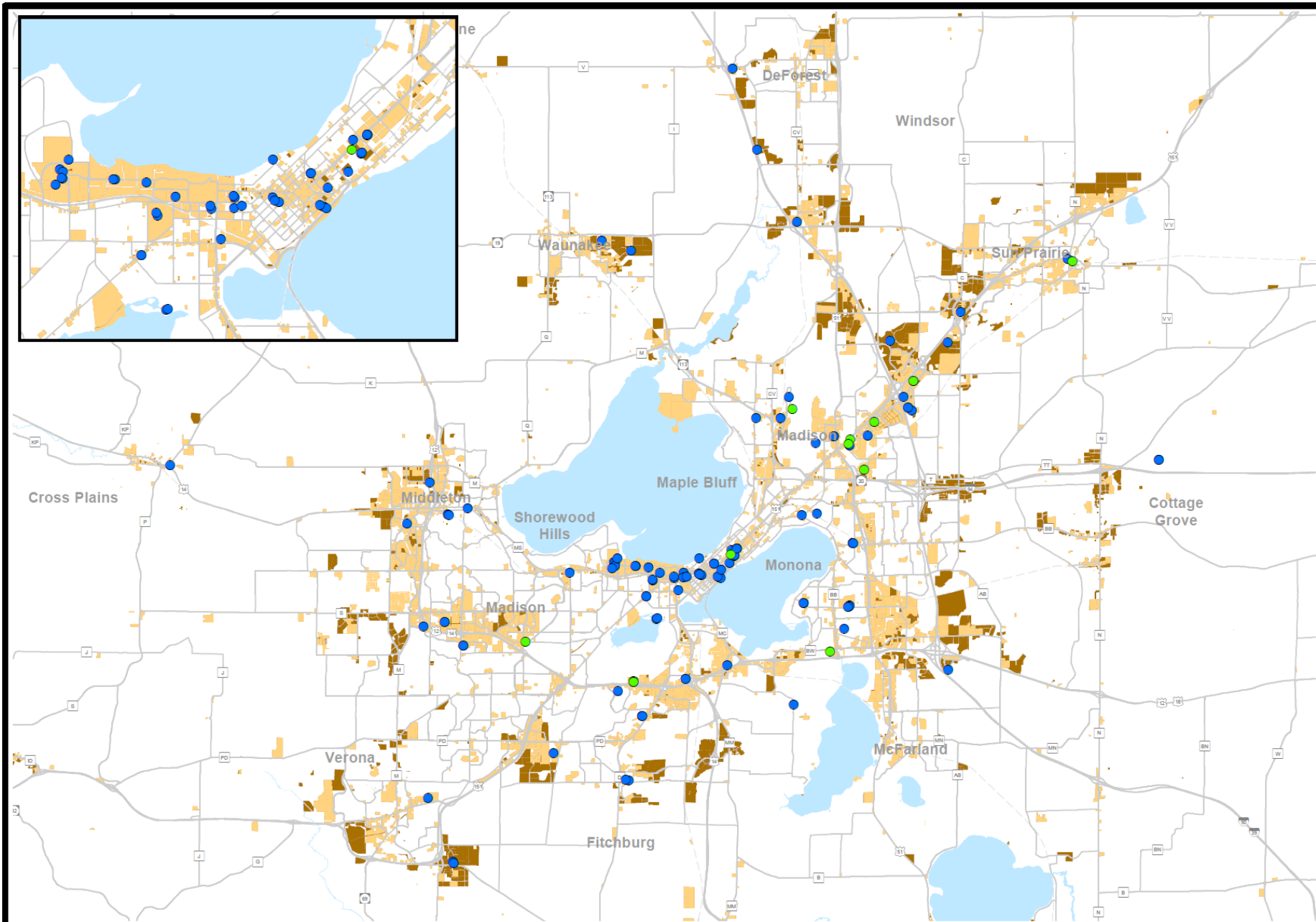
EV Charging and
2016 - 2050 Employment Land Use Growth
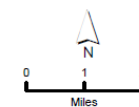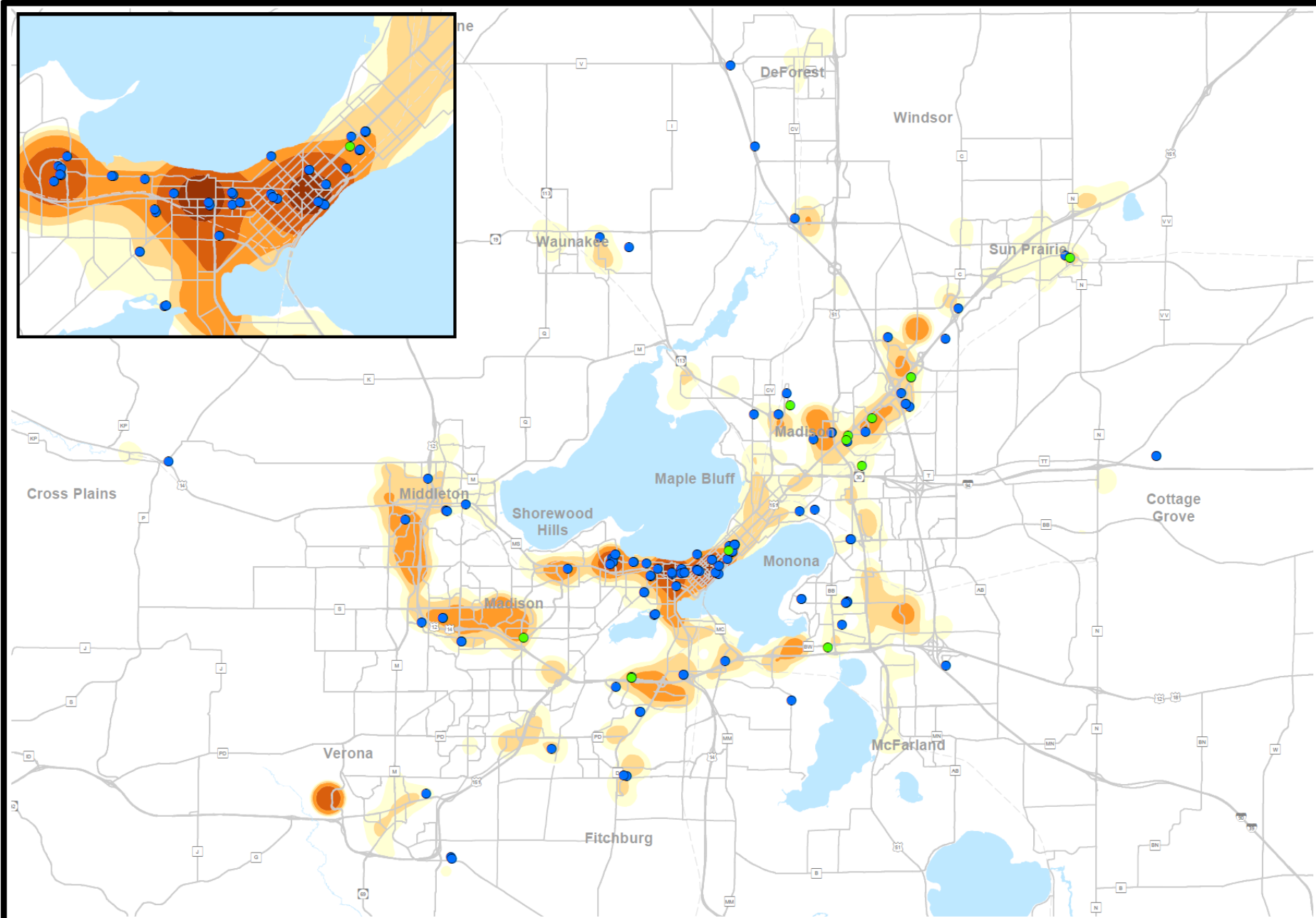Madison Area, Wisconsin

