MEMORANDUM

DATE: May 18th, 2022

TO: Prof. Mark D Poliks

FROM: Devin Henry, Eric Tremsky, Maggie Huang and Taylor Irizarry

SUBJECT: **Broome County Electric Vehicle Charging Point Solutions**

Dear Prof. Poliks,

The report below is Team Green's Capstone Project Final Report on Electric Vehicle Charging Point Solutions.

If you have any questions on this document, please feel free to contact us.

Thank you.

ELECTRIC VEHICLE CHARGING SOLUTIONS FINAL REPORT

Devin Henry, Maggie Huang, Taylor Irizarry, Eric Tremsky

May 18th, 2022

Submitted in partial fulfillment of the requirement of
ISE 492 Systems Design
Spring Semester, 2022

Systems Science & Industrial Engineering Department
T.J. Watson School of Engineering & Applied Science
State University of New York at Binghamton

TABLE OF CONTENTS

LIST OF FIGURES

GLOSSARY OF TERMS

BC - Broome County

EV - Electric Vehicle

DCFC - Direct Current Fast Charge

E-Drive - Evaluation & Development of Regional Infrastructure for Vehicle Electrification

1. EXECUTIVE SUMMARY

This project was created with the purpose of incentivizing and further developing the use of electric vehicles within Broome County. Through the creation of a website and a deep analysis of optimal charging station locations, we expect to ease the life of electric vehicle owners within the county. The optimal locations chosen were in part based on conclusions drawn from research and insight from an environmental group. We were connected with the environmental group through one of our project advisors, Susan Ryan, and worked closely during the prior semester to determine environmental impacts and optimal charging point locations. Using the Site Suitability Tool, we examined potential optimal locations and compared their suitability for EV charging point installation. The resulting answers from the Site Suitability Tool questionnaire were graded on 0 to 2 scale and then averaged to see the overall suitability of the location selected. The closer the average sum was to 2, the more optimal the location would be. The eight optimal locations chosen were Oakdale Mall, Town Square Mall, Vestal High School, Binghamton University, State Theater in Deposit, New York, Broome County Regional Farmers Market, Mobil Gas Station in Whitney Point, New York, and the final location was to be based on the preference of an actual EV owner in the Binghamton area. This EV owner did not get back to us regarding his "ideal location", however the plan has room to include another location in the future based on an EV owner's insight. Focus for electric vehicle charging infrastructure was given to the areas of higher demand and higher population density.

In light of any difficulties throughout the course of this undertaking, this project has achieved its goal. We have produced the desired deliverables of a website and brochure along with a sound infrastructure plan for the installation of EV charging stations throughout Broome County.

2. INTRODUCTION

Electric vehicles are the future of the green initiative and the automotive industry. Early adoption of them could lead to a cleaner, more sustainable world which would improve people's quality of life. Strategically placed charging stations for these vehicles could also help stimulate commerce and travel throughout the country. Broome county is one of many areas that is looking to further their objective of early adoption of electric vehicles and having the infrastructure needed to support them. As of right now, an infrastructure of charging stations exists well enough to travel throughout the county, but it is thin, sparsely placed, and lacking in proper placement. An updated infrastructure plan for optimal integration of electric vehicles charging stations would be needed to fully assist in the early adoption of electric vehicles.

The main objective of this project is to help those in Broome County who want to obtain electric vehicle charging stations by providing a one-stop source with information and resources to streamline this process. This includes set up costs, differences in types of chargers, variations in voltage, who to contact to install charging stations, and several other topics. In addition to the website that was created, a brochure was also created for those who have less time and want information on EV charging stations in a more compact form. To help Broome County, an additional eight optimal locations were suggested for future implementation. These locations were determined to be optimal with the help of our project leads and the ENVI 413 class taught by Susan Ryan. To solve the problem of optimality, we used the E-Drive tool along with a Site Suitability tool to determine how optimal the location we chose was.

3. PLAN AND SCHEDULE

At the conception of this project, the schedule had begun to form and gradually solidified over time. At the very beginning of the project, when the groundwork was just beginning to be laid out, an outline of the schedule had been formed. As time went on, and the project further developed, the schedule became more clear and concise. Halfway through the first semester, the schedule had been laid out, and it continued to be refined throughout the remainder of the project. The schedule then was rough and not concise, leaving time for leverage, mistakes, and accidents. As the project progressed through the stages, the excess time allocated was utilized wisely, as some unexpected problems arose. Some problems were directly related to the project, some to the project leaders, and some to the individuals assigned to the project. The schedule itself was utilized as a guardrail of sorts for the project. This ensured that nothing went too far astray off the determined path, or set timeframe, of the project when possible. The major milestones and deliverable dates were followed and watched closely as the project progressed so that nothing important would be missed or of lacking quality. Resource and workforce allocation was important to this project. By determining the man hours needed for each task, we were able to more accurately and effectively allocate the necessary workers and resources within the project. In the end, each worker operated according to their set of skills and proficiencies, properly utilizing every assigned member of the team to their top capability.

