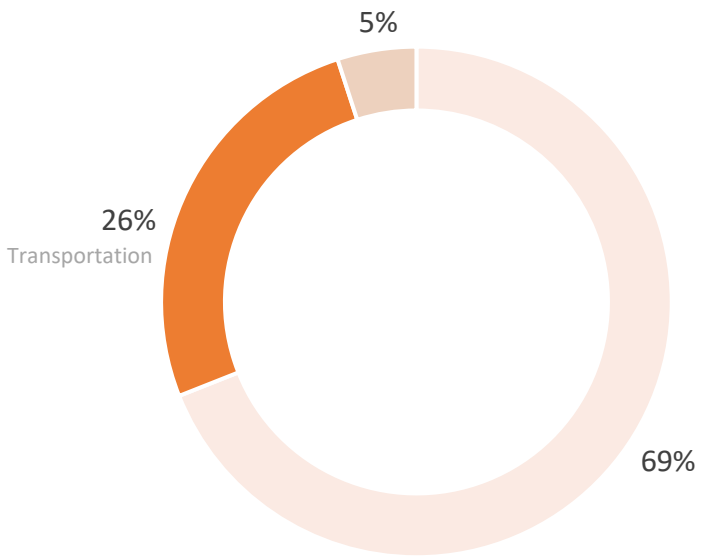
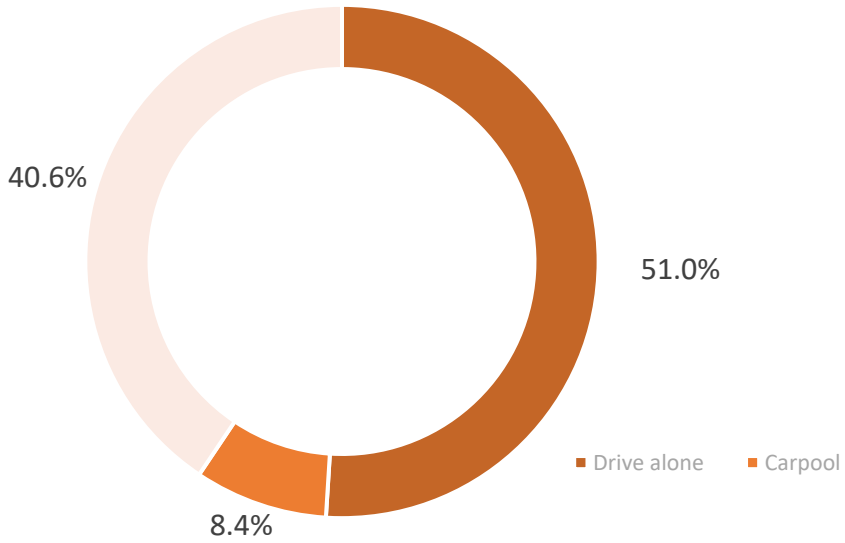
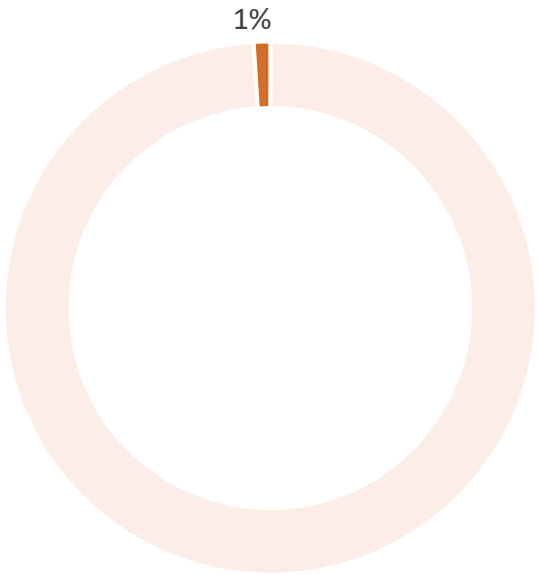
# Every Corner Counts: Neighborhood-Focused EV Charging for an Inclusive Philadelphia

# Broad Context



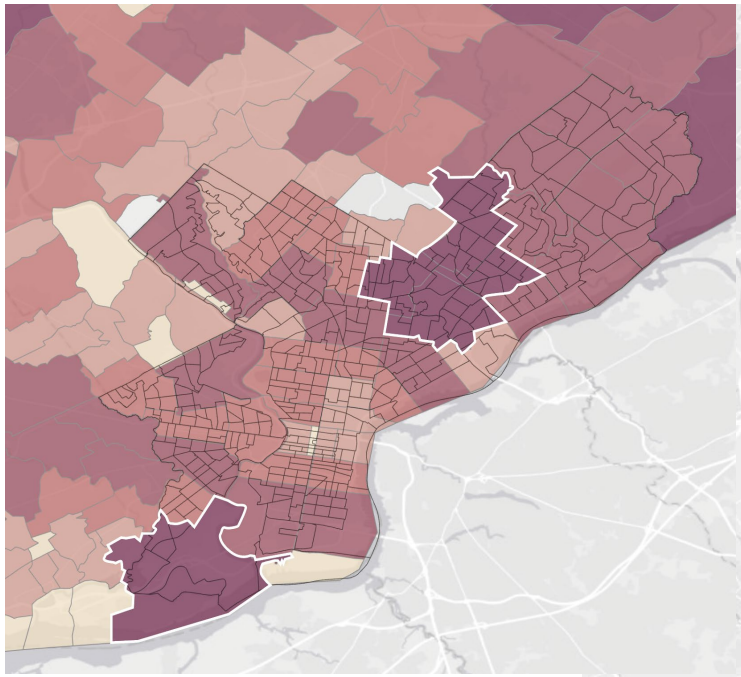

Transportation is responsible for **26%** of Philadelphia's overall greenhouse gas emissions.

