

TO: Town of Apex Town Council

FROM: Jenna Shouse, Long Range Planner II

DATE: June 1, 2021

SUBJECT: Electric Vehicle Parking Information and Proposed Requirements

The purpose of this memo is to present proposed amendments to Section 8.3 Off-Street Parking and Loading of the Town of Apex Unified Development Ordinance (UDO) regarding electric vehicle (EV) charging spaces. Currently, the UDO requires two Level 2 EV charging spaces for structured parking. The goals of the proposed EV parking requirements are to: prepare for the trend of increased use of electric vehicles while avoiding unnecessary development of extra parking and to support the Town's sustainability initiatives.

The following process was used to review and revise the EV parking requirements:

- Internal review of **draft** EV parking requirements by: Planning and Community Development, Public Works and Transportation, Electric Utilities, and Water Resources (Sustainability) departments.
- Planning Board consideration and unanimous recommendation of approval of **draft** EV parking requirements at their May 10th meeting.
- Apex development community stakeholders review of **draft** EV parking requirements from May 4th to May 11th.
- Staff revision of EV parking requirements based on input from Apex development community stakeholders.
- Environmental Advisory Board consideration and unanimous recommendation of approval of **revised** EV parking requirements at their May 20th meeting.

The revised EV parking requirements will be presented to the Town Council in a public hearing process on June 8th.

Background

EV Demand and Supply

As of March 17, 2020 North Carolina had more than 13,482 electric vehicles. The number of registered EVs grew 70% from FY 2018 to FY 2019. The number of EV and hybrid vehicles is expected to grow, but they are not expected to outpace gasoline vehicles in this decade.¹

The lack of adequate charging infrastructure, the cost of EVs, and short driving ranges currently impede EV sales, but these issues are rapidly diminishing. The NCDOT ZEV, a strategic plan for accelerating EV adoption in North Carolina, forecasts three scenarios, ranging from a low of 264,850 EVs in North Carolina to a high of 346,377 EVs in North Carolina by 2030.²

¹ "Revenue Impact from Electric and Hybrid Vehicles," NC First Commission, 2020.

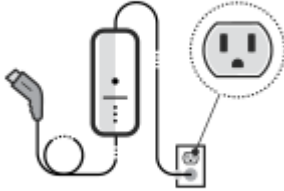
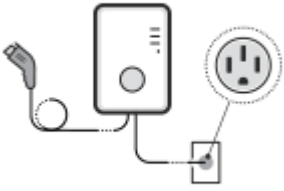
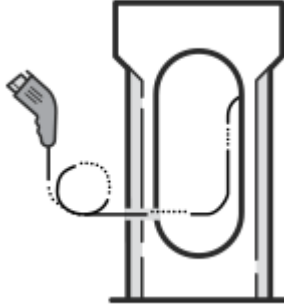


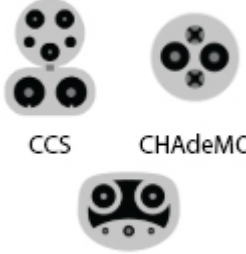
² Ibid.

There are currently four known EV charging stations in Apex available for public use. These stations are located in downtown Apex in the public parking lot off Saunders Street and at the Crossroads Ford Apex.^{3&4}

There are currently EV charging stations in the Town Hall parking lot. These spaces are dedicated for Town of Apex vehicles. The Town of Apex Electric Utilities Department has near-term plans to install six EV charging stations, four at the Public Works & Operations building and two at the Electric Operations Building.

EV Charger Fast Facts⁵

Every electric vehicle sold in North America can use any charging station that comes with the standard J1772 connector, known as the J-plug.⁶ Level 1 charging requires a regular residential outlet along with the J-plug and cord. Different charging options are summarized in the table below.

	Level 1 (120v)	Level 2 (240v)	Direct-current (DC) Fast Charging
Charging Options			
What does the charge port on the vehicle look like?	 J1772	 J1772	 CCS CHAdeMO Tesla Combo
How fast do they charge?	2–5 miles per 1 hour of charging	10–20 miles per 1 hour of charging	At least 60 miles per 20 minutes of charging. Charging time may be shorter depending on station power.

³ “Electric Vehicle Charging Stations,” Town of Apex.

⁴ “Crossroads Ford Apex” PlugShare, 2020.

⁵ “Plug-in Electric Vehicle Charging,” United States Environmental Protection Agency, 2020.