At the onset of the project, it was understood that the framework, knowledge, and understanding of all aspects of the project was vital to the success of the project moving forward. The team had broken up assigned areas of relevant knowledge to the project for each person to research, read into, and understand. This research served the purpose of educating each of our team members on various areas of the project so that they may work with the most knowledgeable resources possible. After thorough research and investigation, the team reconvened and re-assessed where the project was and how much more work was needed. Then, the schedule was reevaluated and remade to more accurately reflect what was now better understood and known. After then refining the actual deliverables and what still needed to be done, the team broke up to focus on their areas of expertise. The team compiled their knowledge into agreed upon formats to work on the various aspects of the project that were identified as needing effort. After overcoming some unforeseen obstacles, the team was able to complete each individual aspect of the project, compiling it all together. Finally, these efforts culminated in the various deliverables and final product we now have.

4. DATA

The data that was collected can be broken down into two sections: the E-Drive Tool, and the Site Suitability Tool. We will discuss this data and its analysis briefly here. For more information on this data and our analysis process see our Technical Report.

E-Drive Tool

The E-DRIVE is a tool created by M.J. Bradley & Associates, an ERM Group Company, in order to evaluate and develop the electric vehicle infrastructure. When accessing it through their website, the tool is available to the entire nation. For this project, we focused only on Broome County. The tool also gives the option to modify the metric weights depending on the importance of each metric for that particular study. There are three main metrics categories. This first one is DCFC Proximity Metrics, which is separated into two subcategories: Distance (Distance from existing DCFC stations to each census tract) and Port Density (Concentration of nearby DCFC ports). The second main metrics category is Demand Metrics, which is also separated into two subcategories: Traffic Volume (Vehicle-miles traveled (VMT)) and maximum roadway annual average daily traffic (AADT) within and near each tract) and Nearby Activity (Concentration of nearby commercial establishments and other points of interest). Lastly it gives the option to alter the Demographic Metrics also housing two subcategories: Population Density (Population density of each tract) and Home Access (Estimated residential access to home charging).

While using this tool, it is important to keep in mind that it was developed by another engineering firm. While it is very transparent in its sources and how it is utilized, one can not be 100% certain in its authenticity or accuracy. In practice and under inspection it seems to hold up to scrutiny, however the small margin of possibility for error is still there. For our purposes, the tool is exactly what was needed, so the risk of any minor error in its calculations or analysis is well worth the payoff it can give.

The various metrics allow for flexibility when using the tool to analyze different priorities. In this case, we compared 5 different metric weightings to identify areas that require more attention regarding electric vehicle charging points. The first one we analyze is a balanced metric weighting among all categories with a focus on demand (Figure 4.1.1).

Site Suitability Tool

The Site Suitability Tool we used was developed by the Ithaca-Tompkins County Transportation Committee (ITCTC). It analyzed 30 different variables and calculated how suitable a location would be for an electric vehicle charging station to be implemented there. The variables are broken down into seven different categories and five different scores are calculated from them. The five component scores are general site suitability, value to electric vehicle drivers with expected use, marketing and imaging, installation costs, and equipment costs. These scores are calculated based on how certain questions within the survey are answered. From those answers, a

calculated score out of 100 is given. An overall suitability score is then tabulated from all of the questions combined, not averaged out of the five components, since the weights for them are based on the importance of certain factors, which is asked within the survey. The questions that are asked in the Site Suitability Tool are listed below with answers to determine how optimal the location is. From that, the answers are scaled from a 0,1 or 2. 0 meaning that the answer was low scoring, 1 meaning that the answer was mid scoring, and 2 meaning that the answer was high scoring and fits into the criteria for an optimal location.

2. Does Broome County own, is it a public or private parking lot where the EV charging station will be installed?

- Private lots restrict access, public lots are preferred

3. Does Broome County either own or lease the building where electricity will be drawn for the EV charging station?

- Building that are leased require more paperwork and agreement with owners

4. What is the predominant land use for the EV charging station site?

- Zoned lands, or historic sites might require special permits

5. Which venue best describes the proposed EV charging station location?

- Dining establishment experiences are shorter than the time required to charge and EV

6. How long do drivers typically park their vehicles at this location?

- Sites with longer expected stay times are preferred as it takes a long time to charge an EV

7. Is this location used for any special event parking?

7B. Approximately how many special events per year?

- Charging stations are more influenced by regular customers rather than occasional, special occasions

8. How far is this location from a busy road used to travel between cities (typically an interstate, US highway, or State route)?

- Locations closer to routes would be more convenient

9. Which potential EV drivers are expected to use the charging station?

- Those not limited through access are more optimal

10. Would an EV driver require a permit, sticker, or card to access the parking lot where the charging station is located?

- Permits could hinder station use

11. Is there a fee to access the parking lot where the charging station would be located or would there be a fee to use the charging station?