Approximately **60%** of Philadelphia's population commutes primarily by driving.

As of 2023, electric vehicles (EVs) account for just about **1%** of the total cars actively used on U.S. roads.

**Our Goal:**

- Make cars more environmentally friendly.
- Enhance the sustainability of commuting by equitably deploying EV charging stations.

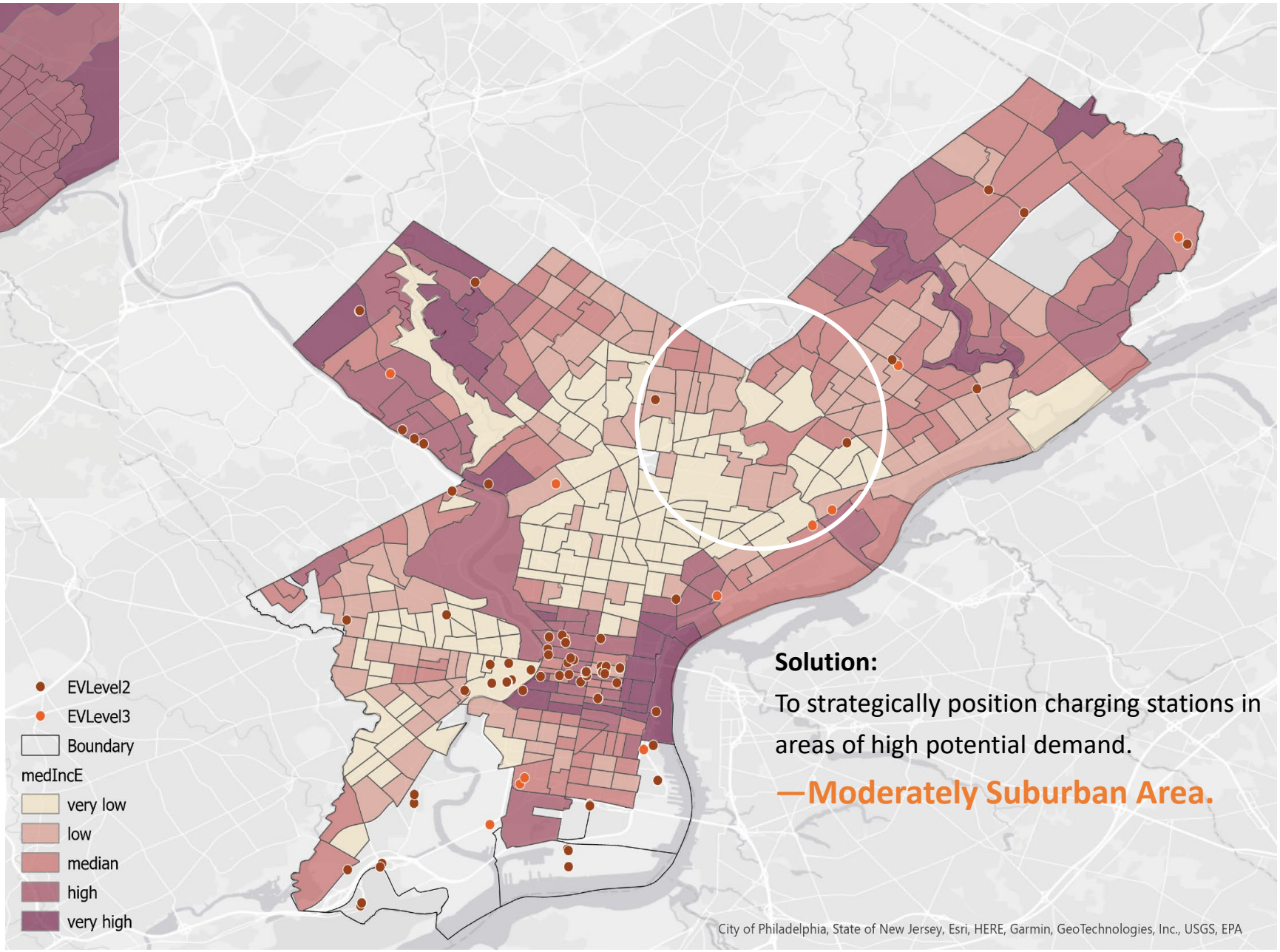


Commute Needs Map

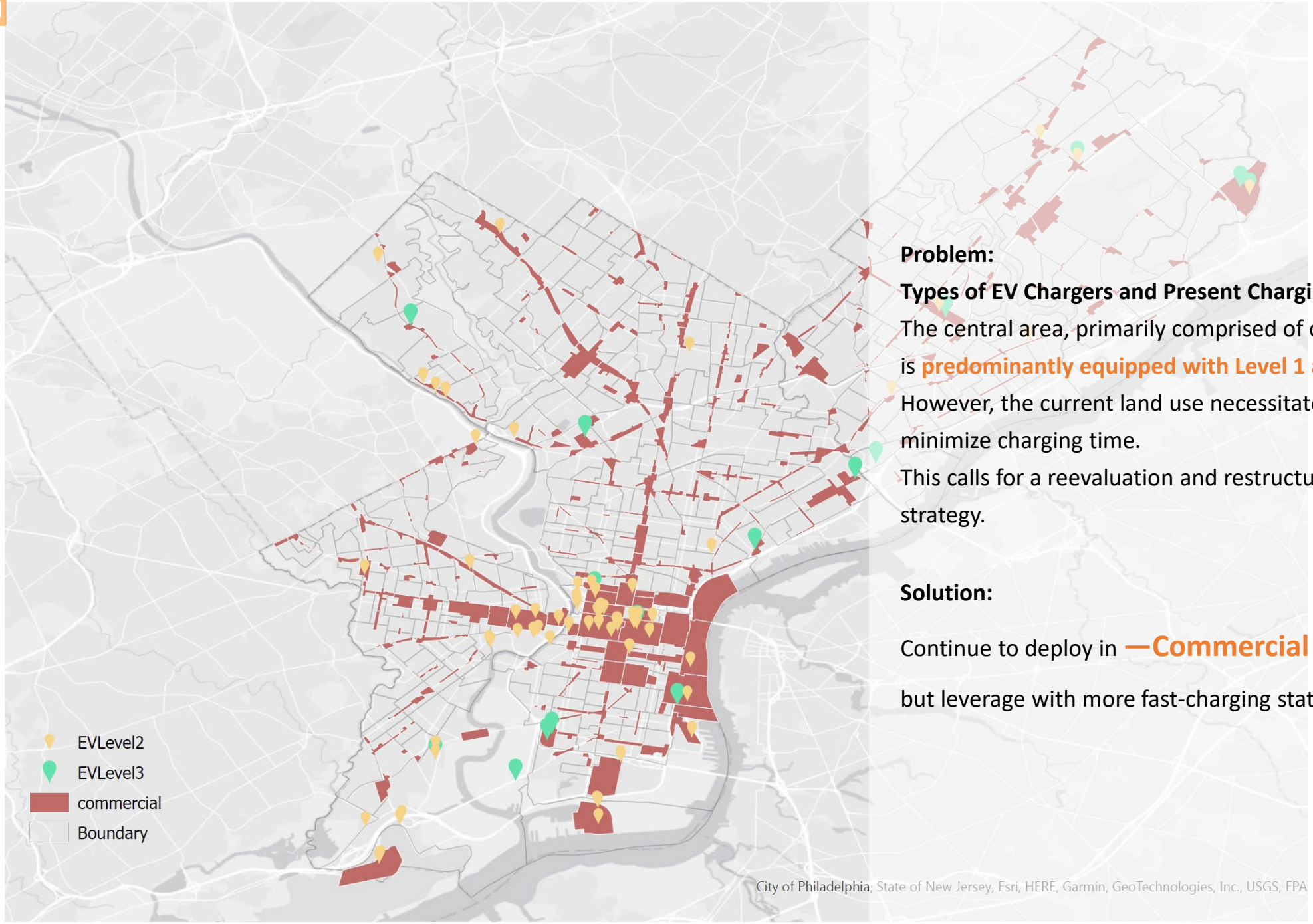
**Problem:**

**Current charger distribution Incongruity**

1. Mismatch Between Electric Vehicle Charging Requirements and Existing Charging Station Network.
2. The central area already possesses an adequate number of charging stations.




Current distribution of EV chargers




**Problem:**

**Types of EV Chargers and Present Charging Demands Incongruity**

The central area, primarily comprised of commercial and workplace zones, is **predominantly equipped with Level 1 and Level 2 chargers**.

However, the current land use necessitates fast charging options to minimize charging time.

This calls for a reevaluation and restructuring of the charger distribution strategy.

**Solution:**

Continue to deploy in **—Commercial Area.**

but leverage with more fast-charging station.

# EVSE Site Selection:

## Commercial Property in Residential Neighborhood





Neighborhood Commercial Center
Affiliated parking lot
Residential Neighborhood

**Residential Neighborhood Pattern:**

In the residential area layout, neighborhood market centers are centrally located within each neighborhood, typically accompanied by an affiliated parking lot.

**Commercial Property in Residential Neighborhood**

- Centrally located in **residential areas** for resident convenience.
- Utilizes **existing parking spaces** for combined parking and charging purposes.
- Offers **commercial amenities**, enabling shopping and errand-running while charging.

# EVSE Site Target User:


**Grocery and other stores customers.**

Avg shopping time: **45min**

Needs: Level 3 chargers (fast charging)

**Residents living around this neighborhood**

Avg stay time: **30min-2h**

Needs: Level 3 chargers (fast charging)
sometimes Level 2 chargers

**Uber/ Lyft drivers**

with high driving distance
-want to minimize the cost
Needs: Level 3 chargers
(fast charging)

**Delivery truck drivers**

-minimize the cost
Needs: Level 3 chargers
(fast charging)

Level 3 chargers (fast charging)