⁶ “The Different EV Charging Connector Types”, Enel X, 2019.

	Level 1 (120v)	Level 2 (240v)	Direct-current (DC) Fast Charging
Where can I find them?	<ul style="list-style-type: none"> In your house/garage Possibly at your apartment/condo and workplace No need to install anything; most automakers provide charger cords 	<ul style="list-style-type: none"> In your house/garage (You will need additional equipment) Possibly at your apartment/condo and workplace At public charging stations 	<ul style="list-style-type: none"> At public charging stations Limited availability, though becoming more common

EV Charging Equipment and Installation Costs

Overview

There are wide ranges of equipment and installation costs associated with EV charging spaces. Infrastructure costs vary according to charger type and whether the installation is completed as part of new construction versus retrofitting an existing development. For existing facilities, site engineering such as laying conduit, adding electrical panels to accommodate load, and planning for parking spaces close to electrical access to prepare for charging infrastructure can often be a much more significant cost than charging equipment. According to a City of San Francisco case study, installation costs of two Level 2 EV spaces was \$3,550 in a building retrofit and \$920 in new construction.⁷

Michael Kalb, Principal at Stantec, shared that the benefits of installing EV charging stations during initial construction are significant in that expanding electrical service capacity can dwarf the cost of the EV charging systems themselves. Kalb noted that the cost to expand the power capacity or add electrical distribution equipment can be in the tens or hundreds of thousands of dollars. Furthermore, it is less expensive to run the distribution (conduit/cable) before pavement is in place.

The following elements are needed to install an EV charging station, assuming the facility has adequate power capacity. Approximate costs were collected from Stantec and Town of Apex staff.

Need	Approximate Cost
Circuit breaker for each charging station	\$500
Foundation/bollards for each charging station	\$750 - \$1,250
Conduit/cable from the electrical room to each charging station. Cost varies based on the distance and the surface (grass vs. sidewalk vs. pavement).	\$15 per foot - \$50 per foot
EV signage and space striping	\$300

Charging station unit cost differences are attributed to the type of charging station and whether the station is open or networked (cellular/WiFi capable). A networked charger can connect to management software and has the capability to implement payment for usage.⁸ The following cost ranges were

⁷ “Electric Vehicle Charging Infrastructure Cost-Effectiveness,” Southwest Energy Efficiency Project, 2016.

⁸ “Transportation Electrification Study,” City of Raleigh, 2019.

collected from the City of Raleigh Transportation Electrification Study, Stantec, and EV Charge Solutions, a distributor of electric vehicle charging equipment.

EV Charger Costs

Type of Charging Station	Unit Cost Range
Level 1	\$300 - \$1,500
Level 2	\$1,650 - \$7,500 (Typical \$3,500)
Level 3 (DC Fast Charging)	\$13,700 - \$100,000 (Typical \$30,000)

EV Site Examples

Information summarizing the costs for recent installation of EV equipment for three different municipal projects are provided below as examples.

Town of Apex - Electric Operations Site

Town of Apex quote from Shealy Electrical Wholesalers in 2021

- New construction
- One networked pedestal with two, Level 2 ports
- EV equipment and network cost: \$7,768
- EV installation cost: \$7,965
- Total cost: \$15,733

Town of Cary - Town Hall

Town of Cary quote from Chatham Electric Service LLC in 2020

- Retrofit
- Electrical and site work for one pedestal with two, Level 2 ports
- EV installation cost: \$6,700

City of Raleigh - Moore Square Parking Deck and City Center Parking Deck

2018 project costs provided by John Wynn, City of Raleigh Parking Superintendent

- Retrofit
- Two, Level 2 charging spaces (one in each parking deck)
- EV equipment cost: \$13,000
- EV installation cost: \$27,000
- Total cost: \$40,000

EV Charging Station Fee Collection

The NC General Assembly passed Session Law 2019-132 enabling third parties to sell electricity from charging stations without being regulated like a public utility. This law allows private property owners to charge for the use of EV charging equipment. Under this NC law, third parties may charge for electricity

by the kilowatt hour rather than only by the time that the vehicles are plugged in, making electric vehicle charging like the dollars-per-gallon pricing of a gas pump.⁹

