Dalhousie University

TRANSPORTATION DEMAND MANAGEMENT PLAN FOR DALHOUSIE UNIVERSITY

TECHNICAL APPENDIX

NOVEMBER 2011

TABLE OF CONTENTS

TABLE OF CONTENTS (CONT'D)

List of Exhibits

1. Introduction

This report contains technical review and analysis related to the Dalhousie University Transportation Demand Management Plan. This report is intended to be a companion document to the Dalhousie University Transportation Demand Management Plan and contains the following sections:

- Parking: a description of existing conditions and a needs assessment
- Active Transportation: a description of existing conditions and a needs assessment
- Shuttle Bus Assessment

2. Existing Parking Conditions

While the majority of students and employees travelling to and from the University do so by walking, cycling, and taking transit, provision of parking remains a key service provided by the University for employees, students and visitors. The nature of the provision and operation of parking at Dalhousie is summarized in the following section.

2.1 Existing Parking Supply and Operations

The University community currently includes over 16,000 students, 1012 academic staff (as of 2009), and 3,100 support staff (staff numbers are full-time only). The University's Facility Management Division manages over 2,000 parking spaces across the three campuses.

In general, parking is operated on a permit basis, with only 4% of the total parking supply operated by parking meters for those who wish to park on a casual basis. The vast majority of parking spaces are available to those who have purchased a general unreserved parking permit (62% of parking spaces), although the general parking permits are oversold by approximately 30%, which results in occasions where all parking spaces are full and some permit holders are unable to park. Based on numbers supplied by Dalhousie staff, in 2009-2010 there were 1,731 general permits sold for 1,269 parking spaces.

The next largest group of parking spaces are only available to those who have purchased a reserved parking permit (30%) that guarantees a specific parking space. Reserved parking spaces are assigned to a specific vehicle and are signed accordingly. Reserved parking permits are not oversold. The remainder of the parking supply is designated for Ride Share parking, accessible parking and motorcycle parking. With the exception of the parking garages, all permit parking is operated without gate controls.

The number of parking spaces per campus is summarized below for each campus. Full details of the names of the lots and the number and types of parking available across the three campuses can be found as Appendix A 1.

Studley Campus – home to the vast majority of programs at the University and has the highest concentration of parking spaces. Studley campus is home to approximately 1415 (over 60%) of the University's total parking spaces.

The majority of parking at the Studley Campus (nearly 90% of the total) is designated for permit parking with approximately 25% of those spaces being reserved permits that are only available for a single vehicle.

Carleton Campus – approximately 215 parking spaces are available at this campus, the fewest across the three campuses.

Sexton Campus – several parking lots are available on this campus offering approximately 460 parking spaces.

Until recently, parking permits were issued by campus and only valid for the campus for which they were issued. In March 2011, the Transportation and Security Committee voted to proceed with merging the three previously separate campus permits into a single unified permit. Implementation of the unified parking permits is planned for the next academic year starting in September 2011.

Parking enforcement is currently carried out by Dalhousie, with Security Officers sworn in as special constables under the authority of Halifax Regional Municipality (HRM) to enforce parking regulations on Dalhousie property. Dalhousie officers issue HRM parking infraction tickets, which are then administered through the HRM ticket enforcement office. Dalhousie does not have any control over the enforcement and collection of fines, and does not receive any revenue from parking enforcement. Illegally parked vehicles are towed away after three tickets, or if the vehicle is parked in a reserved space or in a fire lane.

2.2 Parking Rates

Rates for permit parking for the 2010-2011 academic year are shown in Exhibit 2.1 below.

Exhibit 2.1: 2010-2011 Permit Parking Rates (including HST)

Permit Type	Rate	Monthly Equivalent
Faculty and Staff Annual (unreserved)	$249.84	$20.82
Student Annual (unreserved)	$224.70	$18.73
Motorcycle	$122.26	$10.19
Reserved Annual (Outdoors)	$557.44	$46.45
Ride Share (fee per user)	$185.81	$15.48
Reserved Annual (Tupper, Risley Hall and Fenwick Parkades)	$1362.10	$113.51
Reserved Annual (McCain Parkade and CSB Parkade – Levels 1,2 &3)	$1135.29	$94.61
Reserved Annual (CSB Parkade – Level 4 and Carleton Parking Lot)	$557.44	$46.45
Faculty and Staff Term (4 month)	$151.26	$37.82
Student Term (4 month)	$134.72	$33.68
Weekly	$43.25	$185.36*
Daily	$10.81	$324.30*

* Assuming 30 days per month

2.2.1 Parking Rates Comparison to Transit

The cost of a MetroTransit transit pass ranges from $70 for a standard MetroPass to $100 for a MetroX Pass. While students at Dalhousie have access to a U-Pass for the academic year, faculty and staff choosing to take transit instead of driving do so at a cost premium. Based on the cost of

unreserved outdoor parking at approximately $20 per month, buying a transit pass costs $50 per month or $600 per year more than parking a car on campus (excluding gas, maintenance and other costs of car ownership). Making the comparison to reserved indoor parking, at approximately $100 per month, purchasing a monthly transit pass would work out to be cheaper by approximately $30 per month of $360 per year.

It can be concluded that for the majority of parking permit holders, there is little to no financial incentive to travel to and from Dalhousie University by transit.

2.2.2 Comparison to Parking in Downtown Halifax

The costs of parking in downtown Halifax are not directly comparable to the cost of parking at Dalhousie University since the University is located more on the fringe of the downtown, but the comparison is still informative. The distance from the intersection of Robie Street and University Avenue to the intersection of Hollis Street and Prince Street is approximately 2km. The rates of parking at Dalhousie University were compared to the parking rates for structured parking as reported in the 2010 Central Business District Parking Rate Survey prepared by Colliers International.

The median monthly cost of structured parking in Downtown Halifax was reported as $158 per month. The lowest reported cost of parking was $152 per month. As noted above, the costs of parking in downtown Halifax are not directly comparable to the cost of parking at Dalhousie University, but the equivalent monthly cost of structured parking at Dalhousie (an average of approximately $100 per month) is approximately 70% of the reported cost of a parking space in the downtown area. Considering the distance from the CBD, the rates for indoor parking spaces at Dalhousie University are probably close to market value.

Monthly rates for parking lots in the area of the downtown close to the Sexton Campus are in the order of $120 per month, which compares to the rate of approximately $20 per month (or approximately $1 per weekday) for unreserved parking at Dalhousie. The rates for parking at the health facilities on University Avenue between Robie Street and South Park Street are in the order of $13.00 to $15.00 per day.

2.2.3 Comparison to other Universities

In addition to the review of market rates, a review of parking costs at other Canadian universities was carried out. Exhibit 2.2 summarizes the results.

