WATERLOO
ENGINEERING

Consulting Engineering Design Problem

Fall 2011

Waterloo Engineering Competition

November 4-5

General Rules & Guidelines

1. All communication devices must be turned off.
2. Competitors will be allowed to use:
    a. Computers, USB keys, CDs, pre-existing files etc.
    b. Internet
    c. Reference books

    All other tools must be cleared with the competition coordinator before use. Cell phones, BlackBerrys, online communication (e.g. MSN, GoogleChat, Skype) or other communication devices are prohibited.

    Violation of these rules may result in disqualification.
3. Visitors are not allowed throughout the development and build stage.
4. Keep work stations clean. Clean up at the end.

Schedule

The schedule for Consulting Engineering is as follows:

Friday, November 4	5:15 p.m. – 5:30 p.m.	Check-In	DWE 2527
	5:30 p.m. – 6:00 p.m.	Welcome/Briefing	DWE 2527
	6:00 p.m. – 12:00 a.m.	Design	Various Assigned Classrooms
	12:00 a.m. – 12:15 a.m.	Submissions/Debriefing	DWE 2527
Saturday, November 5	8:00 a.m. – 8:30 a.m.	Check-In	RCH 2nd Floor Lobby
	8:30 a.m. – 12:30 p.m.	Presentation/Demonstration	RCH 103
	12:30 p.m. –1:00 p.m.	Prizes and Winner Announcements	RCH 103

Food will be available between 8:30 to 9:30 p.m. Drinks will be available when the food arrives but Competitors are encouraged to bring water bottles as bottled water will not be provided. There will be water fountains nearby for refills.

Please remind the competition coordinators and volunteers of your dietary restrictions and/or allergies.

There will be a question period after the problem is presented during the briefing session. No questions will be answered during the development and build stage to ensure fairness in the competition.

Background

UW Parking is expected to make some difficult decisions in the years ahead. Though 6000 total spaces (visitor, student, and faculty and staff) currently exist [1], demand is expected to outstrip supply before 2020 [2]. There is currently 7,000,000 square feet of campus space, and it is anticipated to grow to 9,000,000 by 2030 [1].It should be noted that much of this expansion is expected to take place outside of the traditional ring road area. See Appendix for the number of spaces by lot. See the Campus Master Plan, South Campus A for more detailed projections.

According to the campus plan, a strategy is needed to reduce parking needs [2]. Transportation Demand Management is expected to mitigate this demand, in addition to generating at least some of the revenue for future parking structures and the visual impact of large parking lots is to be discouraged.

Full-time Transportation Options

Faculty/Staff Parking	Adult Bus Pass	Student Unreserved parking pass	Student Residence parking pass	Student Bus Pass
$36/month	$64/month	$158/term	$140/term	$49.75/term (included, non-refundable)

- 10 AM and 2 PM tend to be the busiest times in campus parking lots.
- Tuesday, Wednesday and Thursday are the busiest days of the week.
- Over 1600 student spots available (in C, N, W and X)
- 2100 currently issued student parking passes, first-come, first-served
- X, J, S, V and UWP mainly for residents with staff overflow and extra student pass spots

UW Parking staff determine ad hoc, each term, based on the general emptiness of the lots how many student passes can be issued, to a maximum of 2500. There is usually still a waiting list. Despite surplus space at some of the more distant lots, some lots are frequently full during peak periods and students who attempt to park there must find an alternative lot. Though WatPark (see Resources) currently displays the status of Lot C, the status of all other lots is available only by checking the sign located at the lot, which is electronically monitored to indicate full when the net number of cars entered equals the number of spaces.

Visitor Parking

Visitor parking rates were raised for the first time in over a decade this September; comparable markets in KW and at other universities range from $8-$12 per day. Certain premium lots charge $2/hour

Month	Cost/Day	Total Revenue
September 2010	$3	$13,069
September 2011	$5	$13,720

UW Parking Services Financials

In its current state, UW Parking Services takes in enough income to cover its labour expenses and basic upkeep. UW Parking services does not benefit from parking violation revenues. This income (exceeding $100,000/year) is used for scholarships and bursaries. A new surface spot is estimated to cost $2500-$4000/space, whereas a structure can run $32,000-$40,000/space. If monies were available, top priorities, according to Sharon Rumpel, Manager of Parking Services, include: capital purchases of equipment, repairing infrastructure, enhanced signage and more advanced gating systems (eg. RFID tags with transponders, as opposed to the current card readers).

Miscellaneous

UW Parking currently has the authority to replace 'lost' spaces (ie. Parking spaces built over by buildings), but not to create 'new' spaces. However, it is not clear where lost spaces could be developed. There is currently a carpooling program at the University of Waterloo [1]. 15 permits have currently been issued.

