



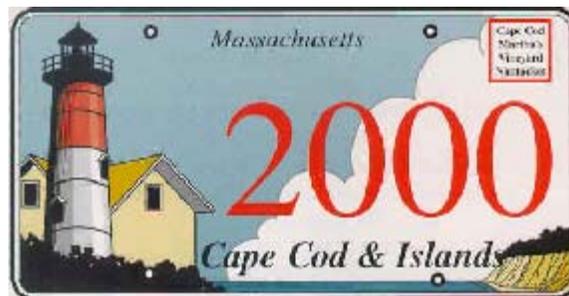
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Cape Cod Park-and-Ride Study

Analysis of Barnstable and Sagamore Park-and-Ride Lots

November 2003



Cape Cod Commission
Transportation Staff

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United States Department of Transportation – Federal Highway Administration**

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- Park-and-Ride Lot Usage Data
- Overnight Study
- License Plate Study
- (Samples) Plymouth & Brockton Bus Schedules

1.0 Background

Cape Cod (Barnstable County) is undergoing dramatic growth both in population and in the number of residents with jobs off-Cape. A significant result of the 2000 Census was growth. Population in the Cape Cod region grew 19.1% between 1990 and 2000 to 222,230 people. Cape Cod is the 3rd fastest growing region behind the Islands of Nantucket and Martha's Vineyard which also contribute to the traffic volumes on Cape Cod. With respect to this study, the most significant finding from the census was the increase in the number of workers commuting from Cape Cod. Based on the census data for Barnstable County, approximately 13,400 people commute from the County to jobs outside the region. This was an increase of approximately 40% over the number of commuters to off-Cape jobs in 1990. The major destination for workers living on Cape Cod and working elsewhere are:

County	2000 Census - Commuters	% Change from 1990
Plymouth	4,152	20
Suffolk	2,767	34.5
Norfolk	1,888	55
Middlesex	1,768	60
Bristol	1,264	27
Worcester	441	134.5
Providence (RI)	285	86.5
Nantucket	137	495.5
Essex	136	29.5
Dukes	131	79.5
Newport (RI)	122	134.5

The two major park-and-ride lots have experienced phenomenal success in getting drivers to “leave their cars behind.” The Sagamore park-and-ride lot (377 spaces), at the intersection of Routes 3 and 6, and the Barnstable park-and-ride lot (365 spaces), at Route 6 Interchange 6, are both experiencing capacity usage. A third, smaller lot, is located in Harwich (75 spaces) at Route 6 Interchange 10. Due to the proximity of major employment centers in Boston and the available bus service many commuters take advantage of the option of leaving their cars behind to take an intercity bus. Others share rides or use vanpools. In addition to these two primary uses, charters to casinos and ski areas use these lots for customer parking. The full extent of these additional uses has not been documented.

1.1. Study Purpose

The purpose of this study is to quantify the various factors relating to usage of the park-and-ride lots. These factors include the duration of parkers, number of passengers boarding the various buses/vanpools, and the origin communities of parked vehicles. For the purposes of task definition, the term “overnight” refers to the time period between the last bus of the day (some time after midnight) and the first bus of the day (some time before 4 a.m.). Based on

the observations and proposed MassHighway parking policies a number of recommendations are to be developed to improve the park-and-ride facilities to provide for the expected increase in the demand for these facilities.

1.2. Plymouth and Brockton Bus Service

Plymouth and Brockton Street Railway (P&B) serves 25 cities and towns from Boston to Cape Cod and is partially subsidized by the Massachusetts Bay Transportation Authority (MBTA), MassPort and the Cape Cod Regional Transit Authority (Cape Cod RTA). P&B's Hyannis terminal located in the Hyannis Transportation Center is their central hub for the Cape. Many of the buses are wheelchair lift-equipped. The company operates three principal services for Cape Cod, a semi-express running from Orleans/Hyannis to Logan Airport, a similar service to downtown Boston, and local service from Provincetown to Hyannis.