There is limited information regarding the timeline to recoup installation costs by charging a fee for use; however, an example was found in the City of Longmont, CO. The City of Longmont has five publicly available EV stations and plans to collect a \$1 hourly fee for station usage. Based on last year’s use of the five EV stations, the \$1 per hour fee will generate approximately \$12,000 per year, which would cover the cost of owning and operating the EV stations and will allow the city to incrementally invest in additional public stations or other EV infrastructure over time.¹⁰

EV Charging Habit Studies

Key takeaways from *Plugged In: How Americans Charge Their Electric Vehicles – Findings from the largest plug-in electric vehicle infrastructure demonstration in the world*^{11&12}

- This nationwide study tracked charging habits of more than 8,000 plug-in hybrid and all-electric cars from 2011-2013.
- Although people will leave home or work to fill their cars or trucks with gas, with electric vehicles it is the opposite.
- While it generally takes 5 or 10 minutes to fill a car or truck with gas, electric vehicles using 110V AC can take up to 8 hours to charge. Fast-charging stations, which use 480V DC, can still take up to half-an-hour to impart a full charge.
- Where charging was fast, public stations were popular – as long as the price was low.
- Most people in the study preferred to charge their EVs at home the same way they might charge their cellphones.
- 98% of charging events were performed at home and work on work days.
- The following table displays EV charging location observations based on the vehicle type.

	Chevy Volt Drivers	Nissan Leaf Drivers
Home	57%	65%
Work	39%	32%
Other	4%	3%

Key takeaways from *Electric Vehicle Driving, Charging, and Load Shape Analysis: A Deep Dive Into Where, When, and How Much Salt River Project (SRP) Electric Vehicle Customers Charge 2018 Technical Report*¹³

⁹ “New N.C. Law Will Make Vehicle Charging Stations More Like Gas Pumps,” WFAE 90.7 Charlotte’s NPR News Source, 2019.

¹⁰ “Fee May be Required to Use Longmont’s EV Charging Stations,” *Governing: The Future of States and Localities*, 2021.

¹¹ “Large National Studies Analyze EV Infrastructure Needs,” Idaho National Laboratory, 2015.

¹² “Plugged In: How Americans Charge Their Electric Vehicles – Findings from the largest plug-in electric vehicle infrastructure demonstration in the world,” Idaho National Laboratory, 2015.

¹³ “Electric Vehicle Driving, Charging, and Load Shape Analysis: A Deep Dive Into Where, When, and How Much Salt River Project (SRP) Electric Vehicle Customers Charge 2018 Technical Report,” Electric Power Research Institute, 2018.

- This study tracked 100 electric vehicles from June 2016 through January 2018.
- The majority of charging occurred at Level 2 (74.0%) followed by Level 1 (23.4%) and DC Fast charging (2.5%).
- On average, vehicles used 2,700-3,300 kWh per year.
- Kilowatt-hour usage was higher for Teslas and lower for Nissan LEAFs and Chevy Volts.
- The following table displays the percent of total kilowatt-hours for each charging locations.

Location	Percent of total kWh
NULL	2.11%
Home	81.08%
Other	7.08%
Public	3.18%
Work	6.55%

Municipality EV Charging Space Requirement Review

The following table displays example EV parking space requirements that other municipalities have adopted. This table is included as a reference.

Municipality	Population	Applicable EV Parking Requirement
St. Louis Park, MN ¹⁴	48,677	Parking structures or lots with at least 50 spaces shall provide: <ul style="list-style-type: none"> • Multi-family residential: 10% of required parking as Level 1 and at least one Level 2 charging station for guest parking. • Non-residential: 1% (minimum of 2 spaces) of required parking as Level 2 charging spaces.
Middletown, CT ¹⁵	46,511	Any development that requires 25 or more spaces shall have a minimum of 1 charging space or 3% of the total number of spaces allocated to EVs (whichever is greater) and must have a Level 2 or 3 charging station/connection per EV parking space.
Mountlake Terrace, WA ¹⁶	21,210	Required Number of Electric Vehicle Charging Stations by Use: <ul style="list-style-type: none"> • Multi-household residential: 10% • Lodging: 3% • Retail, eating and drinking establishment: 1% • Office, medical: 3% • Industrial: 1% • Institutional, municipal: 3% • Recreational/entertainment/cultural: 1% • Other: 3%
Davidson, NC ¹⁷	12,735	One EV charging station is required in all parking lots greater than 50 spaces. In parking lots greater than 100 spaces, two EV charging spaces would be required.