- Fees to pay to enter parking lot are less inclined to go to those without fees

12. Would the charging station be located in a parking lot or garage with limited hours of operation?

- Limited hours of operations restrict EV charging

13. How many parking spaces are in the lot or garage?

- Large number of spaces means more potential slots for EV charging

14. Typically, how full is the parking lot or garage?
    - Lots that experience full capacity have more likelihood that conventional cars would park in EV designated parking spaces

15. Is there fluctuation in parking lot use by season?
    - Venues that are seasonal have minimal use during certain months

16. Is there fluctuation in parking lot use by day of the week?
    - Inconsistent experience is harder to manage

17. Would the EV charging station be mounted on the wall of a building where the cord could run to the EV and not interfere with a pedestrian walkway?
    - EV charging stations will require trenching and repair and a foundation to mount on

18. Is the parking lot paved?
    - Trenching and repairing paved parking lot costs more

19. Is the parking lot prone to flooding or other events that might damage a charging station or plugged-in EV?
    - Potential damage to stations or vehicles that are charging may lead to costly repairs and unreliable reputation

20. Would the EV charging station be located in a covered parking space
    - EV charging stations in open lots require maintenance and care in the winter months

21. Would the EV charging station need to be placed where it would obstruct plowing or in a location where snow is stored in the winter?
    - Locations where snow is piled up in the winter are less optimal

22. Would the EV charging station be in a preferred parking space?
    - Charging stations located in the back or side of the building are harder to find and inconvenient

23. Are there lights illuminating the parking lot at night?
    - Lights are a nice amenity that encourage charging station's usage anytime

24. Would the EV charging station and parking space be visible from the road or entrance to the parking lot or garage?
    - Visibility adds exposure to the general public

25. Does the existing electrical panel have 4 extra slots and 80 amps of available capacity for a dual port Level 2 charging station?
    - Sub panels might needed to be added to accommodate inquiring extra costs

26. How recently has major electrical work been performed at this location?
    - Major electrical work may be required to bring the existing electrical system up to date when adding the charging station

27. How far is the electrical panel from the point of the building closest to where the charging station would be located?
    - Long electrical runs require more materials

4.1 Collection

E-Drive Tool

To collect useful data from the E-Drive tool, we manipulated the various metric weightings to produce various forms of heat maps. Manipulation of the tool's variables yielded multiple scenarios based on which specific metrics were favored over others. Discussed in greater detail in our Technical Report (Technical Description: 1. E-Drive), the data collected from the E-Drive tool helped us determine optimal locations for EV charging points. The figures below show the results of the map when the balanced metrics were tampered with.