EV Charging
● Level 3
● Level 2

2016 Employment Land Use
2050 Employment Land Use

Prepared by staff to the:
GREATER MADISON
mpo

Date Revised: 11/23/2022

14

**EV Charging and
2016 Employment Density
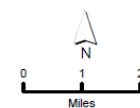Madison Area, Wisconsin**
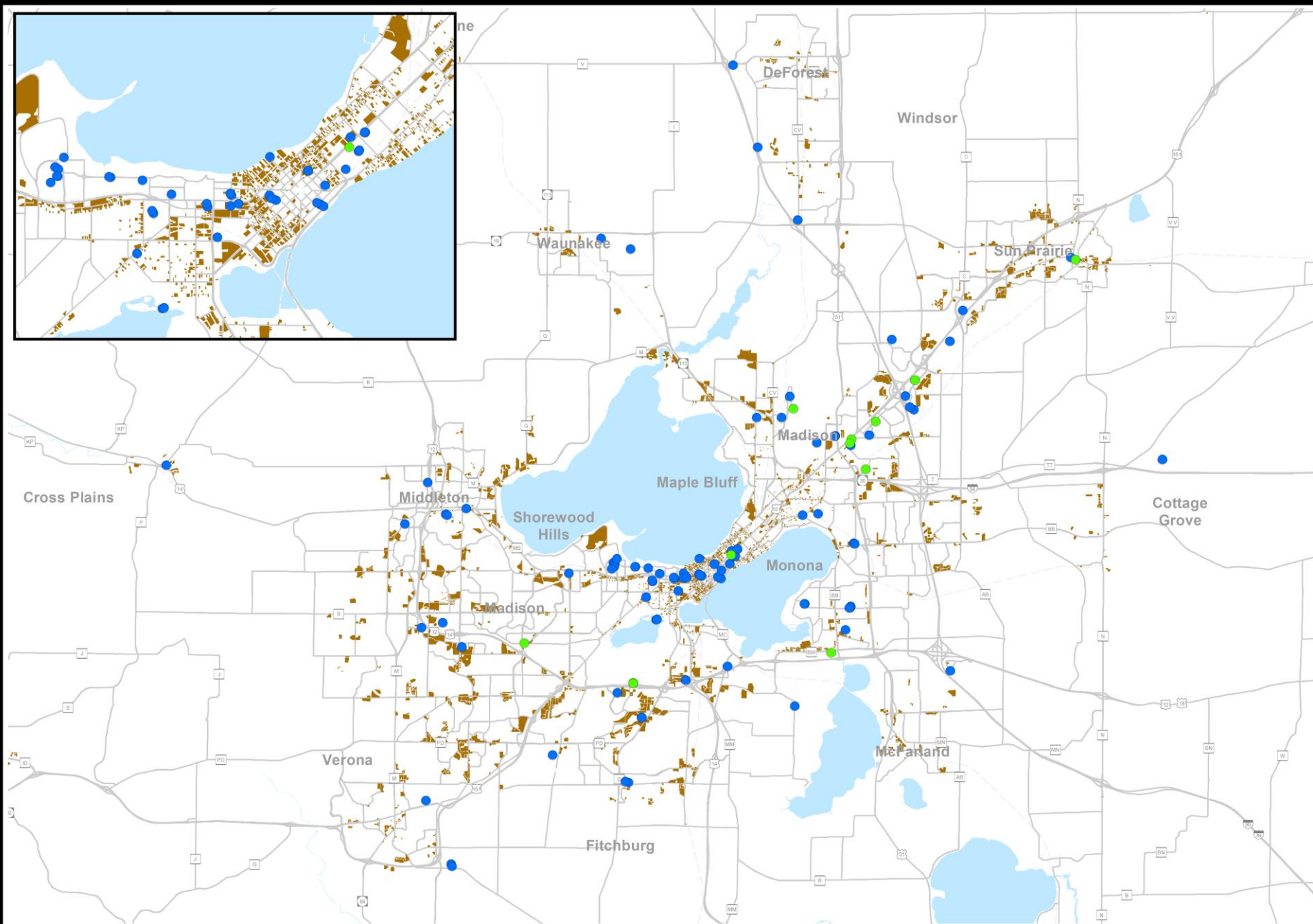
EV Charging

- Level 3
- Level 2

Jobs per Acre

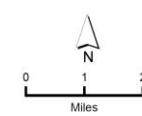|	
0 to 2.0	5.1 to 10.0	25.1 to 75.0
2.1 to 5.0	10.1 to 25	75.1 or Greater

Prepared by staff to the:

GREATER MADISON mpo

Date Revised: 11/23/2022

15

**EV Charging and
2020 Multi Family Residential Land Use
Madison Area, Wisconsin**

16

EV Charging

Multi Family Residential

● Level 3
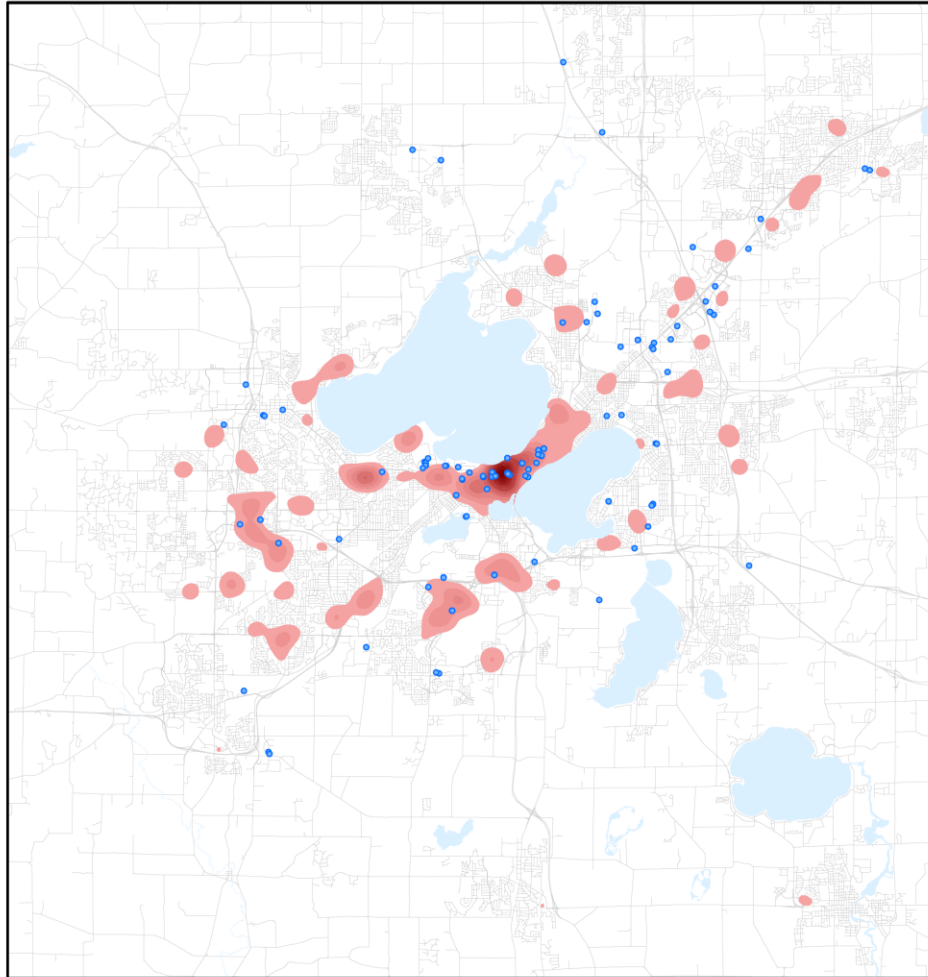
● Level 2

Prepared by staff to the:

GREATER MADISON mpo

Date Revised: 11/23/2022

Multifamily Household Density

Multifamily Housing (3+ Units)

Low (<2 per acre)

Medium (14-16 per acre)

High (>30 per acre)
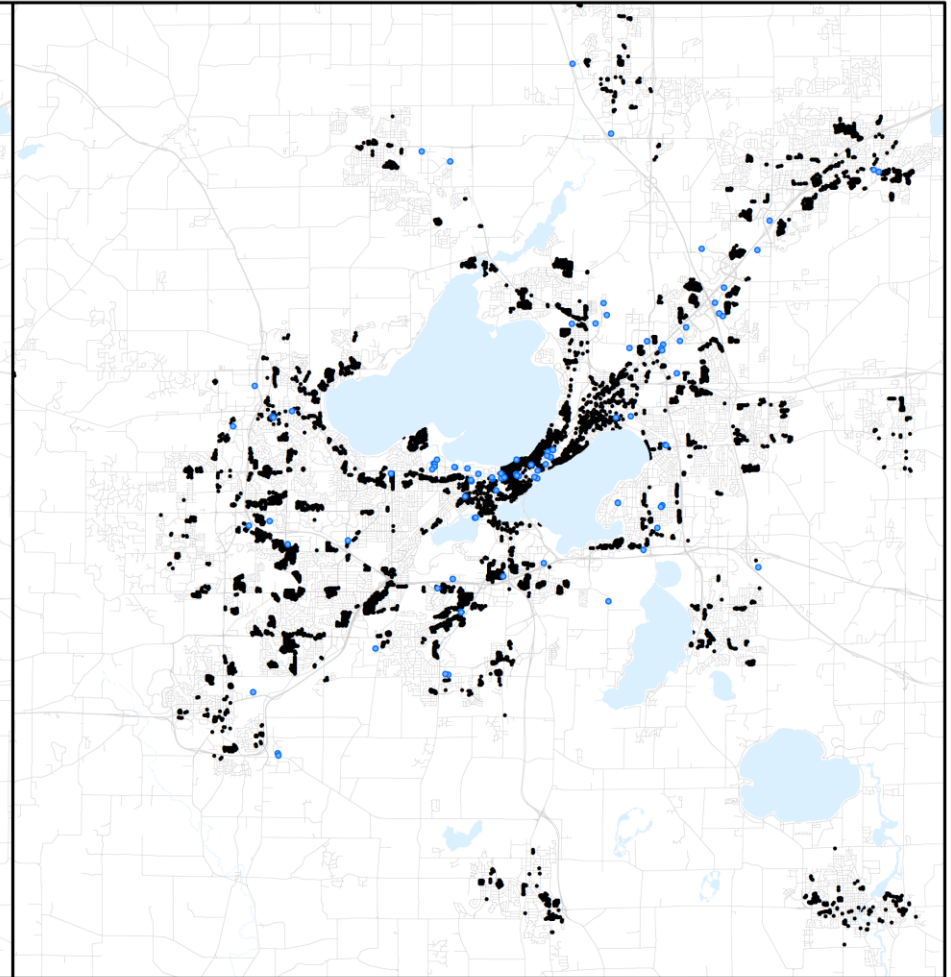
- EV Charging Infrastructure
- Multifamily Land Use (3+ Units)

Source: City of Madison Planning, CARPC, MPO, 2016.