Exhibit 2.2: Permit Parking Rates at other Universities (including taxes)

			Dalhousie University	University of New Brunswick	Queen's University	University of Ottawa	Acadia University	Université de Moncton	St. Francis Xavier University	University of Waterloo	McMaster University	University British Columbia (UBC)	University of Calgary	University of Alberta	University of Winnipeg	University of Manitoba	York University	University of Toronto	Ryerson University	McGill University
Long-Term Parking																				
Motorcycles			$122	-	-	$471				-	-	$363	-	$142	-	$252	$1,044.80	-	$94.75	-
Regular - Students	Annual (12 months)		$225	$205	$909 to $1,248	$1,260 to $1,870	$110.00	$103.00	$125 to $250	-	$540 to $1,164	-	-	$728 to $1,814	$882	$687	$1,045	$1,140 to $1,440	-	-
Regular - Faculty/Staff	Annual (12 months)		$250	$205	$909 to $1,248	$1,260 to $1,870	$110.00	$206.00	$125 to $250	$461.04	$540 to $1,164	$1,045	$948 to $1,524	$728 to $1,814	$1,197 to $1,638	$568	$1045 to $1,642	$1,323 to $1,980	-	$1,440 to $2,256
Reserved (designated space/stall)	Annual (12 months)	Low	$557	-	-					-	-	-	-	$1,368	-	-	-	$1,980	-	$1,440
		Medium	$1,135	-	-					-	-	-	-	$1,626	-	-	-	$2,079	-	$1,872
		High	$1,362	-	-					-	-	-	-	$2,238	-	-	-	$2,400	-	$2,256
Term - Faculty/Staff	4 months (gen. Fall)	-	$151	$96	-	$420 to $623		$91.00		-	$180 to $388	$387	$147 to $491	-	-	-	$348 to $497	-	-	-
Term - Students	4 months (gen. Fall)	-	$135	$58	-			$53		$147	$180 to $388	$460	$147 to $491	-	-	-	$348 to $497	-	$574	$495
Resident	Annual (12 months)	-	$1,196	-	-			$206		$390	-	-	-	-	-	$469	-	-	-	$1,749
Weekly		-	$43.25	-	-		$20.00	$32.00		-	-	$35.09	-	-	-	-	-	-	-	-
Daily		-	$10.81	$4.00	$14.00					-	-	-	-	-	-	-	-	-	-	-
Short-Term Parking																				
Hourly	Lot/Parkades			N/A	$2.50	$4.50	$1.25	$2.00		$2.00	$5.00	$3.50	$5.00	$4.00	$1.00	$1.00	$3.50 to $5.00	$6.00	6.00 to $6.50	$6.50
	Meters		$1.50									$3.75	$3.00	$4.00	$1.00	$1.00	$3.00	$6.00		$6.00
Maximum/Flat Rate for	Lot/Parkades					$14.00				$15.00	$20.00	$14.00	$20.00		$5.00	$10.00	$10 to $20	$10to15		$17.00
Hourly	Meters												$18.00			$2.00	$6 to $9			$12.00
Daily	Flat rate or per entry	Low					$6.00	$8.00		$3.00	$2.50	$6.00	$5.00	$10.00		$4.00	$10.00		$12.00	
		Medium								$3.00				$14.00						
		High								$4.00	$5.00	$14.00	$7.00	$14.00					$15.00	
Evening	Flat rate or per entry	Low								$3.00	$2.50	$6.00	$5.00	$4.00	$2.00	Free	$8.00	$6.00	$5.00	$7.00
		High								$3.00	$5.00			$5.00		$5.00	$8.00	$8.00	$6.00	
Weekend	Flat rate or per entry	Low					$5.00	free		$3.00	$2.50	$6.00	$5.00	$4.00		Free	$5.00	$6.00		$7.00
		High								$3.00	$5.00			$5.00		$5.00	$7.00	$8.00	$8.00	
Notes					Long-term rates vary by surface / structure	Remote parking available with shuttle to main campus ($966 annual). Evening permits available for reduced rates.	Jan-Sept - $75, May-Sept $60 Bi-weekly ($30) and monthly ($40) permits available $50 athletics centre annual permit available	term rates for "quarter" monthly permit $53	Rates depend on parking location but a permit is necessary unless parking in visitor area		Long-term rates vary by location		Long-term rates range for surface / structure and by location	Long-term rates vary by location	Long-term rates vary by location		Long-term rates vary by locations, categorized as Unreserved, Outer Reserved, Reserved, Parking Garage.	Long-term rates vary by surface/unreserved and surface/reserved (and location).		Long-term rates vary by location

2.3 Factors Affecting Parking Provision

The requirement for provision of parking spaces in Halifax is controlled by the Land Use By-laws of HRM. For Dalhousie, the Studley and Carleton campuses (as far east as Summer Street) are within the Peninsula Centre Secondary Plan area, and lands are designated at either Low-density University (U-1 Zone) or High-density University (U-2 Zone). The Secondary Plan states that "Parking for U-1 and U-2 uses in the "Peninsula Centre Area", shall be required to be maintained at 1730 or more parking spaces in total." and requires that development permit applications include proof that the parking requirement is met.

Parking provision is also included in the collective agreement for the Dalhousie Faculty Association (DFA). The collective agreement limits the increase in parking rates per year for all types of parking on campus, and prevents the university from reducing the number of parking spaces available (unless the Association-Board Committee agrees to the departures from the requirements in the collective agreement).

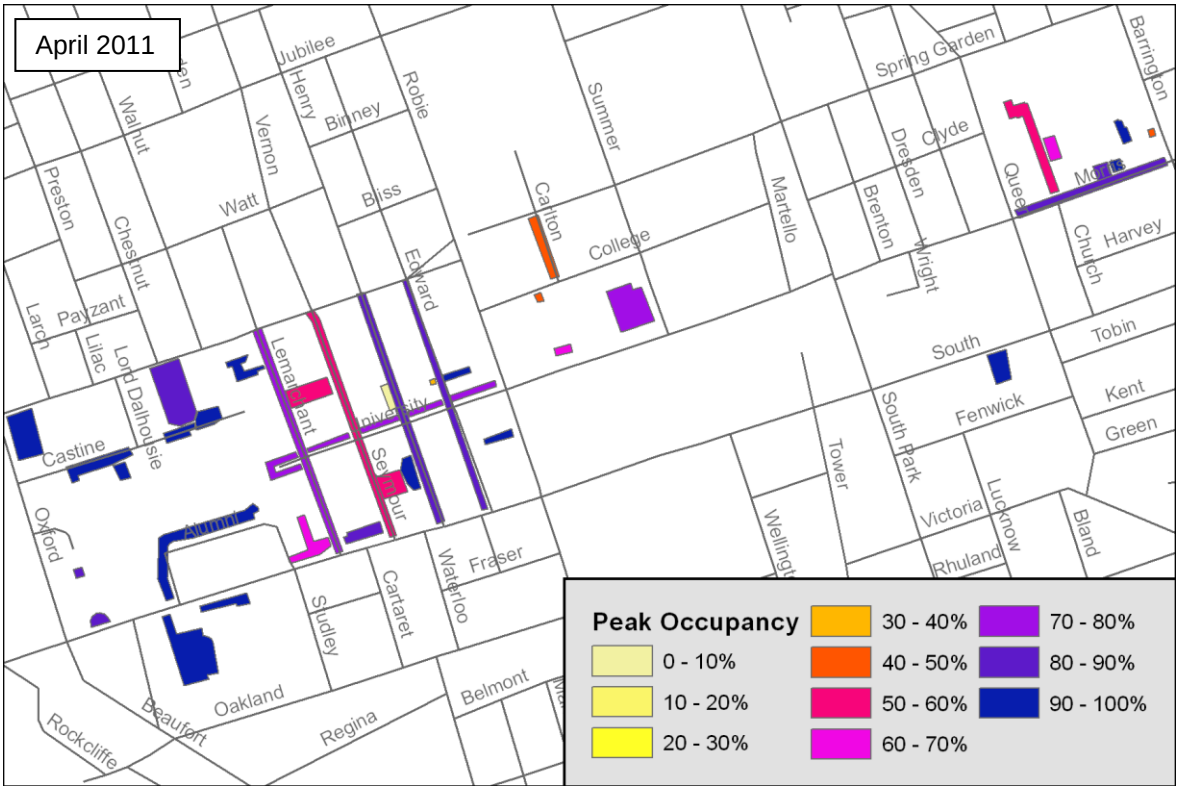
Despite the above requirements, parking spaces are being lost through redevelopment, with approximately 300 spaces removed between 2007 and 2010. The loss of parking spaces is a potential issue with respect to the prevailing zoning and collective agreement requirements. Recommendations to address this issue are discussed in Section 3.1.