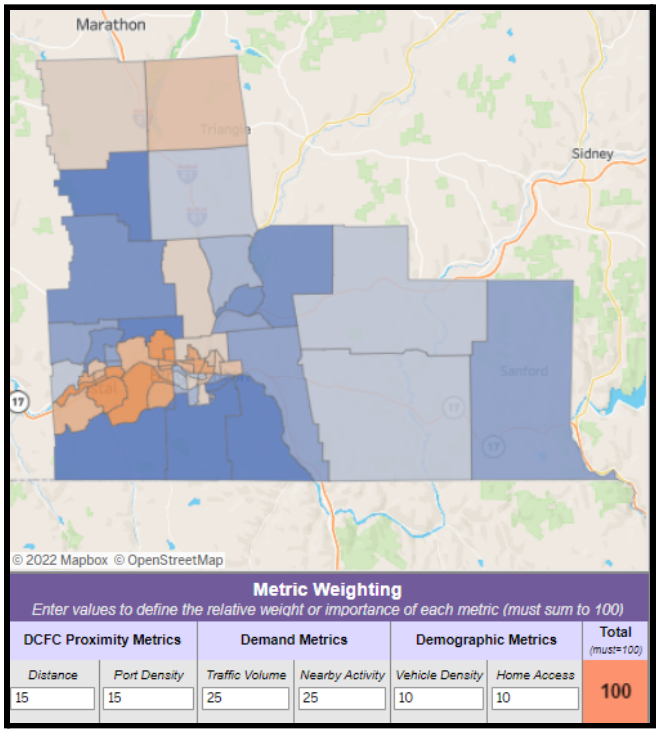

Figure 4.1.1 Balanced metric weighting with focus on demand

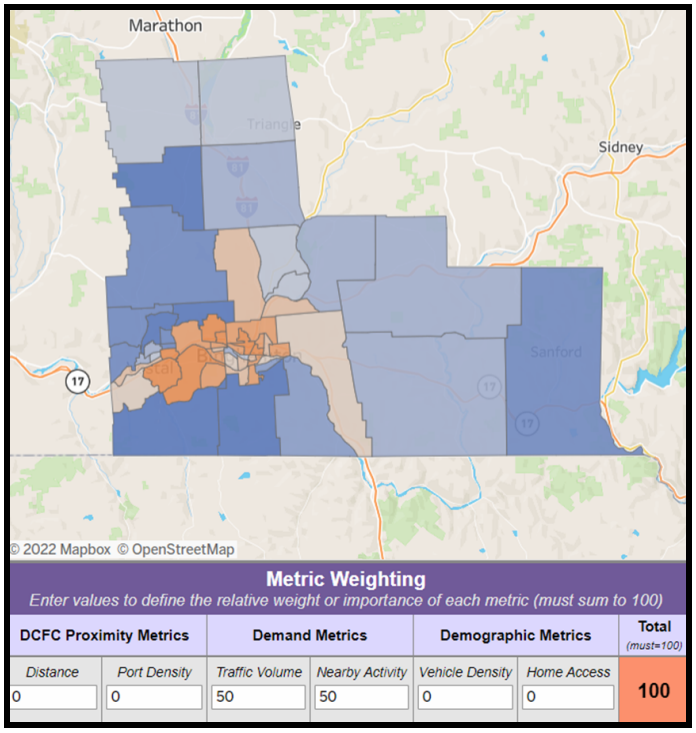

Figure 4.1.2 Metric weighting with focus only in demand

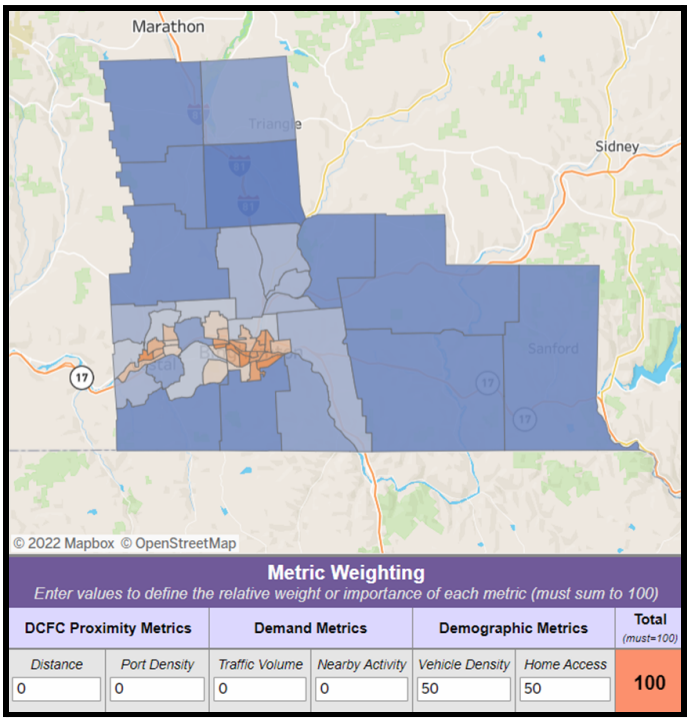

Figure 4.1.3 Metric weighting with focus only in demographics

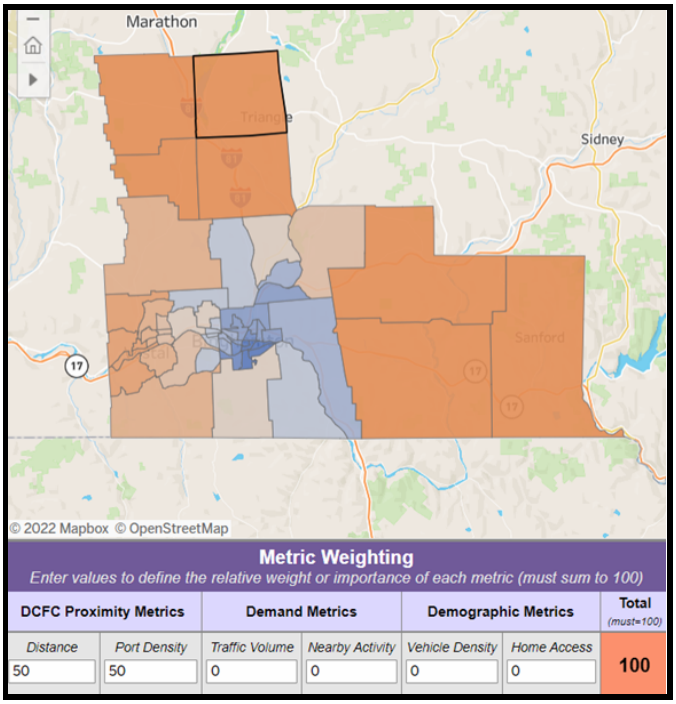

Figure 4.1.4 Metric weighting with focus only in DCFC Proximity Metrics

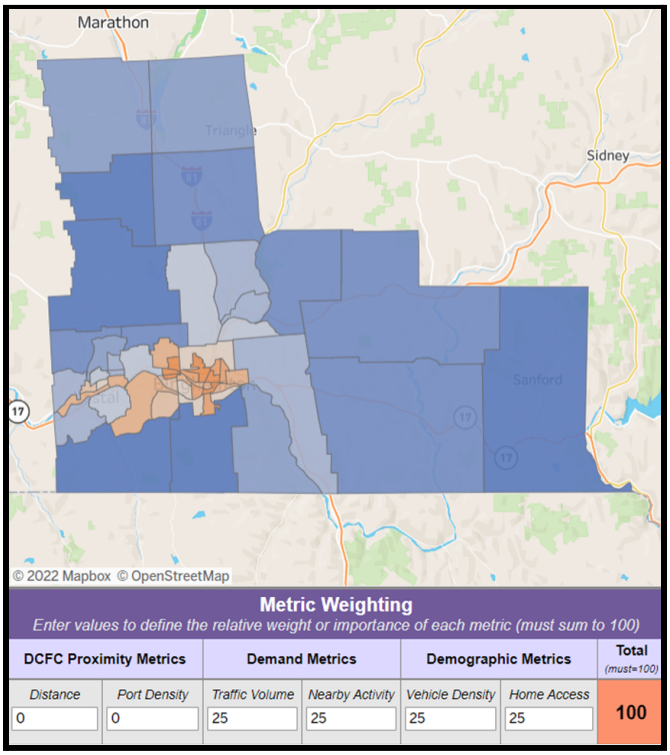

Figure 4.1.5 Balanced metric weighting between demand and demographics

The collected data in the form of location details was used to evaluate how good a location was for an EV charging point in the context of Broome County's needs. This was done through the Site Suitability Tool. The results for sites we evaluated using this tool are shown in the following figures.

The first location was the Cornell Cooperative Extension of Broome County, and provided below is the site evaluation for the location.

Cornell Cooperative Extension of Broome County		
2. Does Broome County own, is it a public or private parking lot where the EV charging station will be installed?	Private	0
3. Does Broome County either own or lease the building where electricity will be drawn for the EV charging station?	No	0
4. What is the predominant land use for the EV charging station site?	Institutional	2
5. Which venue best describes the proposed EV charging station location?	Educational Services	2
6. How long do drivers typically park their vehicles at this location?	2 - 4 hours	2
7. Is this location used for any special event parking?	Yes	2
7B. Approximately how many special events per year?	50 - 100	1
8. How far is this location from a busy road used to travel between cities (typically an interstate, US highway, or State route)?	On a State Road	2
9. Which potential EV drivers are expected to use the charging station?	All	2
10. Would an EV driver require a permit, sticker, or card to access the parking lot where the charging station is located?	Ask Susan	2