Source: CARPC, Dane County, 2020.

How Many Chargers Do We Need?

Current and projected EVs and charging needs

- There were 3,397 registered EVs in Dane County in January 2023, 0.7% of all registered vehicles in the county.
- Projections suggest this will increase to:
    - 45,000–85,000 (13%–16% of registered vehicles) by 2030
    - 185,000–470,000, (32%–81% of registered vehicles) by 2050
- There are currently 16 DCFC ports and 89 level 2 ports available for public use in the county. *Comprehensive data on workplace charging is unavailable.
- US DOE recommends 3.4 level 3 ports (public) and 40 level 2 ports (public and workplace) per 1000 EVs.
- Dane County currently <u>meets the recommended number of level 3</u> charging ports. Due to a lack of data on workplace charging infrastructure, it is <u>unclear whether the county has the recommended number of public and workplace level 2 ports</u>.

Where Do We Need Chargers?

Charging Locations

Residences:

- An estimated 88% of all EV charging takes place at home.
- People in rental housing and/or who live in multifamily buildings often face challenges in charging their vehicles at home.

Workplaces:

- Most employees leave their car parked at work for 8 hours each day.

Opportunity Charging Zones:

- Fast Charging—short-term stopping locations.
- Convenience Charging—medium length stops (1/2 hour to 4 hours).
- Leisure Charging—long stops (4+ hours).

Identifying Priority Charging Locations for Public Charging Infrastructure

Public Priorities*

- EV charging infrastructure for those who might otherwise lack access.
  - Multifamily Residences
  - Environmental Justice areas
  - Underserved rural areas
- Incentivizing behaviors
  - Reducing vehicle-miles traveled (VMT)
  - Transition to EVs

Likely to require public funding.

*Priorities identified in recent Charging and Fueling Infrastructure grant application.

High Demand Locations and Other Priorities

- EV charging infrastructure in areas where large numbers of EVs:
  - Park at a workplace, shopping, or other location.
  - Stop to refuel before, during, or after a long trip
  - Pass by and may stop to top off their charge.
- To attract shoppers/visitors

May be publicly or privately funded.

Identifying Priority Charging Locations for Public Charging Infrastructure – Pubic Priorities

Multifamily Housing

- [red outline] EJ Priority Areas
- [dot] EV Charging
- [orange] Multifamily EV Charging Zone*

* Area within 0.1 miles of a multifamily residential parcel that is more than 0.1 miles from an existing public charging facility.
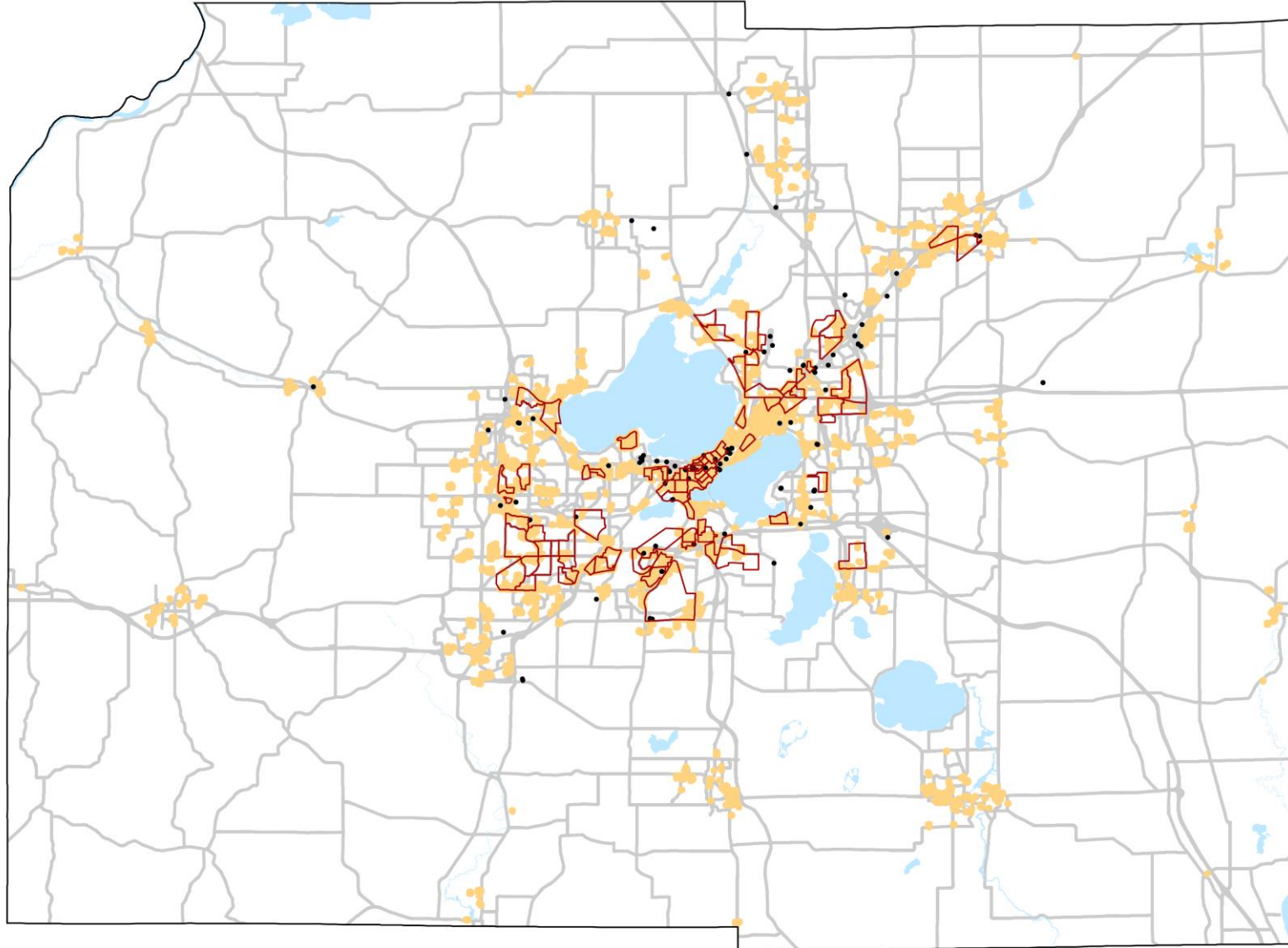
Identifying Priority Charging Locations for Public Charging Infrastructure – Pubic Priorities

Environmental Justice Areas

☐ MPO Environmental Justice Areas

▨ Disadvantaged Tracts (Justice40)

▨ Areas of Persistent Poverty (USDOT)