2.4 Existing Parking Occupancy

As part of Transportation Demand Management Plan for Dalhousie University, a survey of parking use in and around the University was commissioned in April 2011. The survey was repeated in September 2011 to ensure that parking occupancy data was collected at a time with more activity at the University. Off-street parking lots were surveyed throughout the day on two weekdays, and the first three characters of the license plate of each parked vehicle was recorded so that the duration for which vehicles parked could be determined. On-street parking was also surveyed within the Studley and Sexton campuses; on University Avenue from Killam Loop to Robie Street and on Morris Street from Queen Street to Barrington Street.

This section provides selected charts and graphs showing some of the key results from the parking surveys.

Exhibit 2.3: Observed Peak Parking Occupancy



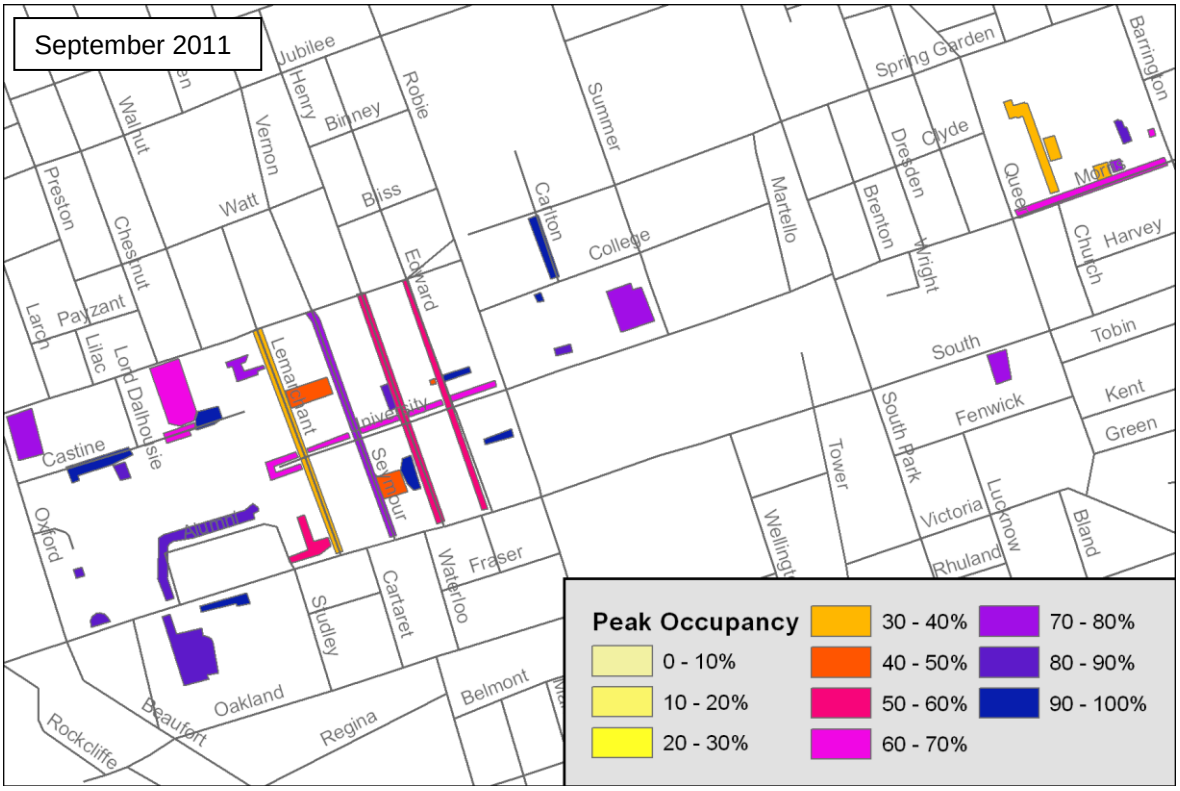


Exhibit 2.3 above shows the peak observed parking occupancy at each surveyed parking lot, and for on-street parking. Of particular note is the high occupancy observed in the parking lots on the Studley campus, where the majority of lots were found to operate at 80% or above at some point during the day. Full details of the peak observed parking occupancy by lot are shown in the table in Appendix A 2.

A comparison of the April and September occupancy data indicates that the peak occupancy of parking was generally similar between the different observations, although a number of lots appeared to show decreased peak occupancy in September.

Exhibit 2.4 below shows a relatively low turnover of parking spaces over the course of the day (less than 1.5 vehicles per space recorded at most University parking lots). Higher turnovers were found for on-street parking, which is not surprising given that the on-street spaces are predominantly time limited, and given that the vast majority of University parking spaces are only available to those who have permits.

A comparison of the April and September parking turnover data indicates that the parking turnover was generally similar between the different observations, with an apparent reduction in turnover in September.