15min: 50% **30min:** 80% **45min:** 100%

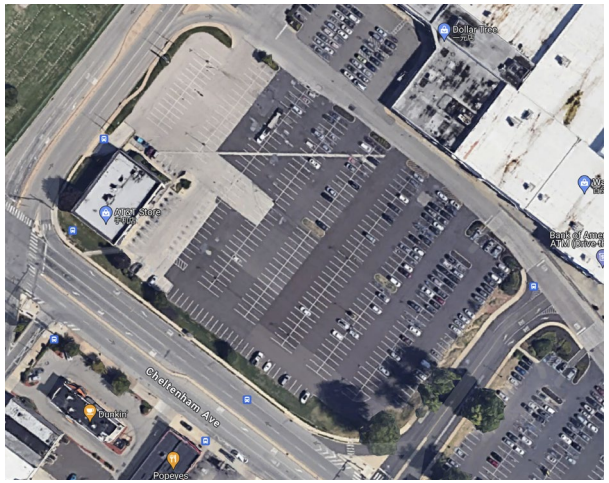
Level 2 chargers

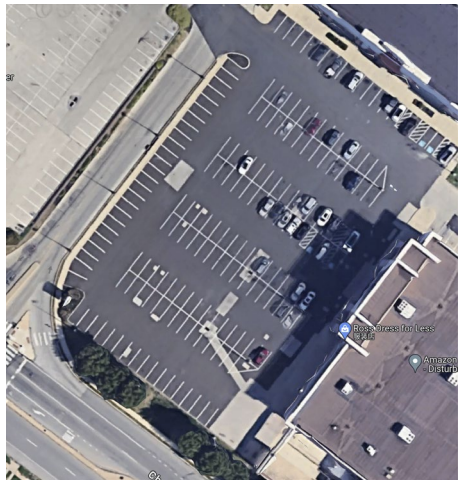
**2h**: 25% 4h: 50% **8h:** 100%

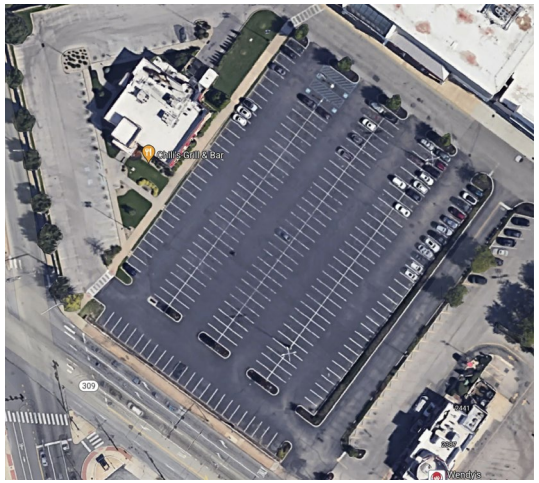
## EVSE Site Selection:

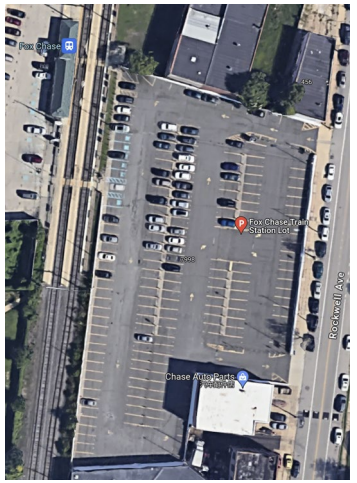
Commercial Property in Residential Neighborhood-**Parking Lot**

The parking lots are predominantly unoccupied,
resulting in notably low land-use efficiency.









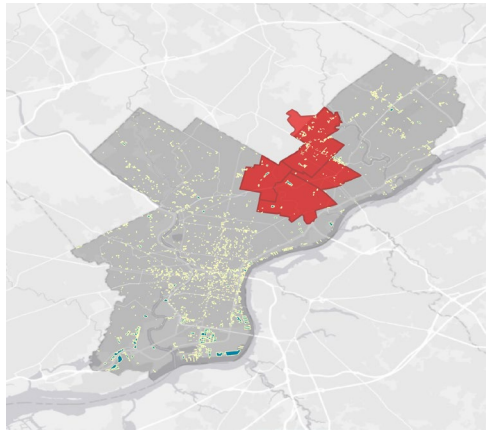

**Energy center of the community:**

Install solar panels to make use of the unshaded sunlight, utilize renewable energy to generalize power.

1. **EV charger station:** charge private EV cars, Ubers, delivery trucks for the commercial center.
2. Extra power could serve the commercial property use of the center
3. Serve community needs (streetlighting, etc.)