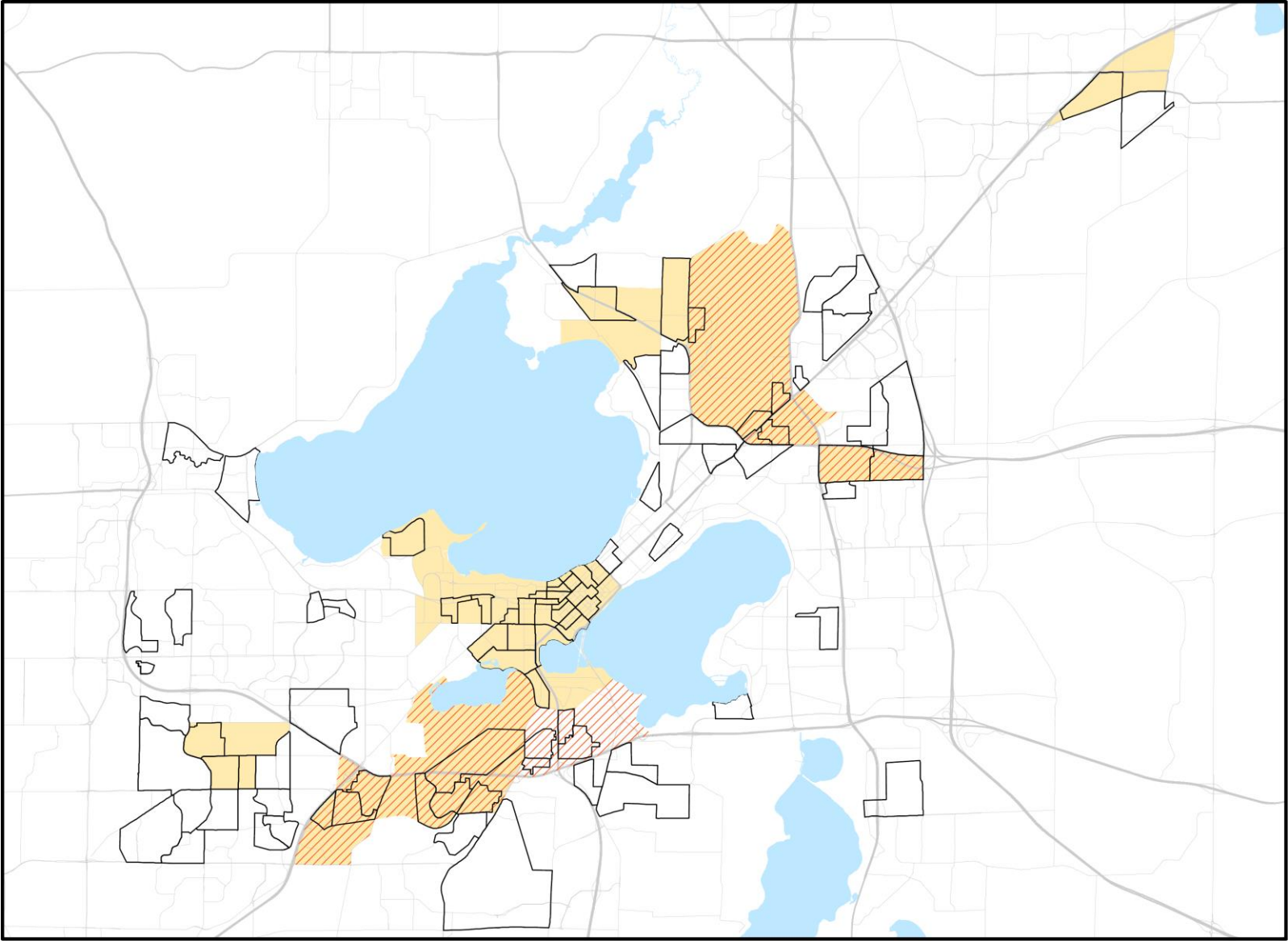# Identifying Priority Charging Locations for Public Charging Infrastructure – Pubic Priorities

Reducing VMT/Promoting Alternate Modes
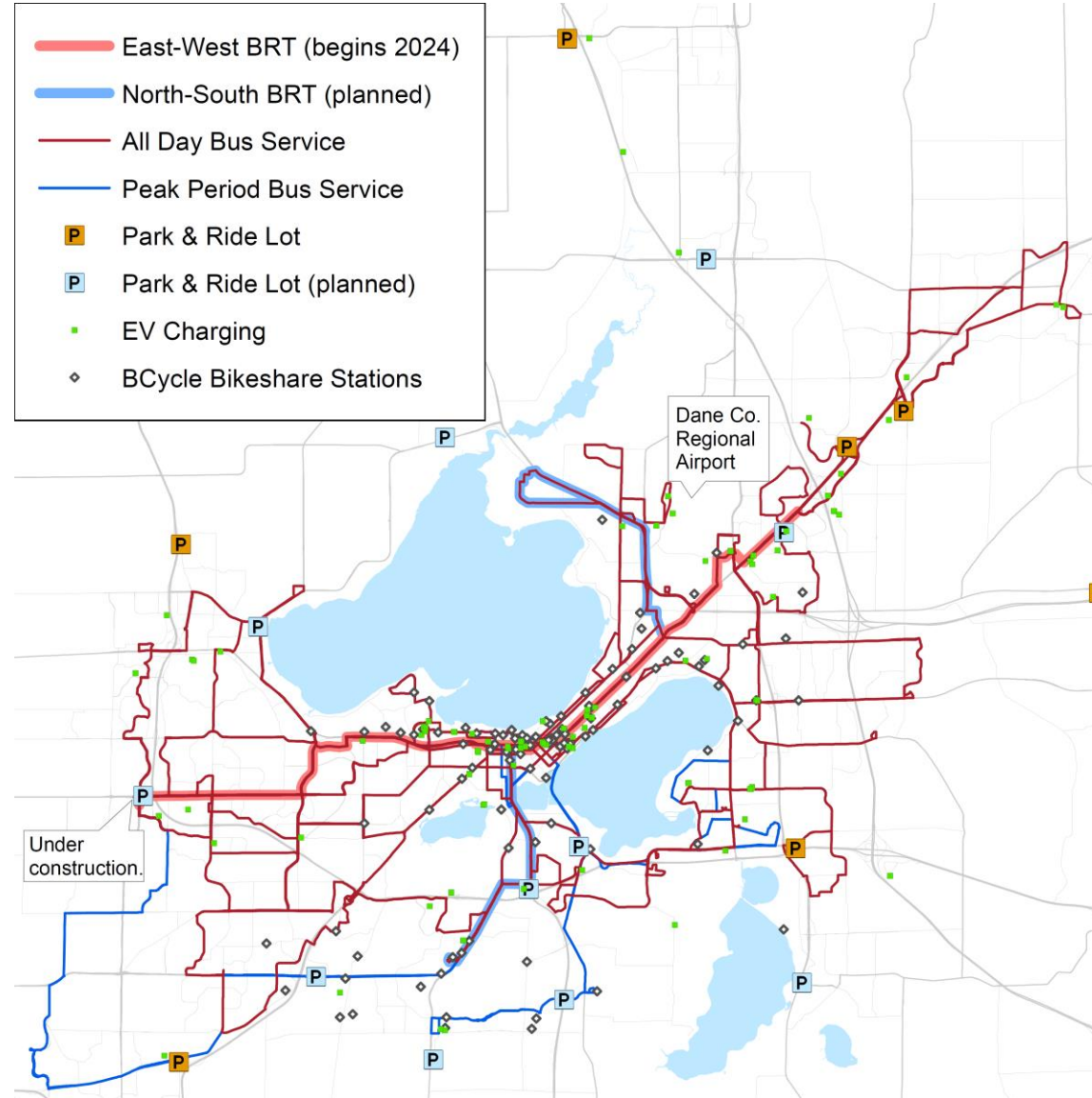
Legend:
- East-West BRT (begins 2024)
- North-South BRT (planned)
- All Day Bus Service
- Peak Period Bus Service
- **P** Park & Ride Lot
- **P** Park & Ride Lot (planned)
- EV Charging
- BCycle Bikeshare Stations

Dane Co. Regional Airport

Under construction.

Identifying Priority Charging Locations for Public Charging Infrastructure – High Demand Locations

Location Types and Charging Levels (Opportunity Charging Zones)

1. Fast Charging Zone
   - Commercial areas near highway exits
   - Short-term parking
   - DCFC at 150kW+

2. Convenience Charging Zone
   - Grocery stores, restaurants, cultural activities, sporting events
   - ½ hour to 4 hour dwell time
   - Level 2, limited DCFC, may be at 60 kW level

3. Leisure/Slow Charging Zone
   - Workplaces, medical facilities, higher ed., etc.
   - Can also serve nearby multifamily residences.
   - Dwell time over 4 hours
   - Level 2

Identifying Priority Charging Locations for Public Charging Infrastructure – High Demand Locations

Criteria: Fast Charging Zone

- Near high volume roadways and highway exits

- Short dwell times (< 30 minutes)

- Large numbers of long trips

- Commercial (retail and services) land use

- Appropriate for DCFC/level 3 charging at 150kW+

Identifying Priority Charging Locations for Public Charging Infrastructure – High Demand Locations

Criteria: Convenience Charging Zone

- Medium-length dwell times (30 minutes to 4 hours)

- Grocery stores, restaurants, cultural activities, sporting events

- Appropriate for level 2 charging, limited DCFC (possibly at 60kW level)

Identifying Priority Charging Locations for Public Charging Infrastructure – High Demand Locations

Criteria: Leisure Charging Zone

- Long dwell times (more than 4 hours)

- Office, Educational, Civic / Institutional, Industrial / Warehouse, Multimodal hubs (bus stops, park and ride lots, bike share), and nearby Multifamily

- Level 2 charging most appropriate.