Exhibit 2.4: Parking Space Turnover

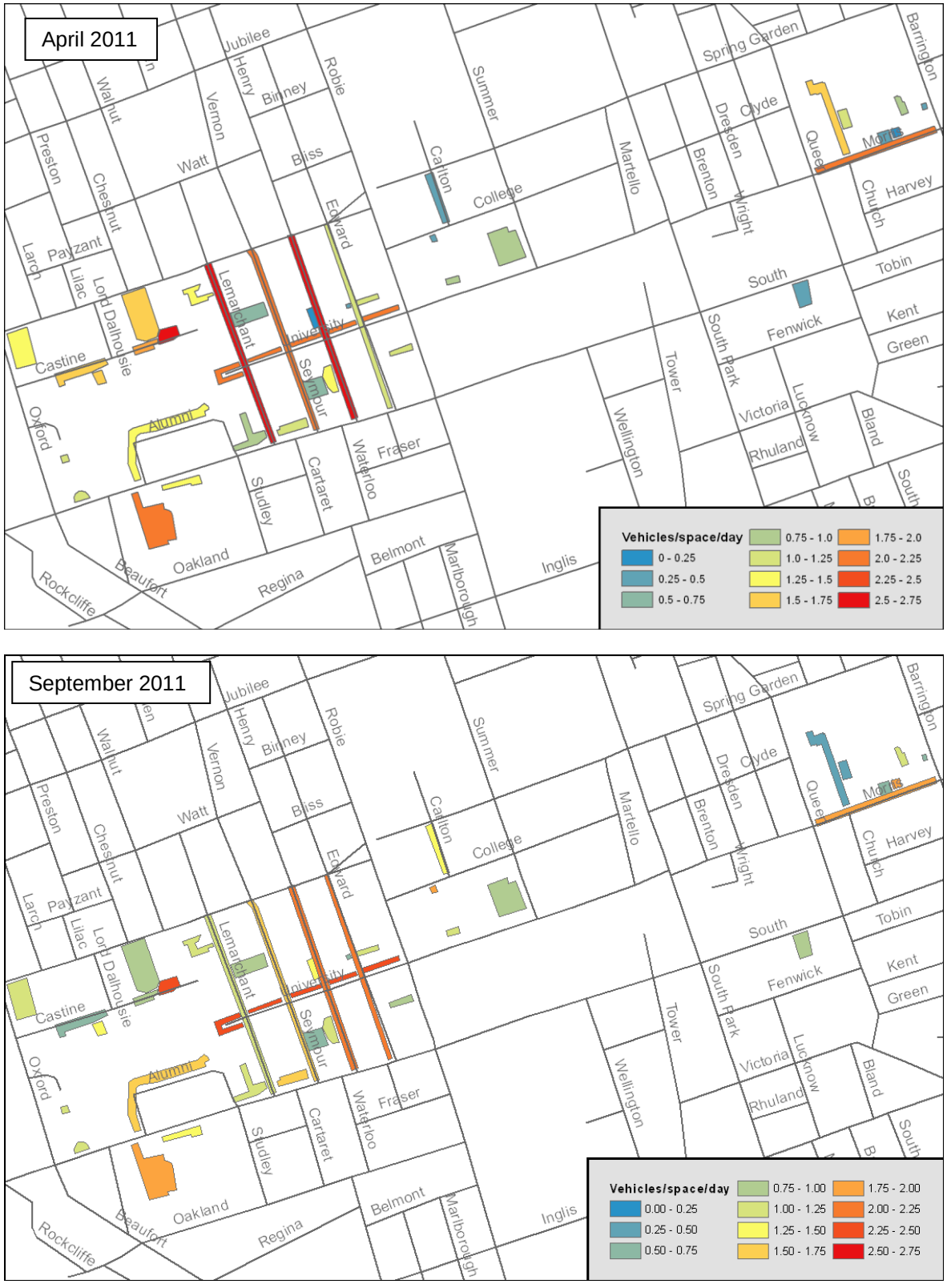
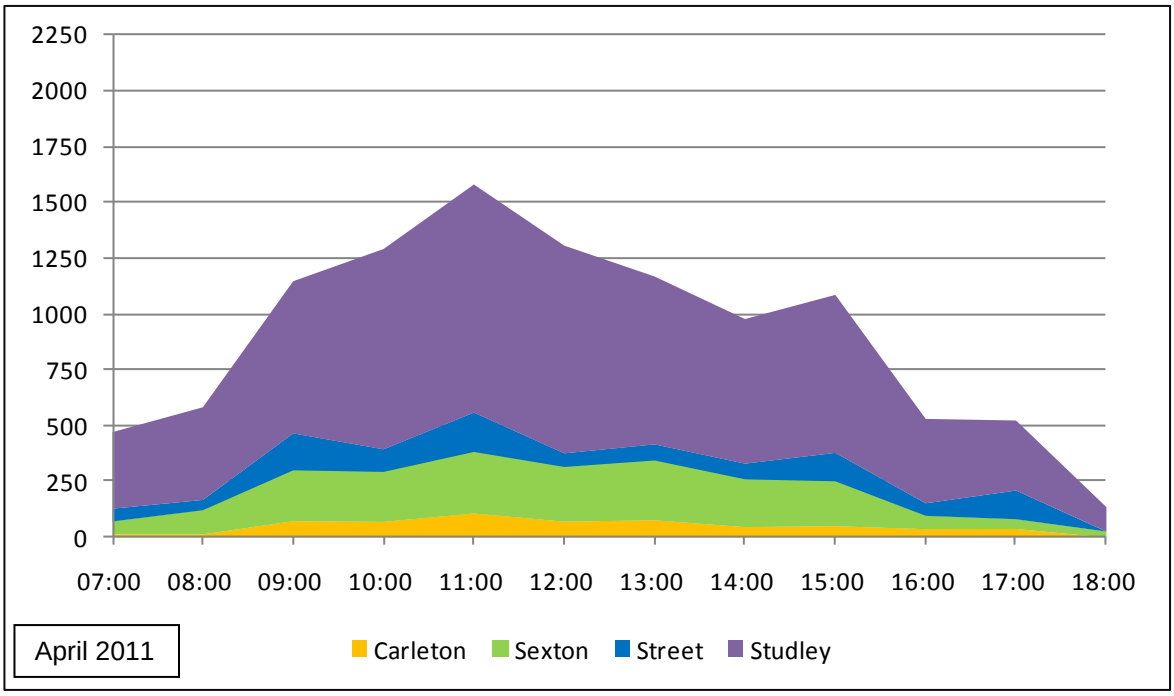
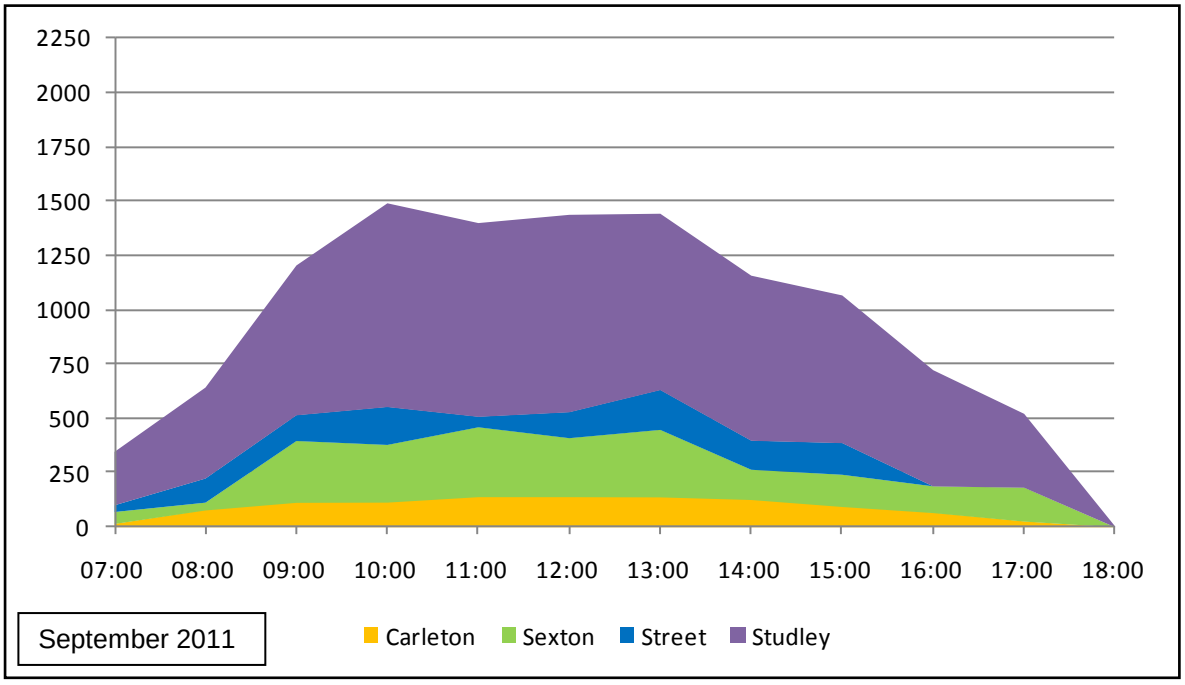