¹⁴ "Summary of Best Practices in Electric Vehicle Ordinances," Great Plains Institute, 2019.

¹⁵ Ibid.

¹⁶ "Chapter 19.126 Electric Vehicle Infrastructure," Mountlake Terrace Municipal Code, 2020.

¹⁷ "Section 8: Parking & Driveways," Town of Davidson Planning Ordinance, 2017.

Municipality	Population	Applicable EV Parking Requirement
		In a parking deck, one EV charging station per 100 spaces would be required.
Gwinnett County, GA ¹⁸	936,250	Commercial and multi-family developments which exceed 50 parking spaces shall provide at least one electric vehicle charging station (pedestal) for each 50 parking spaces. Commercial and multifamily redevelopments which exceed 50 parking spaces shall provide at least one electric vehicle charging station (pedestal) for each 50 parking spaces. Compliance with this subsection is required for redevelopment projects where site work and/or repaving of existing parking areas and driveways (greater than 50 parking spaces) exceeds 50% of the existing impervious surface area.
New Providence, NJ ¹⁹	13,059	New construction of multi-family buildings with five or more units shall have electric vehicle charging stations equal to 10% of the approved parking spaces, in addition to any other required spaces.

Proposed Parking Requirement

The background information on EV supply and demand, installation and equipment costs, review of requirements in other municipalities, and habit studies informed the proposed requirements for the Town of Apex. Based on the EV charging habit studies in particular, a minimum EV charging space requirement is proposed for locations where drivers typically park their vehicles for long periods of time. These locations include: home, work, parks, hotels, and motels. Based on the review of other municipal EV charging space requirements, the proposed minimum EV charging space requirement is between 1% and 3% of all required motor vehicle spaces for the uses listed in the table below. Note: Level 2 or DC Fast Charging EV charging requirements are not proposed at this time for Single-family dwellings and Townhouses as it is not a minimum code requirement in the National Electric Code. If the National Electric Code is modified in the future, the UDO requirements can also be reevaluated.

EV Charging Space Requirements by Use

The following uses shall provide electric vehicle charging spaces in accordance with the following table. Affordable multi-family and apartment developments are exempt from all EV charging space requirements. For purposes of the EV charging space requirements, affordable multi-family and apartment developments are considered those with average rents that are affordable to a household with an annual income that is not greater than 80% of the Area Median Income for the respectively-sized household in the Raleigh, NC MSA, as determined by the United States Department of Housing and Urban Development.

- If less than 11 motor vehicle spaces are required, no EV charging spaces or EV-Ready spaces are required.
- If 11 to 49 motor vehicle spaces are required, one EV-Ready space is required.
- No more than 10 EV charging spaces shall be required within a single development.

¹⁸ “Chapter 240. Off-Street Parking Standards,” Gwinnett County Unified Development Ordinance, 2019.

¹⁹ “Electric Vehicle Charging Stations,” Borough of New Providence Ordinance 2020-06, 2020.

Use	Minimum Number of Electric Vehicle Parking Spaces
Multi-family or apartment	3% of all required motor vehicle spaces
Government Service	3% of all required motor vehicle spaces
Commercial Uses	3% of all required motor vehicle spaces, if the minimum parking requirement is at least 100 spaces. One EV-Ready space is required if 11 to 99 motor vehicle spaces are required.
Office, business or professional	3% of all required motor vehicle spaces
Office: Coworking Space	3% of all required motor vehicle spaces
Office: Call Center	3% of all required motor vehicle spaces
Hotel or motel	3% of all required motor vehicle spaces
Industrial Uses	3% of all required motor vehicle spaces
Park, active or passive	2% of all required motor vehicle spaces
Parking Structure	3% of all provided motor vehicle spaces
Parking Structure (School, public or private: Elementary, Junior, or Senior)	2 spaces
School, public or private: Elementary or Junior	3% of all required spaces that are provided in an off-street surface lot
School, public or private: Senior	1% of all required spaces that are provided in an off-street surface lot

Number of Accessible EV Charging Spaces

Electric vehicle charging spaces shall be sized but not marked as exclusively accessible in accordance with the table below.²⁰

Total Charging Spaces	Total Accessible Charging Spaces	Van-Accessible Charging Spaces
1-25	1	1
26-50	2	1

Standards EV Charging Spaces

- Installation of a Level 2 or DC Fast Charging EV charging space may count as a community amenity for sites that require less than 50 motor vehicle spaces.
- EV spaces shall be utilized to meet the minimum motor vehicle parking requirements.
- All EV spaces shall be installed outside of the public right-of-way.
- All required EV charging spaces shall be Level 2 or DC Fast Charging.
- EV charging equipment shall be placed outside of the critical root zone for any preserved tree.
- EV charging equipment shall be placed at least 10 feet from a newly planted tree.
- EV spaces shall be posted with signage.