Opportunity Zone Analysis

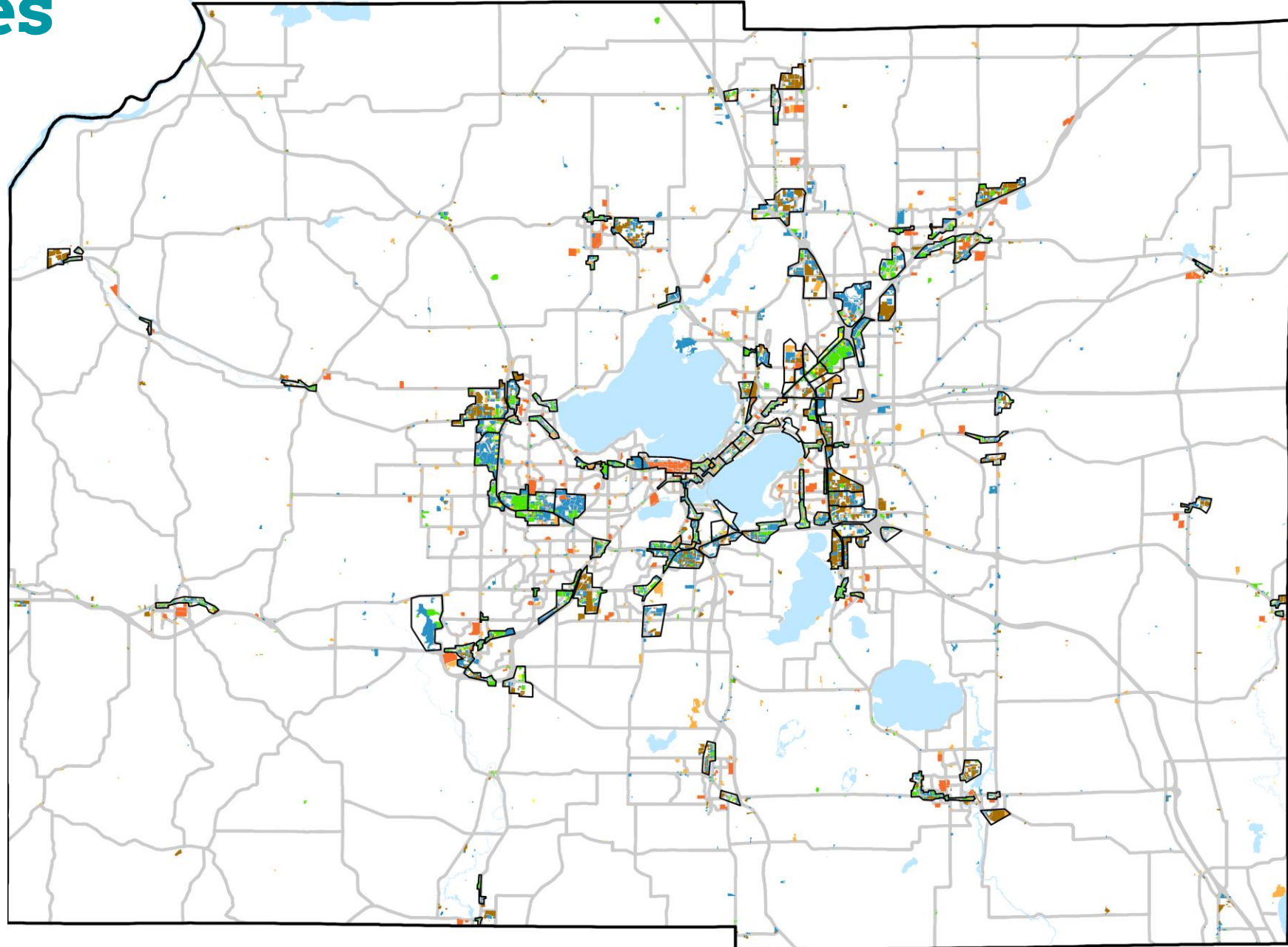## Using Big Data to Assess Potential EV Charging Demand

- The MPO analyzed travel data in a set of 123 zones encompassing clusters of commercial and industrial land uses and other points of interest.

- The analysis was conducted using StreetLight Data.
  - StreetLight provides anonymized travel data for transportation analysis, primarily gleaned from location-based services—generally via smartphone applications.
  - All data is estimated based on trips taken between May 1, 2021 and April 30, 2022.
  - Dwell time data required a contract separate from the MPO's StreetLight Data subscription, and was purchased for 100 zones.

Analysis Zones

Legend:
- General Retail*
- Other Retail & Services
- Lodging
- Industrial
- Educational
- Other Institutional/Governmental
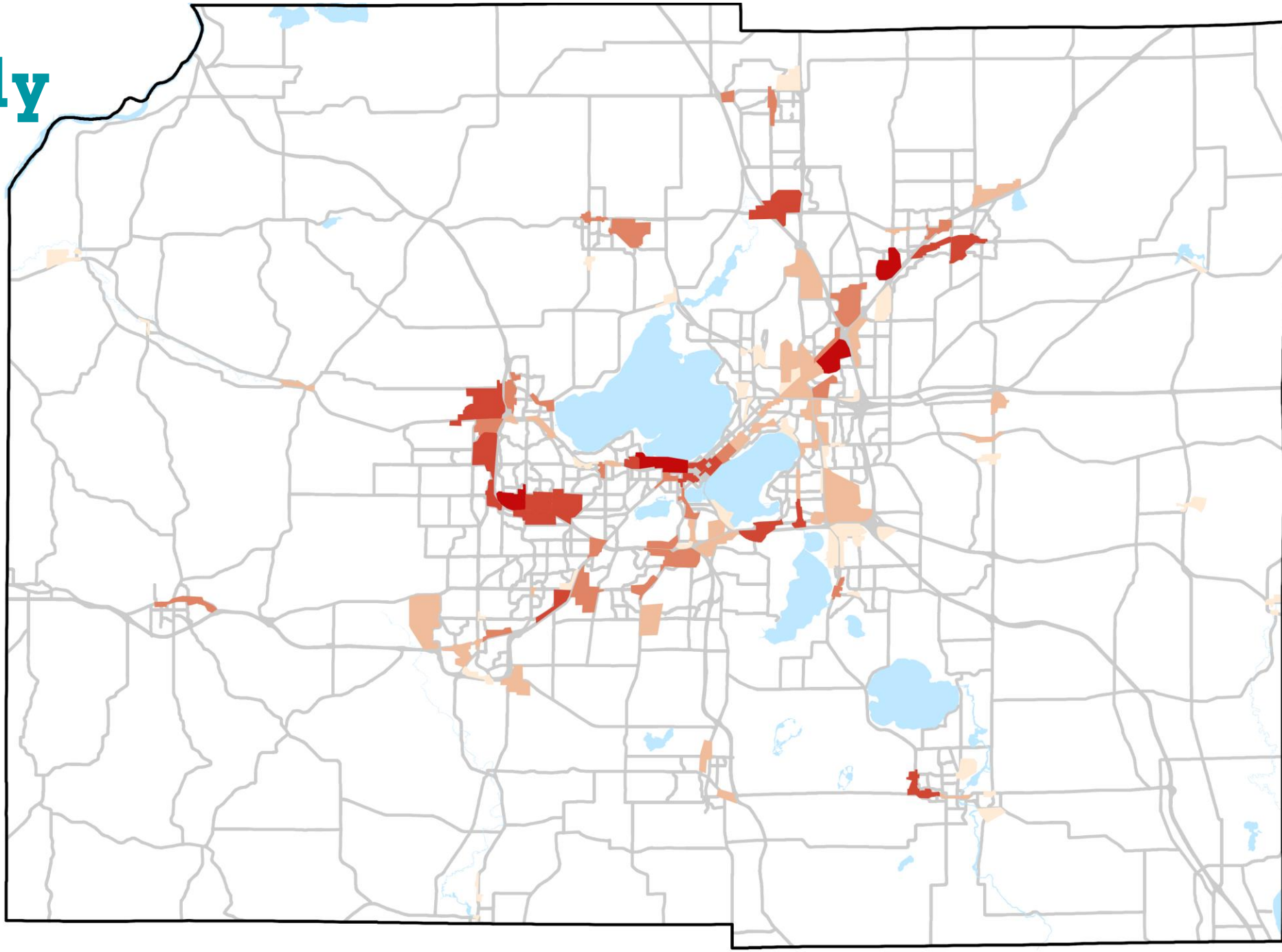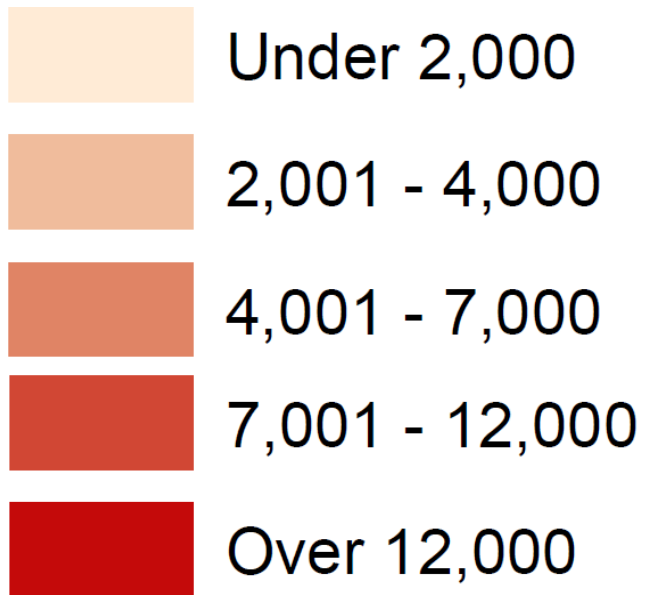
* Includes shopping, restaurants, and gas stations.