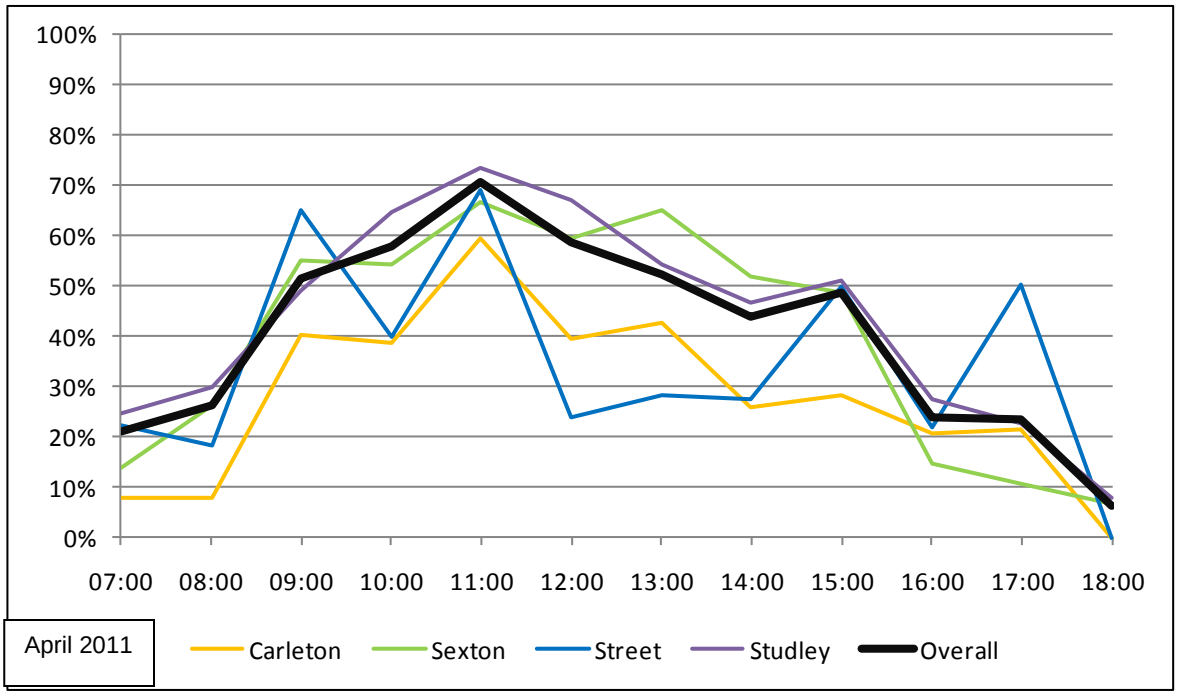
Exhibit 2.5: Total Occupancy at each Campus by time of day





A comparison of the April and September occupancy data indicates that the peak occupancy of parking was generally similar between the different observations, although the overall occupancy in September showed a more sustained peak period between 9 a.m. and 1 p.m.

Exhibit 2.6: Percentage Occupancy by time of day and Campus



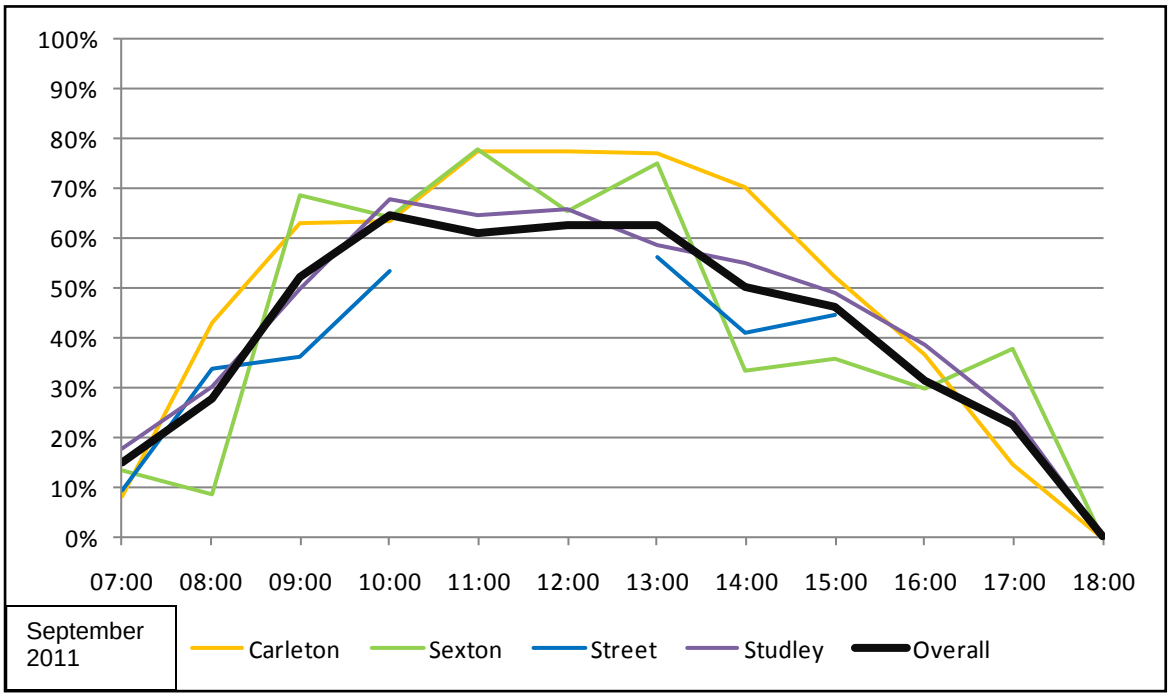


Exhibit 2.5 and 2.6 above show that the peak for parking across all campuses was measured at 11:00am, where the total system was found to be occupied to approximately 70% of capacity. This system-wide summary does not show the occupancy of particular lots that may be operating close to or at capacity as shown on Exhibit 2.3, and in the detailed table in Appendix A 2.

Summary

Overall, the parking system appears to be well used, especially the parking lots located on and close to the Studley Campus. While on a system wide basis, the parking system appears to have some spare capacity at the 11am peak, some individual lots are operating close to or at the level of effective capacity, meaning that some people may be unable to find a parking space at their preferred parking lot. A comparison between the survey data collected in April and September showed similar results, but with the length of the busiest parking period extending longer in September than in April.

2.5 Parking Revenues and Expenses

Revenues

Revenues from parking operations at University can be considered in several categories:

- Transient parking revenue at parking meters in University lots;
- General unreserved parking permits sold;
- Reserved parking passes sold; and
- Parking enforcement revenues currently go to HRM and are not a source of revenue for the University.

Expenses

Expenses from operation of the parking system are primarily related to:

- Staff costs;
- Financing of facilities, including capital costs and allowances for major rehabilitation; and
- Snow clearing and general maintenance.

A summary of all the revenues and expenses as reported by Dalhousie is contained in Exhibit 2.7 below for the year ended March 2010, as reported by Dalhousie University.