## EVSE Site Selection:

Parking lot of Commercial Property in Residential Neighborhood



**Selected area:**

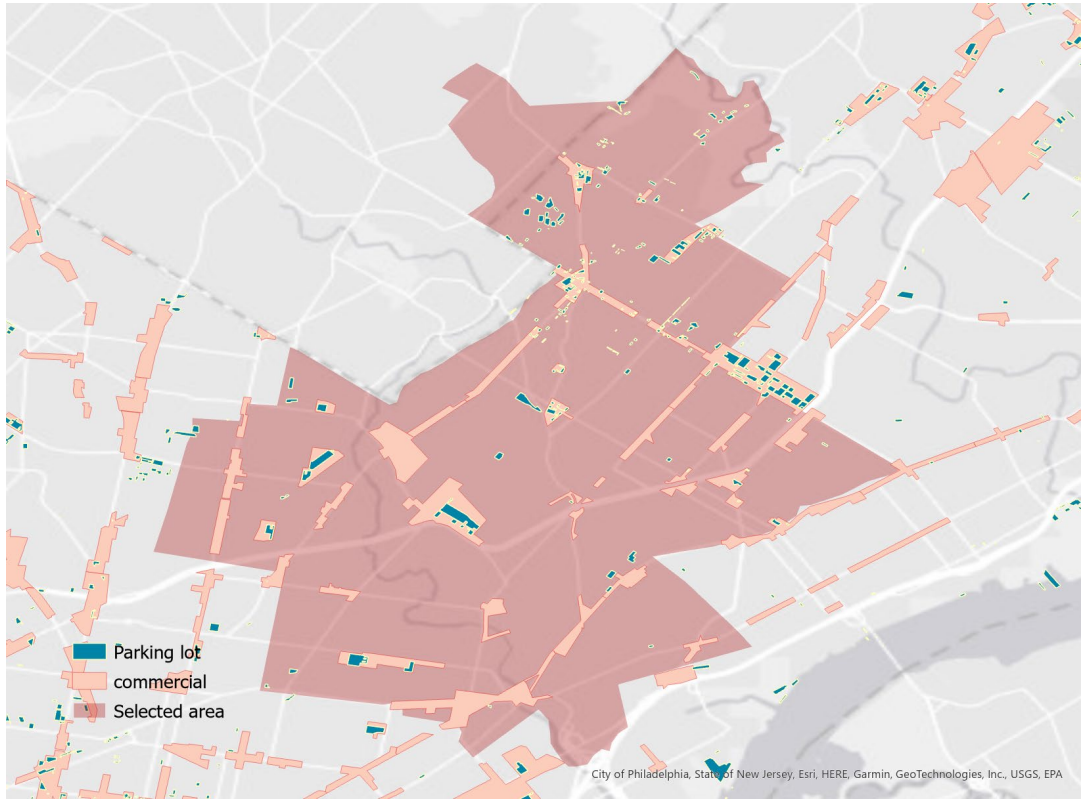
1.High potential needs for EVs

2.High driving demands

3.Densely populated area

4.Benefit less privileged people (racial minority…)

5.Mostly residential area with commercial centers.





**Selected Neighborhood**

**One-Olney square.**

## EVSE Site Selection:

Parking lot of Commercial Property in Residential Neighborhood


**1. Surrounding Residential Area**

Surrounded by residential area,
people mainly comes from the west entrance

**2. Commercial Property**

The main commercial entrance is situated within the primary parking zone, ensuring that closer parking placement correlates with enhanced proximity and efficiency.

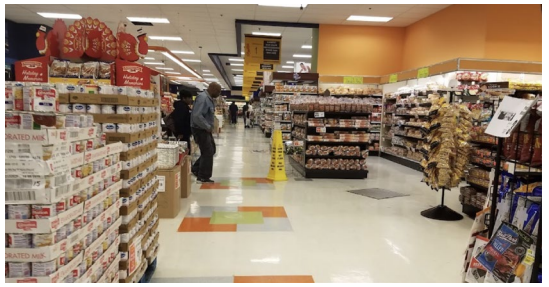
**3. Parking Lot**

There are two parking lots: one serves as the main commercial parking area, while the other is privately owned by a bank.

**EVSE Site Selection:**
Parking lot of Commercial Property
in Residential Neighborhood

**Satisfy neighborhood's everyday needs**

1. **Dining & Refreshments:**
   grocery stores, liquor stores, restaurants, and cafes.
2. **Essential Services:**
   postal services, banks, and ATMs.
3. **Retail & Personal Care:**
   nail salons, beauty services, clothing stores, and dollar stores.
4. **Lifestyle & Convenience:**
   gyms and daycare centers.

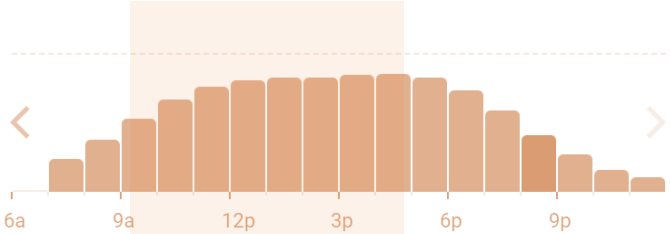


Grocery Store

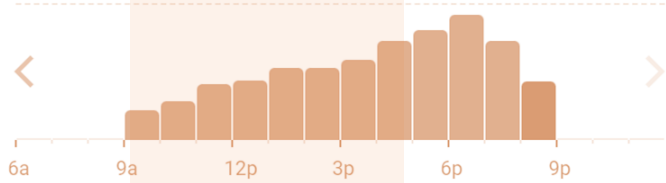

Liquor Store

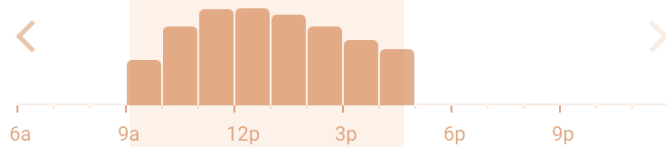

Postal Office

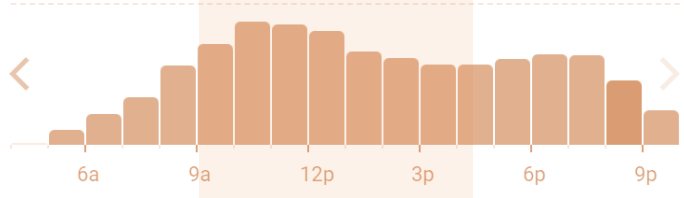
Gym




Most of the shops are open in 9am-5pm
Peak time is usually 10am and 7pm.



**EVSE Site Selection:**

Parking lot of Commercial Property

in Residential Neighborhood


**1. Proximity to Residential Areas:**

allows more residents to park and charge their vehicles without needing to navigate through the entire parking lot.