29

Average Daily Stops

Under 2,000

2,001 - 4,000

4,001 - 7,000

7,001 - 12,000

Over 12,000

Average Daily Traffic passing within ¼ Mile

Under 20,000

20,001 - 40,000

40,001 - 75,000

75,001 - 100,000

Over 100,000
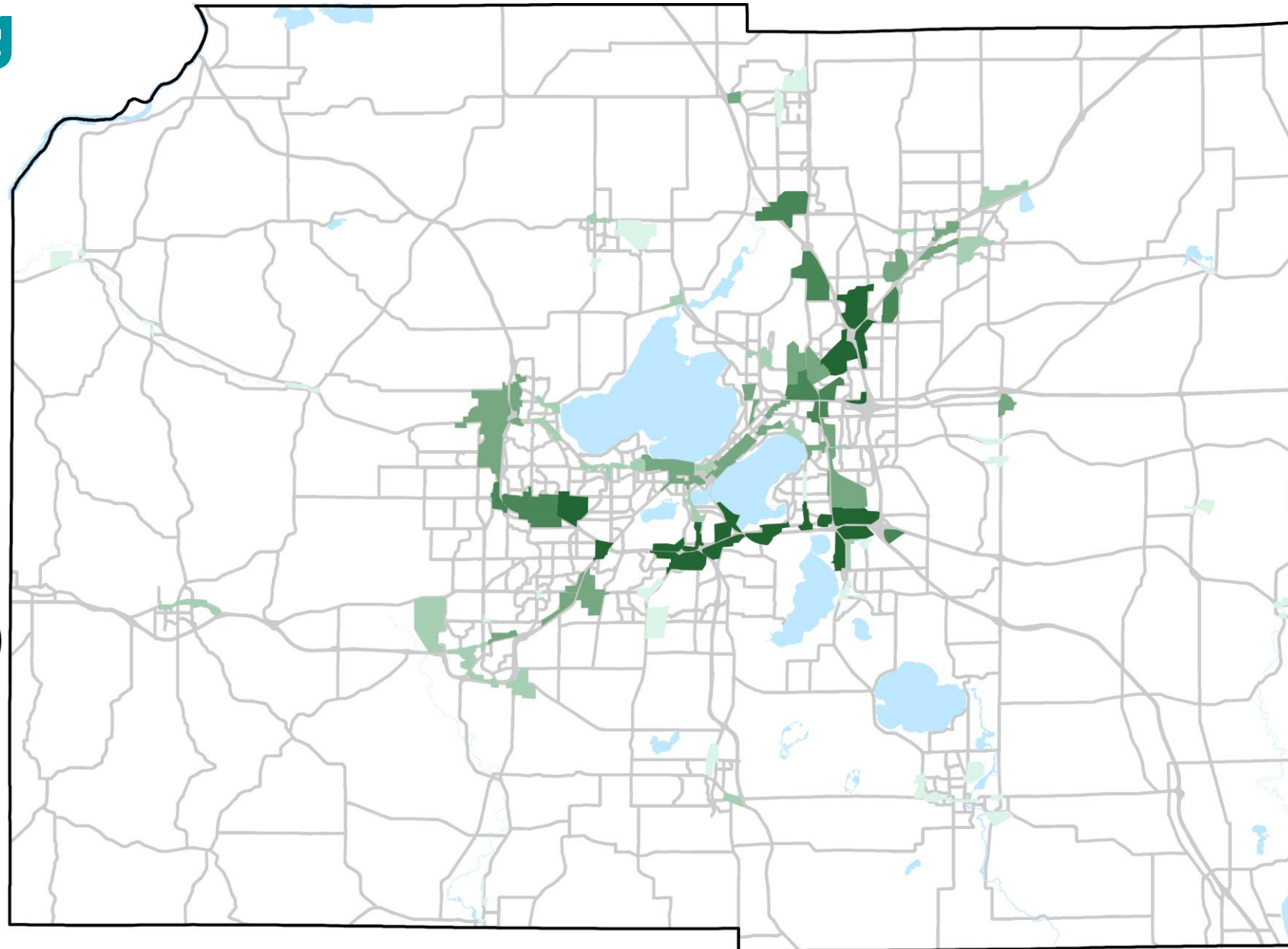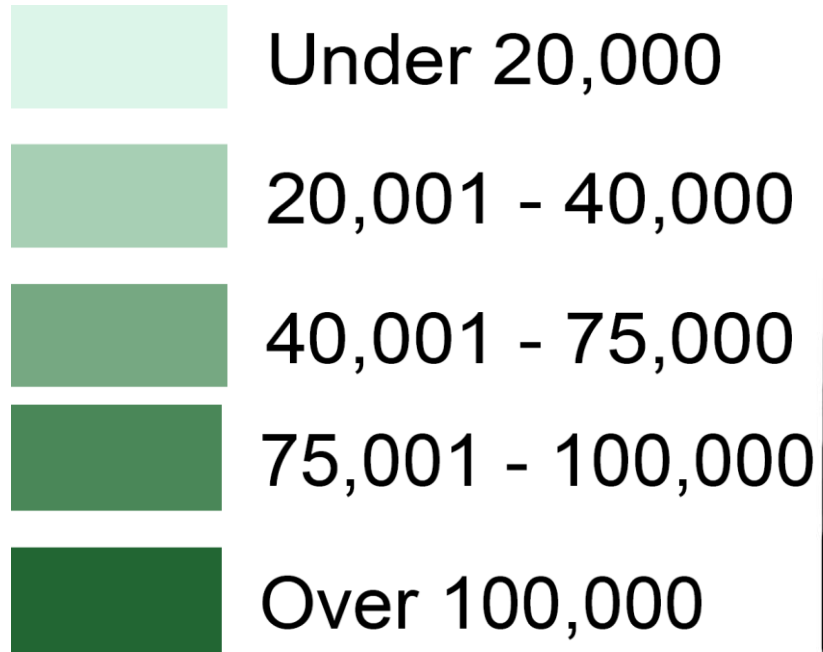
Originating and Terminating Trips over 50 Miles

Legend:
- Under 3%
- 3% - 6%
- 6% - 10%
- 10% - 15%
- Over 15%
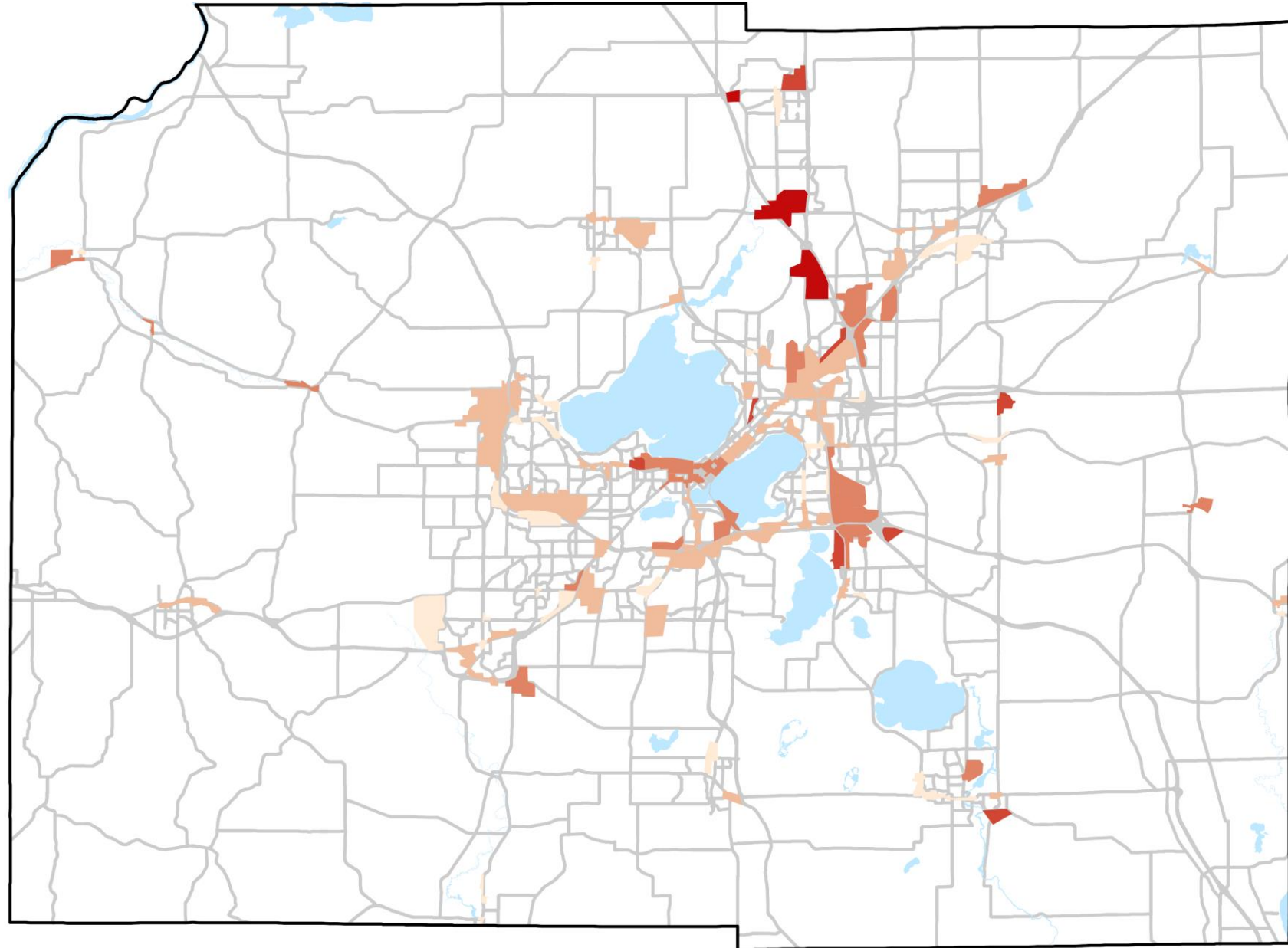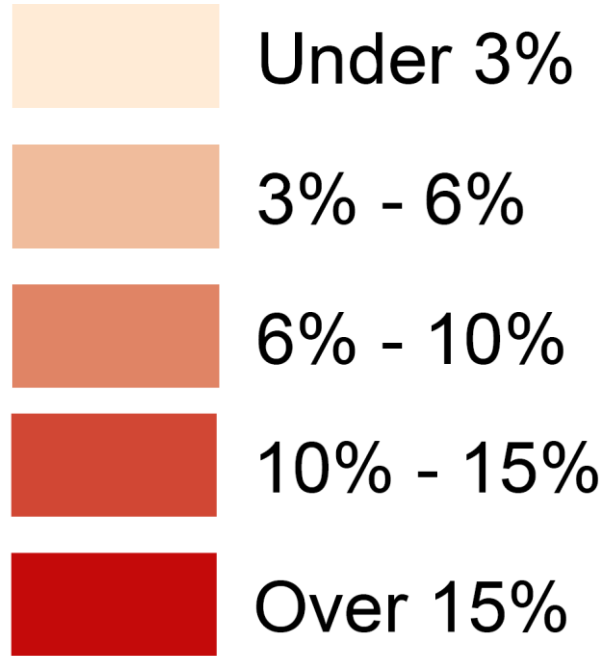
Daily Stops under 30 Minutes