Exhibit 2.7: Parking Statement for Year Ended 2010

	Reserved Parkades	Reserved Outdoor	Hourly Parking	General Parking	Total
Revenue	296,213	37,862	109,499	537,174	980,748
Revenue	296,213	37,862	109,499	537,174	980,748
Operating Expenses					
Salaries	53,909	11,562	41,710	271,636	378,817
Finance	209,293			56,201	265,494
Capital Amortization	2,240	480		39,281	42,001
Maintenance Renewal	119,608				119,608
Utilities	48,606	2,652		8,040	59,298
Snow Clearance	20,000	6,764	7,372	158,924	193,060
Maintenance and Repair	31,236	3,547	15,084	55,677	105,544
Total Operating Expenses	484,892	25,005	64,166	589,759	1,163,822
Surplus/(Deficit)	$ (188,679)	$ 12,857	$ 45,333	$ (52,585)	$ (183,074)

The above exhibit shows approximately $981,000 of annual revenue for the year ended March 2010, with approximately 10% of revenue coming from non-permit parking. Operating expenses are shown at approximately $1,164,000, resulting in a deficit of approximately $183,000.

Exhibit 2.8 shows the reported deficits from the parking system from 2006 to 2010 as reported by Dalhousie University.

Exhibit 2.8: Annual Deficits from Parking Statements from 2006 to 2010

Year ended March	2006	2007	2008	2009	2010
Annual reported deficit	$ (167,831.00)	$ (223,625.00)	$ (336,313.00)	$ (244,742.00)	$ (183,074.00)

For the five years shown in the above exhibit, the total deficit as reported was $1,155,585, or phrased another way; the parking system was subsidized to the extent of approximately $1.156 million over the last five years. Under the current operation, the parking system is not financially self sustaining and does generate revenues that could be used for providing additional parking, implementing TDM programs or any other purpose.

3. Parking Needs Assessment

3.1 Future Parking Supply and Demand

As with many universities across Canada, Dalhousie University is going through a period of growth and change, resulting in changes in parking demand, and the location of those parking demands. The 2010 Campus Master Plan is the guiding document for the immediate future of the University. One of the elements of the Campus Master Plan Framework Plan is rationalizing campus parking facilities to free up land for other uses, and to aid efficiency of the parking system.

Urban university campuses tend to experience a gradual decline in demand for parking as transportation options improve and costs of operating private vehicles increase. Typically, this trend is complemented by passing on increasing costs of providing campus parking to users and as public policies shift from ensuring supply to encouraging reduction in demand.

Also of relevance to parking demands at Dalhousie are changes in parking provision and demand at the adjacent hospitals. Currently, requirements for parking permits at Dalhousie means that hospital visitor parking is not accommodated on university lands, but increasing demands will impact on-street parking occupancy. Increases in the number of faculty who are also associated with the adjacent hospitals will likely result in increased demands for parking permits at Dalhousie.

3.1.1 Impacts of Master Plan on Parking Supply and Demand

The Campus Master Plan seeks to reduce parking demands through improving alternative modes of travel, concentration of parking in centralized facilities, and using remote park and ride lots. The Master Plan also included recommendations and targets for increasing student and staff housing choices, both on campus and within surrounding neighbourhoods, within walking distance and within convenient transit travel distance. When implemented, these measures will contribute to reducing transportation demands and therefore reducing parking demands.

The Master Plan was prepared to plan for student population growth from 15,000 to 17,500 within five years, which equates to a growth rate of approximately 3% per annum. If the campus population growth continues into the future, a growth in parking demand of 3% per annum can be considered as a worst case scenario, which would not take into account the moderating influences of mode shifts, or the increased proportion of population living close to campus.

With the introduction of TDM measures that would increase the proportion of the university community using modes of transportation other than single-occupant vehicles, the issues related to parking supply and demand can be minimized.

3.1.2 Impacts of Existing Parking Policies

Section 2.3 described the existing policies that have an impact on the provision and operation of parking at Dalhousie University. HRM's existing zoning by-law and the DFA collective agreement currently limit the ability of the University to change the amount of parking provided on campus. Together, the existing zoning by-law and the collective agreement combine to reinforce the status quo, and to generate a response to additional development of providing more automobile parking at low rates. In order to allow for a sustainable solution to future travel needs, changes would need to be made to both the collective agreement and the zoning by-law to allow more flexibility in meeting the travel demands of the University.

It is recommended that the zoning by-law parking requirements be modified to remove the requirement for a set number of parking spaces on campus, with an allowance for the provision of off-site parking, or reductions in the amount of parking provided based on measured automobile mode splits.

To support sustainable travel options, the collective agreement should be modified to include benefits for faculty traveling to the campus by modes other than the private automobile (approximately 60% of faculty and staff surveyed in the 2010 travel survey arrived at campus by means other than the private automobile). The collective agreement should also allow for a reduction in automobile parking spaces if warranted, based on measured changes in automobile mode splits.

3.2 Future Maintenance and Capital Expenses

Assuming that the future provision of parking is shifted from predominantly surface parking to predominantly structured parking, some parking operation costs such as snow clearing can be expected to decrease. However, the costs of maintaining and replacing parking supply will increase significantly.

The current cost of structured parking in Canada varies by location and development site, but costs for planning purposes are in the order of $30,000 per space for above ground parking and $50,000 per space for underground parking, along with increased costs of maintenance and rehabilitation of existing parking structures in the future.

Increased costs of the provision of parking will require either increased borrowing or contributions to a reserve fund to pay for future capital expenses. To demonstrate the cost implications of a shift to structured parking, if the approximately 300 unreserved parking spaces lost on campus between 2007 and 2011 were replaced with structured parking at $30,000 per space, the resulting capital cost would be $9,000,000.

Current operation of the parking system with below market rates generates a deficit of approximately $200,000 per annum, and there is no ability under current operation to generate any revenue that would support the sustainability of the parking system in the future.

3.3 Parking Enforcement

While not directly related to TDM measures, parking enforcement is nonetheless an important part of the provision and operation of campus parking. The current parking operation is based on displaying permits, and the majority of lots do not use gated controls, which requires enforcement patrols to ensure vehicles parked on campus have a valid permit.

There are some key issues related to parking enforcement:

- Enforcement using towing is carried out using a tow-away policy for repeat offenders or for vehicles parking in fire routes; and
- Revenues from parking enforcement are collected by HRM and Dalhousie does not receive any revenue from enforcement.

The combination of the above limits the University's control over parking enforcement. Also, the current tow policy is a significant issue for users since the impound lot is a long way from campus and results in a major cost and inconvenience for those who have vehicles towed. The alternative of installing a boot on offending vehicles is being done by the adjacent St Mary's University, and by

Acadia University. Advantages of the boot method is that the University will gain full control of enforcement since the boot would only be released on payment of an instant fine, the University would get to keep enforcement revenues, and University parking enforcement staff could carry out targeted action against repeat offenders.

Based on information provided by Dalhousie, approximately 3,700 parking infraction tickets were issued in the 2009-2010 year, along with approximately 110 vehicle tows. If parking enforcement was fully controlled by Dalhousie, the amount of tickets issued in 2009-2010 would have resulted in approximately $55,000 in ticket revenue (depending on the ticket price structure), along with approximately $5,300 in boot removal fees. In terms of costs and fines that were paid by people receiving HRM parking infractions, the 2009-2010 infractions would have resulted in approximately $115,000 in tickets and towing fees. Moving to University control of parking enforcement could save vehicle owners approximately 50% of the current costs of enforcement.

3.4 Methods to Address Deficit

Analysis was carried out to estimate the annual revenues and expenses and determine the extent to which the operation of parking at the University is financially self-sustaining under baseline conditions.