11. Is there a fee to access the parking lot where the charging station would be located or would there be a fee to use the charging station?	Only a fee to use charging station	1
12. Would the charging station be located in a parking lot or garage with limited hours of operation?	No	2
13. How many parking spaces are in the lot or garage?	75 - 125	2
14. Typically, how full is the parking lot or garage?	75%	2
15. Is there fluctuation in parking lot use by season?	Minimal fluctuation	2
16. Is there fluctuation in parking lot use by day of the week?	A lot of fluctuation	2
17. Would the EV charging station be mounted on the wall of a building where the cord could run to the EV and not interfere with a pedestrian walkway?	Yes	2
18. Is the parking lot paved?	Yes	2
19. Is the parking lot prone to flooding or other events that might damage a charging station or plugged-in EV?	No	2
20. Would the EV charging station be located in a covered parking space?	No	0
21. Would the EV charging station need to be placed where it would obstruct plowing or in a location where snow is stored in the winter?	No	2
22. Would the EV charging station be in a preferred parking space?	Yes	2
23. Are there lights illuminating the parking lot at night?	Yes	2
24. Would the EV charging station and parking space be visible from the road or entrance to the parking lot or garage?	Yes	2
25. Does the existing electrical panel have 4 extra slots and 80 amps of available capacity for a dual port Level 2 charging station?	N/A	
26. How recently has major electrical work been performed at this location?	N/A	
27. How far is the electrical panel from the point of the building closest to where the charging station would be located?	N/A	
Highest Scoring Answer / Lowest Scoring Answer / Mid-range Scoring Answer		1.67

Figure 4.1.6 Site Suitability Tool Analysis for Cornell Cooperative Extension of Broome County

The second location chosen was the parking lot across from State Theatre, which is located in Deposit, New York. Provided below is the site evaluation.