Legend:
- 0 - 1,000
- 1,001 - 2,250
- 2,251 - 4,000
- 4,001 - 6,500
- Over 6,500

33
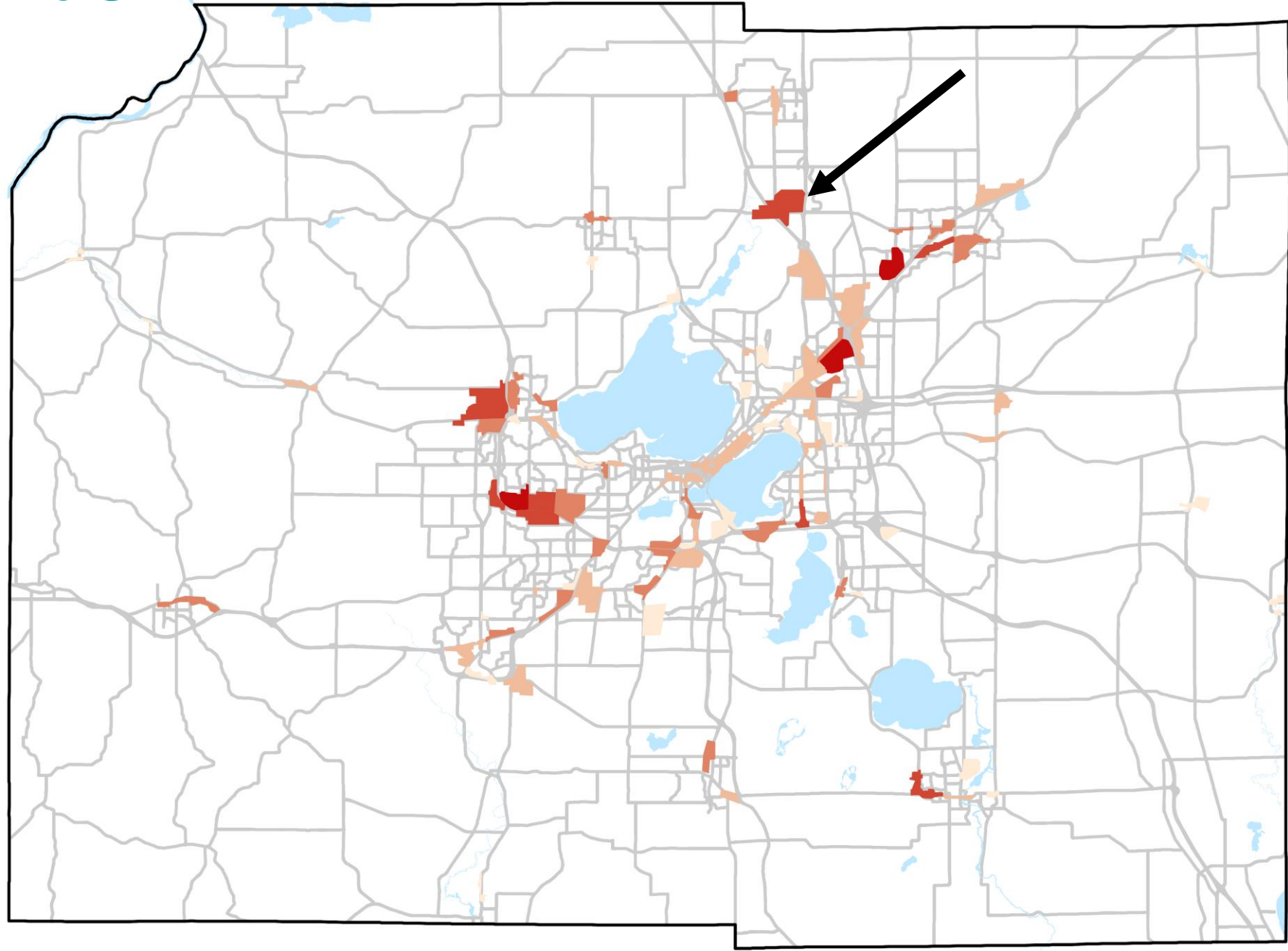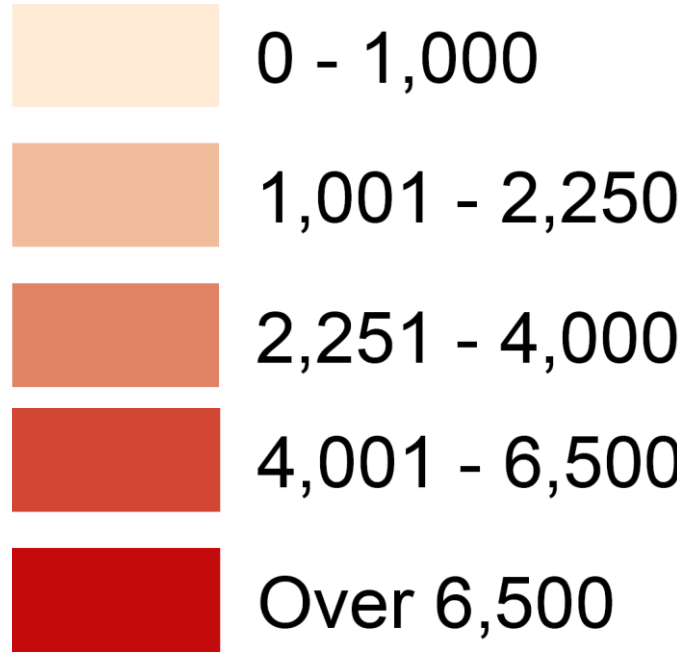
City of Madison EV Charging

- Chargers to serve City EV fleet

- Chargers installed in City-owned public parking facilities

- EV Charging and EV-Ready Parking Space Requirements
  - Applies to new parking facilities and facilities expanded by at least 10,000 square feet, that have at least 6 residential spaces and for certain non-residential uses where visitors are expected to park more than 6 hours.

Years	EV Ready	EV Installed Residential	EV Installed Non-Residential
2021-2025	10%	2%	1%
2026-2030	20%	4%	2%
2031-2035	30%	6%	3%
2036-2040	40%	8%	4%
2041+	50%	10%	5%

Number of EV Installed Spaces Required	Minimum ADA Accessible EV Installed Spaces
0-2	0
3-50	1
51-100	2
101+	3 + 1 for each add'l 50 spaces

Federal Funding Sources

Three Programs included in the Bipartisan Infrastructure Law (BIL)

- National Electric Vehicle Infrastructure (NEVI) Program ($5 billion)
  - Primary goal is to ensure adequate charging capacity on key highway corridors (AFCs). The state will need about 60 new stations to ensure no more than a 50 mile gap between stations along AFCs.
  - Because there is a qualifying station at the Walmart on Nakoosa Rd, most of Dane County is not eligible for NEVI funding.