In order for the parking system to cover its existing costs (based on 2010 figures), either parking revenues must be increased by approximately 20%, or expenses must be reduced by approximately 16%. To generate sufficient revenue to use parking revenue to pay for future capital and maintenance costs arising from the parking system, additional revenue increases or reductions in expenses will be required. As noted above, bringing parking enforcement under the University's control could result in up to $60,000 in additional revenue, but other changes would be required to address the full amount of the deficit.

The review of Dalhousie's parking rates found that reserved parking rates were not far below expected rates, and that the largest difference between existing and market rates or peer university rates was found for general unreserved parking. Increasing revenues can be best accomplished by increasing parking rates for general unreserved parking. Allowing for some overselling of reserved parking permits would also increase efficiency.

General unreserved parking also forms the largest portion of parking revenue, making up approximately 55% of total revenues. Changes to rates for the general unreserved parking will therefore have the greatest financial impact, and will also align with other goals of achieving a better balance of costs between driving to campus and taking transit. The current cost of an unreserved parking permit should be increased towards the cost of transit, which would require an increase from the current monthly equivalent of $20 per month to approximately $50 per month.

Assuming the cost of all general unreserved parking permits is raised to approximately $50 per month, and that current demand continues, the parking system could generate up to approximately $600,000 per annum, which could be used to contribute to a reserve fund for future capital expenses related to the parking system, and to provide a funding source for TDM measures.

Using the existing rate for outdoor reserved parking ($485 + HST), would provide a level of choice between the lowest rate for structured parking at $987 + HST and unreserved parking at $217 + HST.

On a per space basis, parking spaces used for hourly parking generate significantly more revenue than spaces used by general unreserved permit holders. Moving some parking spaces to operation as casual pay and display parking would serve a need that appears to be largely underserved, and

also improve the financial performance of the system. It would make sense to have at least one lot on Studley Campus available for pay and display parking, with likely candidates including the Dalplex lot where there is demand for short-stay parking, and/or the Hancock lot.

Conversion of 33 spaces in the Dalplex Upper Lot to pay and display operation could be achieved with one pay and display machine, resulting in revenues of up to $55,000 per annum, or an additional $40,000 over and above existing revenues. Conversion of the Hancock lot to pay and display parking could generate up to $130,000 per annum, or approximately $90,000 more than existing revenues.

With the increasing scarcity and value of land on the University campuses, provision of subsidized surface parking on the University campuses is not sustainable. To provide an alternative low cost parking alternative for people who need to travel by car, remote offsite parking linked to the university by a shuttle could be provided.

4. Shuttle Bus Assessment

4.1 Inter-Campus Shuttle

The goal of inter-campus shuttle would be to allow quick and easy trips by staff and students between the various campuses. There are two options for routing the shuttle bus:

- Around the perimeter of the campuses, via South St., Oxford St., Coburg Rd., Spring Garden Rd. and Barrington St.; or
- Through the centre of the campuses, using University Ave. and Morris St.

The perimeter route would be approximately 5 km in length. Assuming an average speed of 15 km/hr, a bus would take 20 minutes to complete one loop, and hence about ten minutes to get from end of the University to the other. Use of two vehicles circulating in the same direction would produce a headway of 10 minutes. This would be frequent enough for the service to operate on a “turn-up and go” basis, eliminating the need for published schedules.

The central route along University Ave. and Morris St. would be about 1.6 km in length (one-way). Assuming an average speed of 15 km/hr, a bus would take 6.5 minutes to go from end of the university to another, or about 13 minutes to complete a full circuit. Using one vehicle would be a produce a low-enough headway for a “turn-up and go” service. However, this route would be less convenient for some parts of Studley Campus.

The level of demand is difficult to predict from the data available for this study. The biggest source of demand would be from students with classes in different campuses on the same day. The University could use data it has on students’ classes and their schedules to calculate the potential demand. Another major source of demand would be from students or staff who live within walking distance of one campus but start or end their day at another campus.

Overall, an inter-campus shuttle could easily provide a frequent and useful service. However, there are significant cost implications as outlined below.

Potential Cost of Shuttle

The cost of operating a shuttle service is based on contracting the service to a local private company, such as White’s Buses who operate other services in the Halifax area. Based on

discussions with MetroTransit staff, MetroTransit is not interested in operating a contract service in view of their priority commitment to existing services.

The specific routing of the shuttle service would need to be discussed and confirmed with the University staff and could include discussions with the Student Union. As noted above, depending on the route of the shuttle, it would take approximately 15 to 20 minutes to complete a loop.

Using the assumption that with one bus, the route would then be able to operate every 15 minutes, Exhibit 4.1 summarizes annual operating costs for a route operating 6 days per week (Monday to Saturday) and either 12 hours (7am to 7pm) or 16 hours (6am to 10pm) per day, from September to the end of April (8 months, fall and spring academic semesters) or for a full year.

Exhibit 4.1: Estimated Cost for Proposed University Shuttle Route

	12-hour Service		16-hour Service	
Item	**Fall and Spring**	**Full Year**	**Fall and Spring**	**Full Year**
Number of Buses in Service	1	1	1	1
Hours of Operation	12	12	16	16
Days of Operation	6	6	6	6
Total Operating Hours per Week	72	72	96	96
Total Operating Hours Per Year (x34)	2,448	3,264	3,744	4,992
Operating Cost /Hour	$65.00	$65.00	$65.00	$65.00
Total Operating Cost	**$159,120**	**$212,160**	**$243,360**	**$324,480**
Capital Cost – Vehicle:	$90,000 - $360,00			

As indicated in Exhibit 4.1, the estimated annual operating cost would range from $159,000 to $324,500 depending on the days, hours and months of service as well as the contractor's rate. Capital costs for a vehicle would be additional.

The estimated hourly cost to contract the service to a private operator would be $65.00, excluding the cost of the vehicle. The contractor could be required to supply the vehicle, according to design parameters set by the University. Candidate vehicles could be either small, "cut-away", style buses such as are currently used by the local hospitals for their inter-hospital shuttle, or a small transit-style bus. Vehicle costs range from $90,000 or $130,000 for an accessible vehicle equipped with a small lift or ramp to $350,000 for a small, low floor transit bus. Exhibit 4.2 illustrates the potential vehicles. If the contractor supplies the vehicle, the hourly cost would then increase to cover the capital cost. The hourly rate would depend on the vehicle selected as well as the term of the contract. Alternatively, the University could acquire the vehicle. It should be noted, however, that more than one vehicle may be required in order to provide a spare for maintenance purposes. The contractor could be required to provide a required spare vehicle which would then be subject to separate costing when utilized.

Exhibit 4.2: Examples of Transit Vehicle Choices

Vehicle Options		
Small accessible bus with lift for wheelchair	*Small accessible low-floor bus with ramp*	*30 Foot Low-floor Transit Bus*
		
Capacity – 22 seated	**22 seated**	**24 seated, 20 standing**
Approximate Cost - $90,000	**$120,000**	**$350,000**

4.2 Park-and-Ride Shuttle

There are currently a large number of parking spaces on Dalhousie University land. A park-and-ride scheme would allow people to park at a remote location, and then use a shuttle bus to reach the University. This would allow the University to redevelop parking lots into alternative uses, potentially at a much lower cost than acquiring new land.

The mode share amongst students for travel by car to the university is low, which means that any park-and-ride scheme would be targeted primarily at staff and faculty. People are most likely to use a park-and-ride scheme if the remote parking site is on or near their route by car to the final destination. Consequently, when considering locations for remote parking, it is necessary to consider where staff members are driving from (i.e. their place of residence). Parking sites targeted at trips to the University that would use either of the two toll bridges across Halifax Harbour should be located on the eastern side of the Harbour. This would save drivers the cost of the toll, increasing the benefit of using the park-and-ride facilities.