**2. Peripheral Location:**

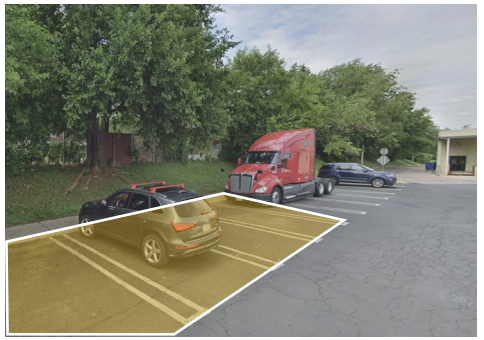
Situated away from the central parking area to avoid occupying the most accessible spots near commercial buildings.

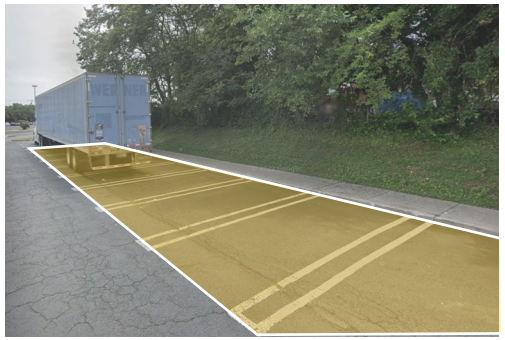
**3. Installation Convenience:**

The selected locations facilitate easy installation of charging infrastructures.

**4. High Visibility:**

Ensuring the charging stations are easily noticeable and accessible to users.





## Selected EVSE Site

## -EV charger implementation

Overall: **1448** parking spot

deploy **16** **Level 3 charging spot &** **4** **Level 2 charging spot**



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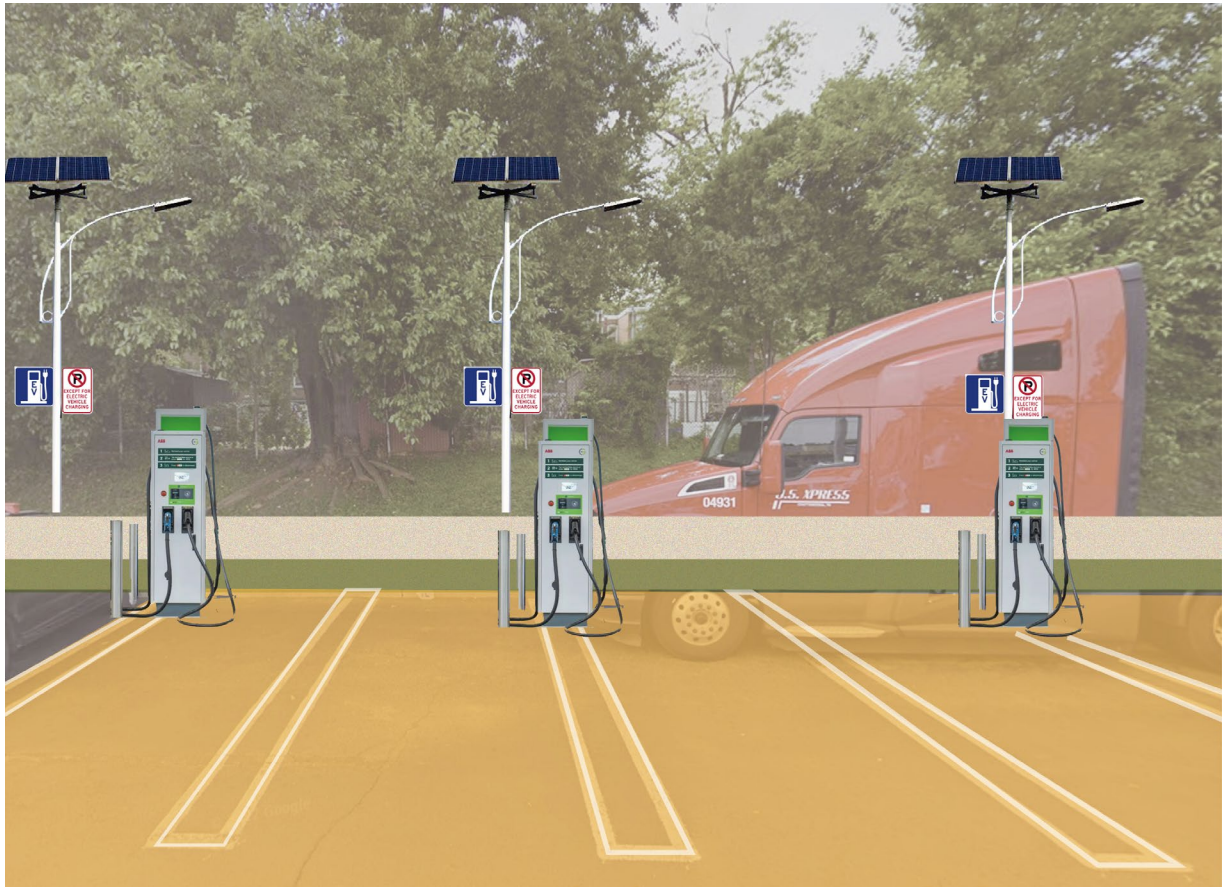
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## Selected EVSE Site

## -EV charger electricity implementation

Parking lot area: 537,106.52 ft² （49,898.83 m²）

Charger efficiency: 0.1-0.2 kWh

Sunshine hours: average of 7h

Solar panel could generate about **52420kw/day**

EV average battery capacity of around 50 to 75 kWh

(needed power: 75kWh*80%=60kWh)