- Carbon Reduction Program (CRP) ($6.4 billion)
  - Although federal guidelines list EV charging infrastructure as an eligible expense, Wisconsin's Joint Finance Committee placed additional restrictions on its use in the state. EV charging infrastructure is currently not allowed.

- Charging and Fueling Infrastructure (CFI) Grant Program ($2.5 billion)

Wisconsin Full NEVI-Compliant EV Charging Station Build-Out Coverage Map

Legend:
- ▬▬ Designated Alternative Fuel Corridors
- ▪▪▪ Approved 2022 Alternative Fuel Corridors
- 🟠 NEVI-Compliant Charging Station Locations
- 25 Mile Radius NEVI Compliant Charger Coverage Area
- • Other Exits Outside 25 Mile NEVI Coverage Area

Eligible Candidate Exits by Groups
- 🔴 A
- 🟠 B
- 🟡 C
- 🟢 D
- 🔵 E
- 🟣 F
- 🩷 G
- 🔵 H

Source: Planning, Environment, Realty (HEP) GIS Website, Federal Highway Administration, US Department of Transportation
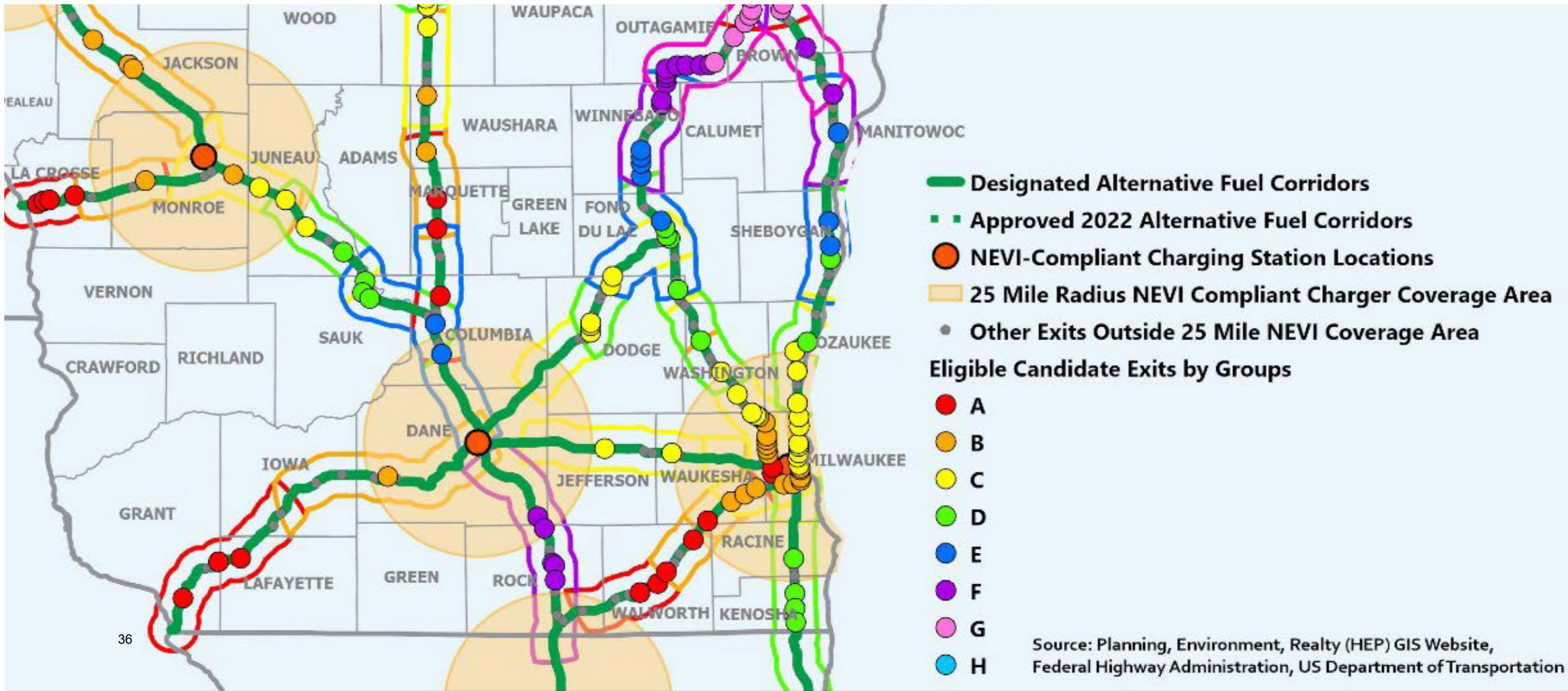
Federal Funding Sources

Three Programs included in the Bipartisan Infrastructure Law (BIL)

- National Electric Vehicle Infrastructure (NEVI) Program ($5 billion)
  - Primary goal is to ensure adequate charging capacity on key highway corridors (AFCs). The state will need about 60 new stations to ensure no more than a 50 mile gap between stations along AFCs.
  - Because there is a qualifying station at the Walmart on Nakoosa Rd, most of Dane County is not eligible for NEVI funding.
- Carbon Reduction Program (CRP) ($6.4 billion)
  - Although federal guidelines list EV charging infrastructure as an eligible expense, Wisconsin's Joint Finance Committee placed additional restrictions on its use in the state. EV charging infrastructure is currently not allowed.
- Charging and Fueling Infrastructure (CFI) Grant Program ($2.5 billion)

Charging and Fueling Infrastructure Grant Application

Charge Up Dane County – Accelerating the Transition to EV Transportation for All

- Partners:
  - Alliant Energy
  - Dane County
  - Drive Electric Wisconsin
  - Community-based organizations
    - Centro Hispano, The Hmong Institute, Urban League of Greater Madison, and others
  - Cities of Madison, Fitchburg, Middleton, Sun Prairie
  - Dane County Towns Association

- The Electrification Coalition
- Greater Madison MPO
- Madison College
- Madison Gas & Electric
- RENEW Wisconsin
- University of Wisconsin – Madison
- Wisconsin Clean Cities
- WPPI Energy, representing most municipal utilities in Dane County

Charging and Fueling Infrastructure Grant Application

Charge Up Dane County – Accelerating the Transition to EV Transportation for All

Vision: Install a regional network of 92 publicly accessible EV charging stations to eliminate charging availability gaps, while improving equity, maximizing emissions reductions, and preparing for projected EV growth.

Timeline: 3 years

Budget: $18.7 million

- Federal $14.7 million

- Local $4 million

- 96% of funding directed towards EV charging station installation.

Plan Outline

Introduction

Benefits of EVs

Barriers to EV Uptake

- Cost of Vehicles

- Range Anxiety

- Concerns about Charging Infrastructure Availability and Charge Time

- Barriers to Charging Station Installation

EV Charging Levels and Infrastructure

- EV Charging Levels

- EV Charging Infrastructure

Previous Planning for EVs in the Madison Area

- Dane County Climate Action Plan

- Wisconsin Electric Vehicle Infrastructure Plan

Policy and Planning Tools

- Comprehensive Plans

- Zoning

- Public Parking

- Building and Electrical Codes

Key Considerations for Public Charging

- Equipment

- Maintenance

- Accessibility

- Networking

- Installation

- On- or Off-Street

- Utilities

- Visibility and Signage

- Ownership Models

Funding Sources

- Federal Programs
  - NEVI Formula Program
  - Charging and Fueling Infrastructure Grant Program
  - Carbon Reduction Program

Plan Outline (cont.)

Regional Context (Dane County)

- Households and Housing Types
- Electricity Sources
- Registered Electric Vehicles
  - Projected Growth
- Existing Charging Stations
  - Charging infrastructure needed to support EV growth
- Local Programs and Policies
  - City of Madison
  - Others…
- Private Sector
  - MGE
  - Others…

Charging Locations

- Residential
  - Single-Family
  - Multi-Family
- Workplaces
- Opportunity Charging
  - Fast Charging Zone (Highway) – short term parking, DCFC.
  - Convenience Charging Zone (Grocery stores, restaurants, cultural activities, sporting events) – up to 4 hour dwell time, Level 2, limited DCFC.
  - Leisure/Slow Charging Zone (Workplace, medical, higher ed., multifamily, etc.) – Longer dwell times, Level 2.

Priority Locations for Public Charging Infrastructure

- Public Priority Locations
  - Multifamily Residential Areas
  - Environmental Justice Areas
  - Underserved Rural Areas
  - VMT Reduction/Mode Shift
- High Demand Locations
  - Fast Charging
  - Convenience Charging
  - Leisure Charging

Next Steps

- Complete draft plan
  - Integrate new materials produced for CFI application
- Send to steering committee for review
- Finalize

Questions?