Parking Lot Accross from State Theatre (Deposit, NY)		
2. Does Broome County own, is it a public or private parking lot where the EV charging station will be installed?	Public	2
3. Does Broome County either own or lease the building where electricity will be drawn for the EV charging station?	N/A	
4. What is the predominant land use for the EV charging station site?	Parking Lot	2
5. Which venue best describes the proposed EV charging station location?	Resturant/Theater Parking Lot	2
6. How long do drivers typically park their vehicles at this location?	30 min - 3 hours	2
7. Is this location used for any special event parking?	Potentially	1
7B. Approximately how many special events per year?	Not Many	0
8. How far is this location from a busy road used to travel between cities (typically an interstate, US highway, or State route)?	Directly off major state highway	2
9. Which potential EV drivers are expected to use the charging station?	All	2
10. Would an EV driver require a permit, sticker, or card to access the parking lot where the charging station is located?	No	2
11. Is there a fee to access the parking lot where the charging station would be located or would there be a fee to use the charging station?	Pontential fee to use charger	1
12. Would the charging station be located in a parking lot or garage with limited hours of operation?	No	2
13. How many parking spaces are in the lot or garage?	25 - 40	2
14. Typically, how full is the parking lot or garage?	15%	2
15. Is there fluctuation in parking lot use by season?	Minimal fluctuation	2
16. Is there fluctuation in parking lot use by day of the week?	Minimal fluctuation	2
17. Would the EV charging station be mounted on the wall of a building where the cord could run to the EV and not interfere with a pedestrian walkway?	Not on a wall, but not crossing a walkway	1
18. Is the parking lot paved?	Yes	2
19. Is the parking lot prone to flooding or other events that might damage a charging station or plugged-in EV?	No	2
20. Would the EV charging station be located in a covered parking space?	No	0
21. Would the EV charging station need to be placed where it would obstruct plowing or in a location where snow is stored in the winter?	No	2
22. Would the EV charging station be in a preferred parking space?	Yes	2
23. Are there lights illuminating the parking lot at night?	Yes	2
24. Would the EV charging station and parking space be visible from the road or entrance to the parking lot or garage?	Yes	2
25. Does the existing electrical panel have 4 extra slots and 80 amps of available capacity for a dual port Level 2 charging station?	N/A	
26. How recently has major electrical work been performed at this location?	N/A	
27. How far is the electrical panel from the point of the building closest to where the charging station would be located?	N/A	
Highest Scoring Answer / Lowest Scoring Answer / Mid-range Scoring Answer		1.70

Figure 4.1.7 Site Suitability Tool Analysis for Parking Lot Across from State Theatre

The third location chosen was the Mobil Gas Station by Route 82 located in Whitney Point, New York. Provided below is the site evaluation.

Mobil Gas Station Route 81		
2. Does Broome County own, is it a public or private parking lot where the EV charging station will be installed?	Private	0
3. Does Broome County either own or lease the building where electricity will be drawn for the EV charging station?	No	0
4. What is the predominant land use for the EV charging station site?	Business	2
5. Which venue best describes the proposed EV charging station location?	Gas Station	2
6. How long do drivers typically park their vehicles at this location?	10-15 minutes	0
7. Is this location used for any special event parking?	No	0
7B. Approximately how many special events per year?	0	0
8. How far is this location from a busy road used to travel between cities (typically an interstate, US highway, or State route)?	1-2 miles	1
9. Which potential EV drivers are expected to use the charging station?	All	2
10. Would an EV driver require a permit, sticker, or card to access the parking lot where the charging station is located?	No	2
11. Is there a fee to access the parking lot where the charging station would be located or would there be a fee to use the charging station?	No	2
12. Would the charging station be located in a parking lot or garage with limited hours of operation?	No	2
13. How many parking spaces are in the lot or garage?	Fewer than 10	0
14. Typically, how full is the parking lot or garage?	50%	2
15. Is there fluctuation in parking lot use by season?	Minimal fluctuation	2
16. Is there fluctuation in parking lot use by day of the week?	Minimal fluctuation	2
17. Would the EV charging station be mounted on the wall of a building where the cord could run to the EV and not interfere with a pedestrian walkway?	Yes	2
18. Is the parking lot paved?	Yes	2
19. Is the parking lot prone to flooding or other events that might damage a charging station or plugged-in EV?	No	2
20. Would the EV charging station be located in a covered parking space?	No	0
21. Would the EV charging station need to be placed where it would obstruct plowing or in a location where snow is stored in the winter?	No	2
22. Would the EV charging station be in a preferred parking space?	Yes	2
23. Are there lights illuminating the parking lot at night?	Yes	2
24. Would the EV charging station and parking space be visible from the road or entrance to the parking lot or garage?	Yes	2
25. Does the existing electrical panel have 4 extra slots and 80 amps of available capacity for a dual port Level 2 charging station?	N/A	
26. How recently has major electrical work been performed at this location?	N/A	
27. How far is the electrical panel from the point of the building closest to where the charging station would be located?	N/A	
Highest Scoring Answer / Lowest Scoring Answer / Mid-range Scoring Answer		1.375

Figure 4.1.8 Site Suitability Tool Analysis for Mobil Gas Station at Whitney Point

4.2 Analysis and Verification

The analysis of the data is briefly described in the above section, however there is a more in depth review of the methods and analysis in our Technical Report. We used the map data from the E-Drive Tool and the questionnaire values from the Suite Suitability Tool to determine the optimal locations for EV charging points in this project. To Verify this data was accurate we cross referenced sources, did multiple iterations of data collection and analysis, and used our knowledge of engineering and the Broome County area to ensure the data was accurate.

