Allocating Bicycle Parking Locations in the University Campus

Nick Bevilacqua, Bryce Brown, Jessenia Cossio, Will Gaccione

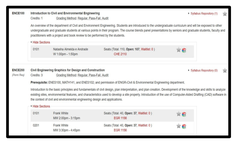
TEAM CEE-8

CIVIL AND ENVIRONMENTAL ENGINEERING DEPARTMENT

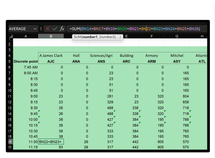
A. JAMES CLARK SCHOOL OF ENGINEERING

Optimization Methodology

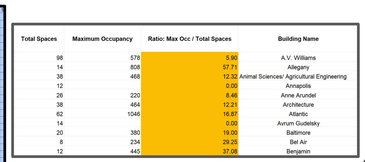
We created a code that runs through Testudo class data. An automated program runs through all disciplines in the Testudo Schedule of Classes Page. For each class code, there is a list of all classes offered. Our program runs through all of these classes, which are delegated to be in a specific building at a specific time. We compiled all this information into a large excel spreadsheet. The columns represent buildings that hold classes. The rows are time blocks. Together, we are able to view an estimate of how many students are registered to be in each academic building on campus, and at what time.



The table in light blue shows this original information our code output.The table in green shows manipulated data. The light green spreadsheet breaks all class data into 15 minute time blocks. We can then determine the maximum amount of people that will be in each building, at precisely what time. From there, Maximum Occupancy-to-existing capacity ratios are calculated (in orange).



Start/End Time	A. James Clark A/C	Hall ANA
7:45am - 9:00am		
8:00am - 9:15am		
8:00am - 8:50am		
8:00am - 10:00am		
8:30am - 9:20am		
9:00am - 9:50am	23	
9:00am - 10:50am		
9:00am - 11:50am		
9:30am - 10:20am		
9:30am - 10:45am	3	
9:30am - 12:10pm		
10:00am - 10:50am	35	
10:00am - 11:50am		
10:00am - 12:30pm		
10:30am - 12:30pm		
11:00am - 11:50am	25	
11:00am - 12:15pm	40	26
11:00am - 12:50pm	28	
11:00am - 1:00pm		
11:00am - 1:50pm		

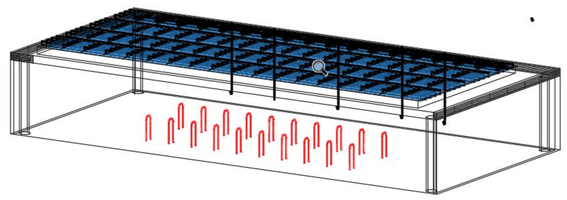


Total Spaces	Maximum Occupancy	Ratio: Max Occ / Total Spaces	Building Name
98	578	5.90	A.V. Williams
14	808	57.71	Allegany
38	468	12.32	Animal Sciences/ Agricultural Engineering
12		0.00	Annapolis
26	220	8.46	Anne Arundel
38	464	12.21	Architecture
62	1046	16.87	Atlantic
14		0.00	Avrum Gudelsky
20	380	19.00	Baltimore
8	234	29.25	Bel Air
12	445	37.08	Benjamin

Introduction & Project Scope

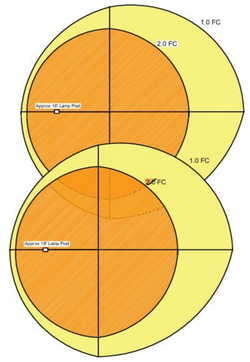
The project "Allocating Bicycle Parking Locations in the University Campus" is a comprehensive initiative to address the growing demand for safe, secure, and accessible bicycle parking facilities within the university campus. This initiative is especially pertinent, because as the population of students and faculty grows, so does the reliance on sustainable micro-mobility transportation. Specific improvements include quantifiable safety, security, and convenience combined with newly proposed parking stations for various forms of micro-mobility from electronic bicycles to scooters. A high-demand parking location will even have a charging station powered by renewable solar energy. Utilizing the University Registrar and Student Data, we have have determined the most efficient locations for parking expansion, to benefit as many people on campus as possible. We hope to provide a comprehensive solution to micro-mobility infrastructure on campus for the sustainable future.

Prototype Solar Parking Station



Charging Station 3D CAD Rendering - McKeldin Library

Safety Improvements

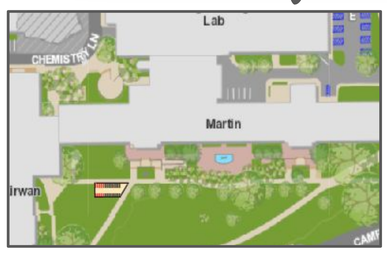


Pedestrian Walkways	Commercial		Intermediate		Residential	
	Footcandle	Lux	Footcandle	Lux	Footcandle	Lux
Sidewalks (and Shared Use Paths within the Roadway ROW)*	0.9	10	0.6	6	0.2	2
Pedestrian Walks (and Shared Use Paths within a separate ROW)	2.0	22	1.0	11	0.5	5
Building Sites:						
Entrances	5.0	55				
Grounds	1.0	11				
Parking Areas:						
Self Parking	1.0	11				
Attendant Parking	2.0	22				

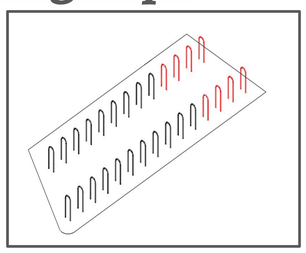
Values are given in minimum Average maintained horizontal footcandles and lux.

AutoCad drawn isolux curve for the standard exterior lighting that exists on campus. These represent the emitted lighting from each of the existing lamp posts, hand measured and read by our group. These drawings are overlaid to the designated locations where parking will be expanded. Curves will then indicate where lighting is inadequate based on Maryland codes and regulations, which in turn will indicate need for additional lighting.

Micro Mobility Parking Expansion

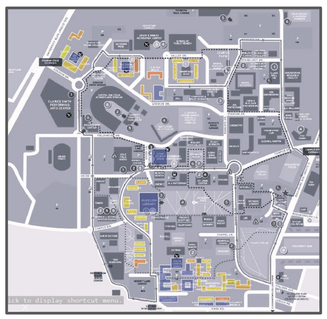


2D Campus Map with Expanded Parking Locations



Rendering of Existing Parking (Black) & Expansion (red)

Heat Map of Campus Parking



Residential Map

Academic Map

Buildings that are the most Red have the largest discrepancy between existing micro mobility parking and expected demand. Using this method we have selected: **Armory/Mitchell Building, Charles Hall, Garrett Hall, Kim Engineering, La Plata Hall, Martin Hall, Oakland Hall, Prince Frederick Hall, Pyon-Chen Hall, Tawes Hall, Taliaferro Hall, Van Munching Hall** as locations for expanding parking.

Signage Improvements

Expanded Signage Around UMD Campus

Student Survey Results