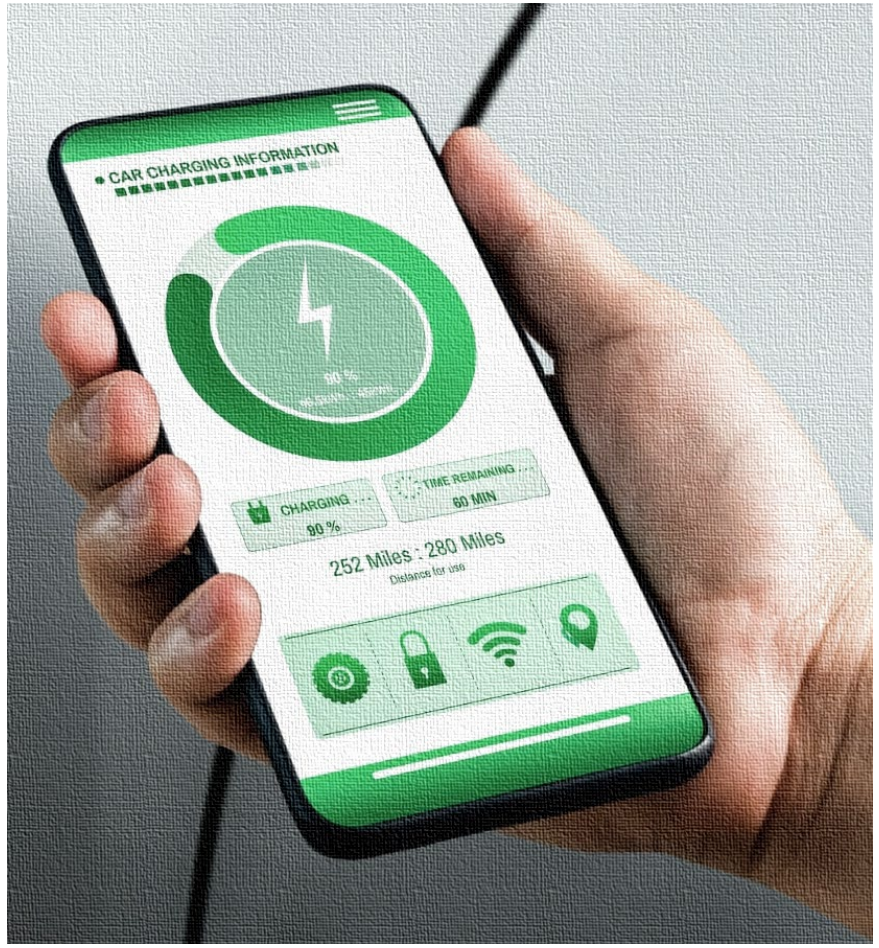
roughly could charge 870 cars/day

30min/car

**18 charger stations charge cars seamlessly in 24hours**

## Selected EVSE Site

## -Internet & Broadband implementation




a Parking Lot Scalability Check

b User Authentication

c Charging Status Monitoring

d Payment for Charging

e User report system (maintenance)

EV and EVSE all needs to be connected to internet to real-time traffic & energy status updates

## Selected EVSE Site

## -Maintenance & Partnership

***Guards Patrol:***

Scheduled patrols by maintenance staff training in recognizing damage or malfunction

**Partnership:**

Cooperate with current commercial property guardians

Commercial property: Use EV chargers to attract customers, boosting business revenue.