4.3 Results

Through our technical analysis and study of what makes an ideal EV charging point location, we determined seven optimal locations to use in our infrastructure plan. The optimal locations chosen were as follows: Oakdale Mall, Town Square Mall, Vestal High School, Binghamton University, State Theater in Deposit, New York, Broome County Regional Farmers Market, and Mobil Gas Station in Whitney Point, New York

5. DELIVERABLES

The main deliverables of the project are as follows: An infrastructure plan, a website, and a brochure. The infrastructure plan, as discussed previously, is a list of optimal locations for electric vehicle charging points in Broome County. This plan is supported by the optimality studies we did on each of the suggested locations. The website (Figures 5.1-5.3) is a conglomerate of all the research we did on the procurement and installation process of EV chargers. This site will serve as an easy to access, one-stop source for those interested in getting an EV charger. They will be able to learn about EV charging, how to get one, and what resources are available in that process. The brochure (Figure 5.4 and Figure 5.5) serves as a physical, condensed version of the information on the website. Having a physical resource makes the information more accessible and allows for more channels of distribution.

The following images (Figures 5.1-5.3) are some of the sections of the website design. These are not full sections, but rather parts to show the format and information layout of the site. The rest of the website design is contained in a document accessible by Broome County and our team.

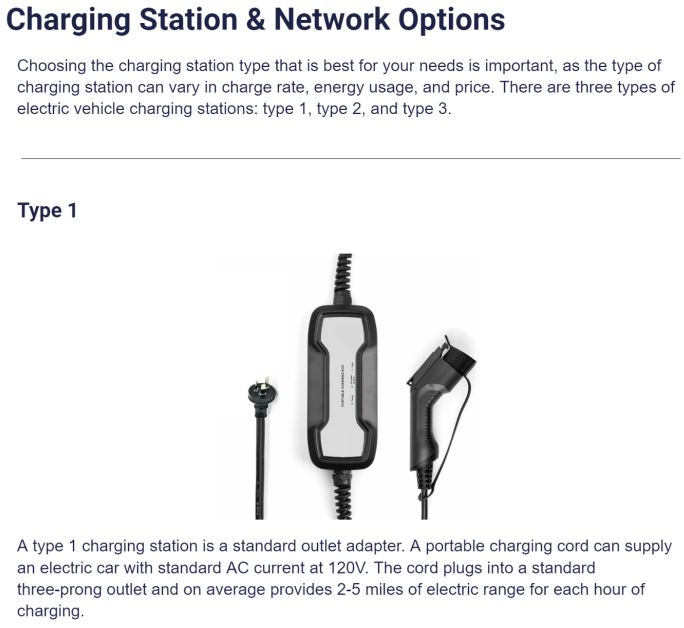

Figure 5.1 Website Charging Station & Network Options section

Charging Adaptor Options

NEMA 14-50

ClipperCreek HCS-40 Electric car charging station (EVSE)

- Manufacturer: ClipperCreek
- Price: $589 + $36 shipping with plug ($565 + $36 shipping hardwire)
- Rating: 4.9 out of 5 Stars (Amazon)
- Power: 7.7 KW (32 Amp)
- Cord Length: 25 feet
- Enclosure: NEMA 4
- Plug: 14-50
- Warranty: 3 year
- Size: 19.7"H x 9"W x 5.3"D

ChargePoint Home 25

- Manufacturer: ChargePoint
- Price: $749 Plug-in ($699 hardwire)
- Rating: 4.6 out of 5 Stars (Amazon)
- Power: 7.7 KW (32 Amp)
- Cord Length: 25 feet (18 feet is $50 less)
- Enclosure: NEMA 3R
- Plug: 6-50
- Warranty: 3 years
- Size: 11.2"H × 7"W x 4.5"D

Figure 5.2 Website Charging Adaptor Options section

Incentives Available

New York State provides a wide range of incentives for those looking to offset the cost of purchasing an electric vehicle charging station. Before purchasing an EV charging station, account for the savings these incentives can provide and find any that could be applied to your purchase.

Utility EV Make-Ready Programs

Through this program, entities seeking to install or participate in the installation of L2 and/or DCFC chargers can earn incentives that will offset a large portion of, or in some cases, all of the infrastructure costs associated with preparing a site for EV charger installation.

Utility EV Program Website: https://jointutilitiesofny.org/ev/make-ready

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Figure 5.3 Website Incentives Available section

The following two images (Figure 5.4 and Figure 5.5) show the brochure print out.

Figure 5.4 Electric Vehicle Charging Point Solution Brochure front

Electric Vehicle Charging Station Types

Type 1

A type 1 charging station is a standard outlet adapter. A portable charging cord can supply an electric car with standard AC current at 120V. The cord plugs into a standard three-prong outlet and on average provides 2-5 miles of electric range for each hour of charging.

Type 2

Supplies an electric vehicle with a higher voltage than a type 1 charging station can. 208-240V is supplied as alternating current to the electric car using a standardized connector that works for all cars. A type 2 charging station provides approximately 20 miles of range per hour charged.