Problem Statement

Your group has been hired by the University Of Waterloo Board Of Governors to prepare a report on the parking situation at the University of Waterloo. It should define both the quantitative (**eg.** number of spaces, cost) and qualitative (**eg.** convenience, equity) needs and concerns. It should dictate how best to achieve these objectives, in the short (<2 years), medium (5-10 years) and long-term (several decades).

Think carefully about your stakeholders. While the campus master plan (including Transportation Demand Management) is not inviolate, think of who would need to be convinced to make changes. What stakeholders are important to key decision-makers in the University? If you do decide to continue existing policies, rather than generate your own solutions, there will be a greater onus to justify and elaborate on the details and implementation of the plan.

Assume the Regional Rapid Transit Proposal will not be reversed, though the exact route locations and corresponding express bus routes are not yet finalized. While the University of Waterloo has contracted you, the University need not necessarily be responsible for implementation of all aspects of your solution. However, you will have to justify how the University could influence, lobby or spend to achieve the proposed course(s) of action.

Some Guidance

Go here: http://wec.uwaterloo.ca/consulting_engineering.html to see how you will be judged ("Marking Scheme") and what you're supposed to be doing ("Deliverables").

It is highly recommended (as the marking scheme shows) to use a structured engineering design method to form the outline of the report and presentation.

Some questions that can get you started (but that do not necessarily have to be answered word-for-word; they are just meant to help you address the problem statement):

- What is the current plan?
- What are some drawbacks to the current plan?
- Who is affected?
- What are the various transportation options?
- What incentives are at play?
- What behaviours need to change?
- What technologies or capital investments must be made?
- How do we measure success?
- What does an ideal solution look like?

Resources

WatPark http://opendata.uwaterloo.ca/parking/home/

Campus Map http://uwaterloo.ca/map/

References

[1] UW Parking Services http://parking.uwaterloo.ca/

[2] Campus Master Plan http://plantoperations.uwaterloo.ca/cmp/cmp.php

area in Acres.

Parking Lot Inventory March 2010

Campus Lots

Number	Parking Lot Name	Regular Spaces	Disabled Spaces	Other Spaces	Total Spaces	Paved Area	Island Area	Total Area	Chargeable Area
P01	A	633	3	0	636	5.100	0.250	5.350	5.100
P02	B	188	4	0	192	2.950	0.080	3.030	2.950
P03	Bauer Warehouse	21	0	0	21	0.270	0.000	0.270	0.270
P04	Brubacher House	18	0	0	18	0.200	0.000	0.200	0.200
P05	C	807	2	0	809	6.390	0.340	6.730	6.390
P06	CL Playing Fields	61	0	0	61	0.380	0.000	0.380	0.380
P07	Columbia Greenhouse	15	0	0	15	0.250	0.000	0.250	0.250
P08	CLV - North	309	0	0	309	2.840	0.060	2.900	2.840
P09	CLV - S / Visitor	161	1	0	162	1.500	0.170	1.670	1.500
P10	D	15	6	11	32	0.340	0.000	0.340	0.340
P11	E	67	0	0	67	0.580	0.000	0.580	0.580
P12	ECEC (PAS)	20	0	0	20	0.140	0.000	0.140	0.140
P13	ECH Gravel	95	0	0	95	0.738	0.005	0.743	0.738
P14	H1	200	2	0	202	1.240	0.010	1.250	1.240
P15	H - Visitors	70	0	0	70	0.530	0.000	0.530	0.530
P16	Health Services Staff	23	0	0	23	0.076	0.000	0.076	0.076
P17	Hildegard Marsden	50	0	0	50	0.430	0.000	0.430	0.430
P18	J	67	0	0	67	0.460	0.000	0.460	0.460
P19	K	91	0	0	91	0.650	0.000	0.650	0.650
P20	L	203	3	0	206	1.370	0.030	1.400	1.370
P21	M	166	2	0	168	1.420	0.030	1.450	1.420
P22	N	252	0	0	252	1.844	0.002	1.846	1.844
P23	O Visitor	69	0	0	69	1.100	0.000	1.100	1.100
P24	O	146	0	0	146	0.530	0.000	0.530	0.530
P25	R	139	0	0	139	0.886	0.002	0.888	0.886
P26	RAC	152	4	0	156	1.430	0.030	1.460	1.430
P27	S	75	0	0	75	0.550	0.000	0.550	0.550
P28	T	89	0	0	89	0.602	0.002	0.604	0.602
P29	Tutors Houses	13	0	0	13	0.046	0.000	0.046	0.046
P30	University Club	46	2	0	48	0.440	0.000	0.440	0.440
P31	UWP	611	8	2	621	5.640	0.050	5.690	4.321
P32	V	74	0	0	74	0.560	0.000	0.560	0.560
P33	W	189	0	0	189	1.274	0.004	1.278	1.274
P34	X	627	0	0	627	4.883	0.004	4.887	4.883
P35	Health Sciences Campus	226			226	1.670	0.030	1.700	1.670
	Total	5988	37	13	6038	49.309	1.099	50.408	47.990

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