Example Operation

It is possible to group the origins for trips to the University into three main groups: trips coming from the east across Halifax Harbour (including Dartmouth); trips coming from the Peninsula; and trips coming from the area to the west of the Peninsula (the western border of Peninsula is taken to be the rail tracks running between Fairview Cove and the Northwest Arm.) Roughly 27% of staff trips originate from Dartmouth and the east; 39% originate from the Peninsula; and 25% originate from the areas to the west of the Peninsula. The remaining 10% of staff have home addresses outside of Nova Scotia. Trips originating from the Peninsula less likely to use park-and-ride facilities, because the interchange time would increase their travel time by a larger percentage than for longer trips.

One possible location for a park-and-ride facility would be Halifax Shopping Centre, located near the eastern terminus of Highway 102 (which is also fed by Highway 103). It is also relatively close to the western terminus of Highway 111, which uses one of the two bridges crossing Halifax Harbour. A bus departing this site could reach Sexton campus within 15 minutes (including stops at other campuses). From there, it could return to the parking site in about 10 minutes. This means that operating one vehicle would result in a headway of around 30 minutes. Two vehicles would

reduce this to about 15 minutes, frequent enough to form a desirable “turn-up and go” service. This location is also served by an existing MetroTransit park and ride service.

Inter-Hospital Shuttle

There is an existing shuttle bus operating between Victoria General Hospital and the Halifax Infirmary. This shuttle bus operates every 15 minutes all day, and is provided free of charge. Potentially, a shuttle bus between the University and a park-and-ride site could include these two hospitals on its route, replacing the existing shuttle. This would allow the responsibility of operating the shuttle to be shared between the hospitals and the University.

Potential Cost of Shuttle

As indicated in Exhibit 4.1, the estimated annual operating cost for an inter-campus shuttle would range from $159,000 to $324,500 depending on the days, hours and months of service as well as the contractor’s rate. For a park and ride shuttle, costs would likely be doubled since the increased travel distance and the desire to provide frequent service would require two buses in service. As with the analysis of the inter-campus shuttle, capital costs of the vehicles are not included, and there may be additional costs associated with a parking lot lease or other agreements with the park and ride site.

APPENDIX A

Appendix A 1 - Details of Available Parking at Dalhousie

Parking Lot	Vehicle (General)	Meters	M/C (Motorcycle)	Access	Reserved	Other	Campus
Carleton Lot					59		Carleton
Dentistry Lot	1				17		Carleton
Dentistry Rear Lot					2		Carleton
Robie Lot	22			1	3		Carleton
Tupper /CRC lot	16				2		Carleton
Tupper Parkade					90	2	Carleton
Carleton Campus Total	39	0	0	1	173	2	
CO OP Lot	13						Sexton
Fenwick Parkade					55		Sexton
Gerard Hall Lot	78			2	1		Sexton
Lower Morris	41		2	1	4		Sexton
O'Brien Hall Lot	4				4		Sexton
Queen Street Lot	46		4	1			Sexton
Sexton Main Drive	4	11					Sexton
South St Lot	65						Sexton
Upper Morris	72		25	3	25		Sexton
Sexton Campus Total	323	11	31	7	89		
1390 Lemarchant	7						Studley
Alumni Lot	113	9		1	9		Studley
Arena Lot	56						Studley
Arts Centre Lot	8				3		Studley
Bio Lot	23		6				Studley
Chemistry Lot	27	3		1			Studley
CSB Regular Lot	43		3	1	8		Studley
CSB Reserved Parkade					167		Studley
Dalplex Lower Lot	78	16	7	4		49	Studley
Dalplex Upper Lot	32						Studley
Dunn Lot	184	4	6	3	15		Studley
Eliza Ritchie Lot	29			1			Studley
Glengary Lot	19				1		Studley
Hancock Lot	100	9		2	1		Studley
Houses	15						Studley
Killam Circle Lot		13					Studley
McCain Parkade					86	3	Studley
MSSW Driveway	4						Studley
Oceanography Lot	44				6		Studley
Risley Hall Lot	37		6				Studley
Risley Hall Parkade					68		Studley
Shirreff Lot	10			1			Studley
Stairs Lot	17						Studley
Studley Lot	27	7		2	3		Studley
SUB Lot		9			2		Studley
Weldon Law Lot	3			2	1		Studley
Studley Campus Total	876	70	28	18	370	52	
Total	1238	81	59	26	632	54	

Appendix A 2 – Peak Occupancy Observed During Parking Survey

Campus	Lot	Capacity (Survey 1)	Peak Occupancy (Survey 1)	Capacity (Survey 2)	Peak Occupancy (Survey 2)
Carleton	Burbidge	2	50%	2	100%
Carleton	Carleton	68	41%	68	93%
Carleton	Dentistry-Forrest	18	61%	18	81%
Carleton	Tupper	90	73%	90	73%
	Carleton Total	**178**	**60%**	**178**	**82%**
On-Street	Edward	44	82%	44	57%
On-Street	Henry	41	83%	41	59%
On-Street	LeMarchant	30	77%	30	38%
On-Street	Morris St	44	84%	44	66%
On-Street	Seymour	32	56%	32	70%
On-Street	University	63	79%	136	66%
	On-Street Total	**254**	**78%**	**327**	**62%**
Sexton	Gerard Hall	218	62%	80	97%
Sexton	Fenwick-South	62	92%	62	79%
Sexton	Grad Res-L Morris	18	94%	18	78%
Sexton	Gym (J) Lot	32	91%	32	88%
Sexton	OBrien	6	50%	6	67%
Sexton	Queen St	51	51%	51	35%
Sexton	R2-Co-op	11	82%	11	36%
Sexton	Sexton Main Drive	15	87%	15	93%
	Sexton Total	**413**	**70%**	**413**	**51%**
Studley	Alumni Cres.	115	90%	115	83%
Studley	Arts Cntr	12	0%	12	88%
Studley	Chase	5	100%	46	83%
Studley	Chemistry Lot	39	92%	39	69%
Studley	CSB	42	90%	42	100%
Studley	CSB Parkade	170	54%	170	48%
Studley	Dalplex	190	93%	190	87%
Studley	Dunn	229	84%	229	66%
Studley	Eliza Ritchie	30	100%	30	97%
Studley	Glengary	14	100%	14	93%

Campus	Lot	Capacity (Survey 1)	Peak Occupancy (Survey 1)	Capacity (Survey 2)	Peak Occupancy (Survey 2)
Studley	Hancock	127	94%	127	74%
Studley	Killam Circle	25	92%	25	94%
Studley	LSC Biology	78	95%	44	98%
Studley	McCain	97	59%	97	48%
Studley	Memorial Arena	67	69%	67	57%
Studley	Risley Hall	43	84%	43	101%
Studley	Shirreff Front+Back	8	88%	8	81%
Studley	SRES-Robie	23	96%	23	93%
Studley	Stairs	16	100%	18	94%
Studley	Studley	39	95%	39	74%
Studley	Sub-Risley Park	11	100%	N/A	N/A
Studley	Weldon Law	3	33%	3	50%
	Studley Total	**1,383**	**82%**	**1,381**	**74%**
Grand Total		**2,228**	**71%**	**2,299**	**59%**