Type 3

The fastest charging and most expensive out of all three station types. Type 3 charging stations, known as direct current fast chargers (DCFC), require 3-phase power and up to 500V to provide 50-400kW of charging power. A type 3 DCFC charger can provide over 100 miles of range to an electric vehicle in an hour of charging.

15 Aspects of An Ideal Location

1. Proximity to electrical box/outlet
2. Proximity to activities nearby
3. Plenty of parking spots
4. Proximity to electric vehicles
5. Drivers willing to spend time at location
6. Near busy roads/highways
7. Public access to charging stations
8. Consistent use of parking space
9. Ability to charge without interfering with pedestrians
10. Weather-proofing
11. EV-preferred parking
12. Illumination at night
13. Visibility from road/lot entrance
14. Pre-existing electrical outlets
15. Up-to-date electrical work

For More Info & Resource Check Out Our Website:

www.to be added.com

Incentives Available

Utility EV Make-Ready Programs

Through this program, entities seeking to install or participate in the installation of L2 and/or DCFC chargers can earn incentives that will offset a large portion of, or in some cases, all of the infrastructure costs associated with preparing a site for EV charger installation.

NYS Tax Credit for Public and Workspace Charging

New York State provides an income tax credit of up to $5,000 for the purchase and installation of an electric vehicle charging station. The credit is targeted at commercial and workplace charging stations. The tax credit is available through the end of 2025.

NYSDEC Municipal Rebate Program

The Municipal ZEV rebate program provides rebates for costs associated with the purchase or lease (for at least 36 months) of eligible clean vehicles, and installation of eligible infrastructure that supports public use of clean vehicles

Links + Additional Incentive on Website:

www.to be added.com

Broome County Transportation & Environment Management Council

Primary Business Address
Address Line 2
Address Line 3
Address Line 4

Phone: 555-555-5555
Fax: 555-555-5555
Email: someone@example.com

Figure 5.4 Electric Vehicle Charging Point Solution Brochure back

6. CONCLUSIONS

At the culmination of the project, a lot of work had been done and completed to the best ability possible. Between the research, meetings, outreach, and various help acquired, a proper and expert-level product has been pulled together. The work of our team and associates resulted in many achievements that will have a positive impact. A website that will be utilized by the Environmental Management Council of Broome County and the extended county government has been designed. A matching brochure to be handed out as physical copies was made from scratch and taken by the county legislature to be used for future projects. The website was a culmination of the months of research done surrounding electric vehicle charging points and any and all information pertaining to them. Within the website is relevant information regarding acquiring, owning, installing, maintaining, and upkeeping electric vehicle charging points. From price, to outcome, to local installers, all possible information one could need can be found on the site. The brochure is a miniature version of the website; it contains a summary of the more pertinent information, pointing back to the website for an expansion upon the information presented.

This work is significant as it sets Broome County on a clearer track towards being a sustainable area. Through making EV charging information easier to access and understand, electric vehicles and charging station ownership should increase. Given that EV ownership is growing, having a plan for the development of EV charging infrastructure puts Broome County in a good place.

7. RETROSPECTIVE

Knowing what we know now, there are a number of things that we would have done differently. Starting off the project, we were not introduced to a clear “engineering aspect” to be worked on. This is because it was not stated in the project description and the project beneficiaries did not know much about the class associated with the project. If we had been made aware of the situation earlier, then we would have had more time to experiment with different types of calculations for more optimal locations of charging stations in Broome County. We had spent a great deal of time wondering how to incorporate an “engineering aspect” to our project and it was not until nearing the final weeks that we decided on what it was going to be. Another problem that we had encountered was the communication, or lack thereof, between our project leads and the rest of the team. Moving forward, our team would make more strides to reach out and pester the project leads for available meeting times.

8. ACKNOWLEDGEMENTS

This project could not have been done without the help of our advisors Adam Flint and Susan Ryan, who were able to meet with us on a bi-weekly basis. Joseph Kovar was also crucial to the development of this project, aiding us in communicating with the advisors and keeping us on track. The environmental team that lent us a helping hand with all their resources, and the internet of things that we found, including the E-Drive tool, aided us a generous amount. When we were unsure of how to approach the project, Professor Chung was also there to assist and steer us in the right direction in working with optimality. We would also like to thank Professor Mark Poliks. He greatly helped us direct our research and planning efforts. Without his guidance and helping us step out of our comfort zone in terms of communication and engineering thinking, we would not have decided to use the E-Drive tool like we did, nor would we have applied the Site Suitability Tool to the locations that we had chosen.

9. APPENDIX

ISE 492 was instrumental in the creation and implementation of our project. The weekly meetings held us accountable as we needed to discuss our work and show progress. Professor Poliks pushed us to do better in all aspects of the project, which was at times stressful, but still appreciated. Some improvements that we would like to suggest is to hold more mandatory classes that focus on team building and to make announcements regarding the following week earlier. The ISE 491 class was also very enjoyable and there was a lot to learn from that class. However, since the classes were not mandatory, students and their respective teams were not incentivized to go. This resulted in some team members not attending during the first steps of team creation due to a lack of incentive.

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