²⁰ “Charging Station Installation Handbook for Electrical Contractors and Inspectors,” Advanced Energy, 2014.

- In surface lots, a wheel stop, bollards, or other barrier shall be placed between the EV charging space and the EV charging equipment. Alternatively, there shall be a minimum distance of 2 feet between the curb and the EV charging equipment.²¹
- The Town does not restrict property owners from collecting a service fee for the use of an electric vehicle charging station.

Definitions

- **EV-Ready:** Installation of “raceway” (the enclosed conduit that forms the physical pathway for electrical wiring to protect it from damage), dedicated branch circuit(s) (electrical pre-wiring), circuit breakers, and other electrical components, including a receptacle (240-volt outlet) or blank cover needed to support future installation of one (1) or more charging stations.²²
- **Level 2 Charging:** 208/240 volt AC charging, requiring a 40-amp circuit, open or networked. Level 2 chargers have a cord that plugs directly into the vehicle in the same connector location used for Level 1 equipment.^{23&24}
- **Level 3 Direct-current (DC) Fast Charging:** 240/208/440 volt DC charging, 3-phase, 100+ amp circuit, open or networked, the highest-powered electric vehicle chargers available. DC fast chargers have three (3) types of connectors: CHAdeMo, CCS, or Tesla.²⁵

Summary of Comments Provided on EV Parking Requirements

Planning Board Comments on **Draft** EV Parking Requirements

- Discussion on the lifespan of a DC Fast Charger.
 - Staff finding: There is limited data available on the lifespan of EV charging equipment due to the technology still being relatively new. Some sources suggest a 10-year usable lifespan.
- Interested in not restricting the EV charging spaces to only EVs.
- Agree with the need for EV-Ready spaces.
- Interested in incentivizing DC Fast Charging stations.
- Need to be cognizant of equity concerns.

Apex Development Community Stakeholder Comments on **Draft** EV Parking Requirements

- Agree with foresight of expanding EV infrastructure.
- Incentivize rather than mandate EV charging installation.
 - Staff recommend a provision to count an EV charging space as one community amenity for sites that have a minimum parking requirement of less than 50 spaces.
- Implement a maximum number of EV charging spaces or decrease the percentage of required spaces.
 - Staff recommend setting a maximum requirement of 10 EV charging spaces for a single development.
- Agree with the 50 space threshold for 1 EV charging station.
- Consider methods to limit charging during peak demand.

²¹ “Summary of Best Practices in Electric Vehicle Ordinances,” Great Plains Institute, 2019.

²² “Guide: Electric Vehicle Infrastructure Requirements in CALGreen Building Code,” City of Sacramento, 2019.

²³ “Article 12: Definitions,” Town of Apex Unified Development Ordinance, 2020.

²⁴ “Transportation Electrification Study,” City of Raleigh, 2019.

²⁵ “Electric Vehicle Charging 101,” Center for Sustainable Energy - California Energy Commission, 2021.

- The Town cannot enforce EV parking time restrictions.
- Consider a broader plan for expansion beyond UDO requirements.
 - Staff shared the proposed plan for EV expansion with the Environmental Advisory Board for future consideration.
- Consider potential equity concerns and impacts on affordable housing.
 - Staff recommend an exemption for affordable apartment and multi-family residential developments.

Environmental Advisory Board Comments on Revised EV Parking Requirements

- Question of whether the Board could ask developers to include a zoning condition to provide a 240 volt outlet that is connected to a circuit breaker in single-family and townhome garages.
 - Staff cannot enforce this requirement as it is not a minimum code requirement in the National Electric Code.
- Question of whether EV spaces should count toward the minimum parking requirement.
 - Staff responded that developers are permitted to exceed the minimum parking requirement by 15% or 25%, depending on the size of the development. The purpose of counting EV spaces toward the minimum parking requirement is to avoid unnecessary development of extra parking.
- Agree that retrofitting for EV charging spaces is much more expensive than installation as part of new construction.
- Question of whether it would be helpful to ask apartment complex developments to provide DC Fast Charging spaces.
 - Staff noted that these are the fastest charging types and suggested that the Board consider the context of the apartment complex as DC Fast Chargers are the most expensive type of EV charger.
- Support requiring EV-Ready spaces.