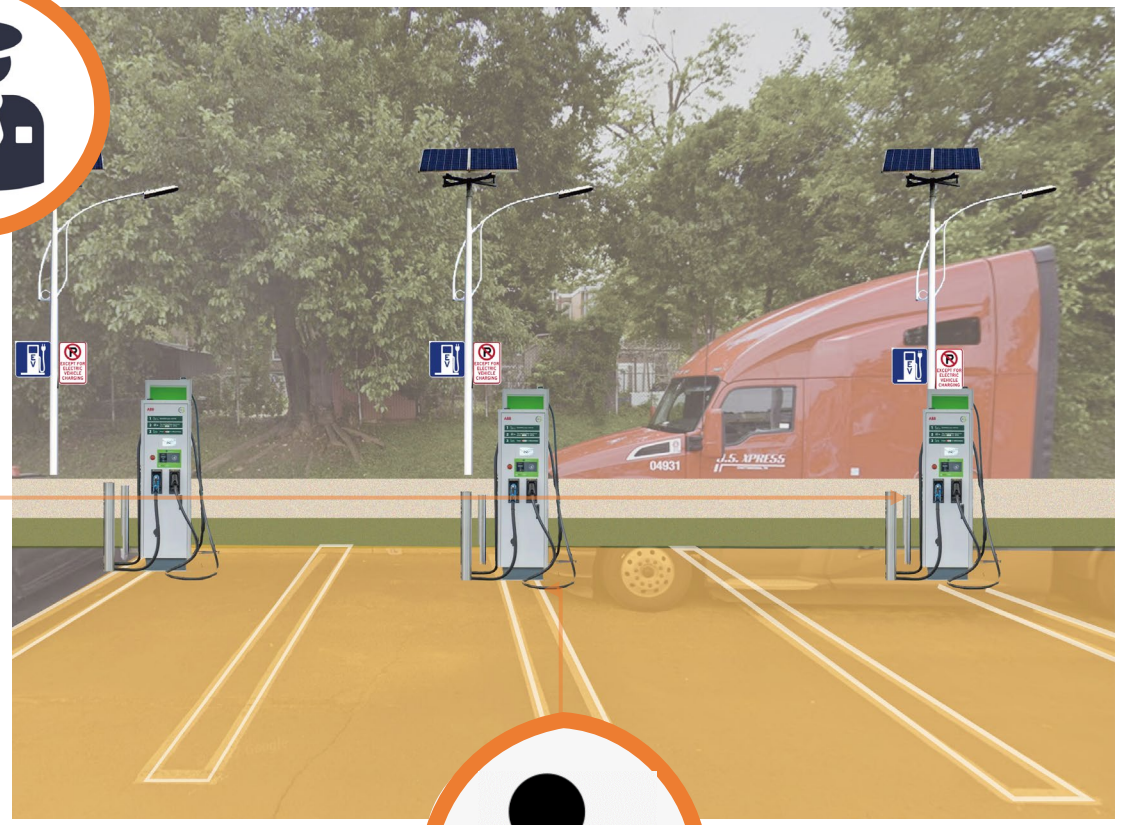
***User Report System:***

User-friendly issue reporting system with clear reporting instructions at station

**Partnership:**

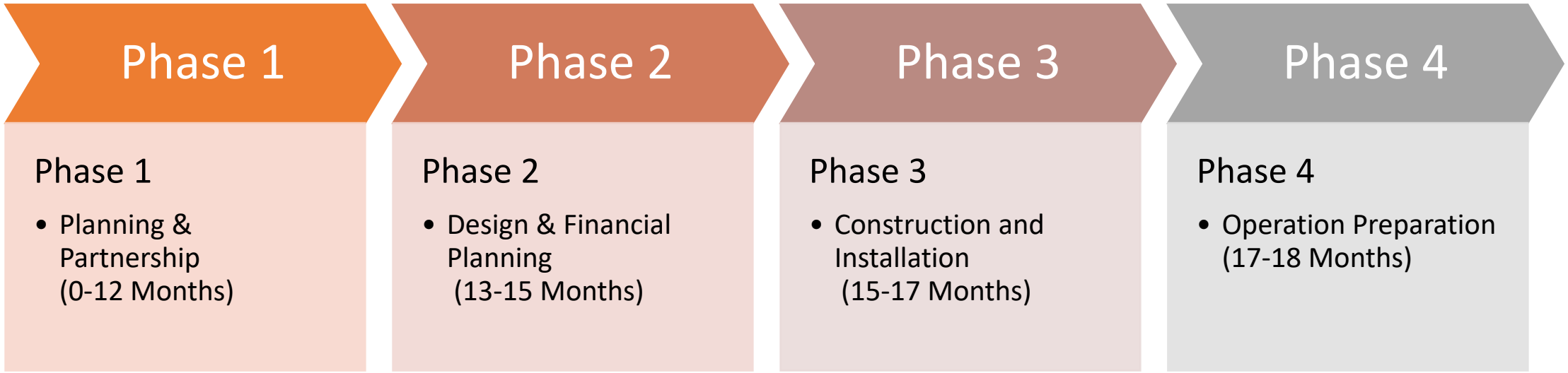
Cooperate with large EV app companies

charger into the network to be found and use, user could report the problems here



**Selected EVSE Site**

**-Implementation Timeline**



## Selected EVSE Site

## -Implementation Influence

### Encouraging

Encouraging More People to Buy Electric Vehicles:

- **Increased Convenience:** The presence of a reliable charging station reduces range anxiety, making electric vehicles more appealing to potential buyers.
- **Environmental Awareness:** The visibility of the charging station promotes environmental consciousness, encouraging people to consider electric vehicles as a sustainable alternative.
- **Incentivization:** The charging station can work in tandem with local incentives for electric vehicle ownership, making them a more attractive financial choice.

### Drawing

- Drawing More People to the Area and **Boosting Local Businesses:**
- **Attracting EV Owners:** EV owners are likely to visit the area specifically to use the charging facilities, increasing foot traffic.
- **Marketing Opportunities:** Businesses can capitalize on the presence of the charging station by offering discounts or promotions to EV owners, further encouraging visits.
- **Enhanced Business Image:** Being in proximity to an EV charging station can boost the eco-friendly image of local businesses, appealing to a customer base that values sustainability.

## Reference:


Current charger station user experience:
https://www.reddit.com/r/philadelphia/comments/q66lm6/how_do_you_own_an_electric_car_in_philly_without/?onetap_auto=true

Case Study:
https://www.fortum.com/products-and-services/vehicle-charging/news-blog/case-study-ev-parking-fortum-hq

Charging stations distribution map:
https://www.plugshare.com/
https://chargehub.com/en/charging-stations-map.html
https://hub.arcgis.com/datasets/mwcog::electric-vehicle-charging-stations-2/about

Charging spot deployment strategy:
https://www.driveelectricvt.com/Media/Default/docs/electric-vehicle-charging-station-guidebook.pdf
https://www.driveelectricvt.com/charging-installation-guide

Charging apps:
https://www.kbb.com/car-advice/electric-vehicle-charging-apps/

Partnership:
https://www.chargepoint.com/blog/grocery-stores-add-ev-charging-their-basket-amenities
https://www.chargepoint.com/blog/5-ways-retail-stores-can-boost-sales-ev-charging