Illustrative Examples of Application

EV Charging Spaces Required

The following tables display the number of EV charging spaces that would be required under the proposed minimum requirements. The maximum EV charging space requirement for a single development is 10 spaces. The proposed EV charging space requirement is based on the minimum motor vehicle parking requirement and the existing fractions rule: any fraction of one-half or less shall be rounded down to the next lower whole number and any fraction of more than one-half shall be rounded up to the next higher whole number.

Minimum Parking Requirement	Number of EV Spaces Required (1%)
1-50	0
51-150	1
151-250	2
251-350	3
351-450	4
451-550	5
551-650	6
651-750	7
751-850	8
851-950	9
951-1050	10

Minimum Parking Requirement	Number of EV Spaces Required (2%)
1-49	0
50-75	1
76-125	2
126-175	3
176-225	4
226-275	5
276-325	6
326-375	7
376-425	8
426-475	9
476-525	10

Minimum Parking Requirement	Number of EV Spaces Required (3%)
1-49	0
50	1
51-83	2
84-116	3
117-150	4
151-183	5
184-216	6
217-250	7
251-283	8
284-316	9
317-350	10

Proposed EV Parking Requirement - Development Examples

The following table displays the minimum number of EV charging spaces that would have been required for developments in Apex in accordance with the proposed EV charging space requirements.

Land Use(s)	Development	Minimum Parking Required <ul style="list-style-type: none"> Based on March 2021 Requirements Includes all spaces subject to EV requirement 	Proposed Minimum EV Parking Required	Status
Office & Warehouse	Peak City Business Park Buildings 5 & 6	132	4	Under Construction
Office & Medical Uses	Olive Chapel Professional Park	188	6	Under Construction
Office, Retail, Storage	3050 Lufkin Rd Office Bldg	25	0 (1 EV-Ready Space)	Approved
Office & Warehouse	Norris Park Bldgs 2 & 3	109	3	Constructed
Office	MCI Business Park Bldg 2	67	2	Constructed
Office & Warehouse	MCI Business Park Bldgs 3 & 4	103	3	Under Construction
Multi-family Residential	Meridian at Nichols Plaza	413	10	Constructed
Multi-family Residential	Meridian at Ten Ten	415	10	Constructed
Multi-family Residential	Westford Apartments	453	10	Constructed
Commercial Uses: Grocery & Retail sales	Haddon Hall Commons	277	8	Constructed
Commercial Uses: Grocery & Retail sales	Publix Pointe (does not include outparcels)	268	8	Constructed
Commercial Uses: Grocery	Lidl	116	3	Constructed
Hotel	Marriott Springhill Suites	97	3	Under Construction
Hotel	Candlewood Suites	84	3	Constructed
Hotel	Holiday Inn Express	67	2	Constructed
Park	Pleasant Park	729	10	Under Construction
Park	Hunter Street Park <ul style="list-style-type: none"> Softball and Soccer 	154	3	Constructed
Parking Structure	Peak City Business Park Bldg 7 Parking Structure	67 (Zero spaces required as structured parking)	2	Under Construction

Land Use(s)	Development	Minimum Parking Required <ul style="list-style-type: none"> • Based on March 2021 Requirements • Includes all spaces subject to EV requirement 	Proposed Minimum EV Parking Required	Status
Parking Structure (School)	Apex High School Renovations	192 (Zero spaces required as structured parking)	2	Constructed
Parking Structure (School)	Felton Grove High School	631 (Zero spaces required as structured parking)	2	Proposed (2 EV Spaces proposed in the parking structure)
School, public or private: Senior	Apex High School Renovations	678 (Surface lot spaces provided)	7	Constructed
School, public or private: Senior	Felton Grove High School	469 (Surface lot spaces provided)	5	Proposed
School, private or public: Senior	Apex Friendship High School	849 (Surface lot spaces provided)	8	Constructed
School, public or private: Elementary or Junior	Apex Friendship Middle School	116	3	Constructed
School, public or private: Elementary or Junior	Apex Friendship Elementary School	104	3	Under Construction

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