P&B's express service offers 35 round trips each weekday and 20 round trips Saturdays, Sundays, and holidays with additional trips added during the summer months. The route runs along Routes 132 and 6 on Cape Cod and Route 3 and I-93 (the Southeast Expressway) into Boston. Sixteen of these trips operate daily under the heading "Logan Direct." Logan Direct provides hourly access from Hyannis to Logan Airport starting at 3:15 a.m. originating at the Hyannis P&B terminal, with stops at the park-and-ride lots in Barnstable and Sagamore, the P&B terminal in Plymouth, the park-and-ride lot in Rockland, (a few runs stop at South Station in Boston) and finally Logan Airport.

On weekdays, there are trips geared to Boston commuters beginning in Orleans or Hyannis starting at 4:45 a.m. and ending either at South Station or Park Square in Boston with returns in the afternoon and evening. Fares run between \$16 and \$27 each way depending on the length of the trip. Discounts are available through the purchase of a ten-ticket book.

	Annual Ridership	Daily Ridership
Provincetown – Hyannis (this service is within Cape Cod. Some riders may continue on to Boston)	27,095	74
Orleans - Boston Hyannis – Boston (these services share routes starting at Barnstable park-and- ride lot)	368,881	1,011
Logan Direct	136,739	375

As shown in the table above, for the year beginning November 1999 and ending October 2000 (most current available data), ridership on the Provincetown-Hyannis route was 27,095, or an average of 74 passengers per day. For the Orleans/Hyannis to Boston route year beginning November 1999 and ending October 2000, annual ridership on the non-Logan

Direct trips was 368,881 and on the Logan Direct trips, 136,739, an average of 1,385 passengers per day. Ridership during the summer months is about 20 percent higher. Compared to figures for the previous year, ridership increased 10 percent on the non-Logan direct trips and 23 percent on the Logan Direct trips.

1.3. Cape Cod Park-and-Ride Lots

Cape Cod/ Barnstable County has three park-and-ride lots located in Sagamore, Barnstable, and Harwich. Park-and-ride facilities have recently been added at the new Hyannis Intermodal Center (see section 1.4). It should be noted that additional information is forthcoming from a current CTPS study of statewide park-and-ride lots which is expected to be available in Fall 2003. The CTPS study will include summaries and information regarding:

Jurisdiction, Spaces Available, Lot Conditions, Lot Safety, Services Available, Trailblazing Signs, and Recommendations.

The following sections of the report describe the facilities and usage at Cape Cod park-and-ride lots. Note that usage varies by season and tends to be increasing over the years (see appendix for detailed observations).

- Sagamore park-and-ride lot – This lot is located near the Sagamore Rotary off Meetinghouse Lane with an exit directly onto Route 3 northbound. This lot has a capacity of 377 vehicles. Bus shelters appear to be in fair condition. Although the lot lacks rest facilities, two fast food restaurants are within walking distance. For the two observations taken in 2001, a peak parking demand was observed in May, with 385 parked vehicles (102.1 % of capacity). Including observations as far back as 1995, the average observed demand is 83% of capacity.
- Barnstable park-and-ride lot – This lot is located on Route 132 adjacent to Interchange 6, north of the Mid-Cape Highway (Route 6). This lot has a ramp directly onto Route 6 westbound and the number of parking spaces was increased during the course of this study. The lot capacity prior to August 2001 was 308 vehicles and since the expansion the lot can accommodate 365 vehicles. As part of a recent expansion, new shelters have been installed and appear to be in good condition. Public restrooms and food service are available. The lot experiences heavy usage, often near or over-capacity. For the two observations taken in 2001, a peak parking demand was observed in November, with 354 parked vehicles (97% of capacity). Including observations as far back as 1995, the average observed demand is 97% of capacity.
- Harwich park-and-ride lot – This lot is located on Route 124 adjacent to Interchange 10, south of the Mid-Cape Highway (Route 6). This lot was not explicitly part of this study. However, information on usage is included in the appendix. Observations collected between 1996 and 2000 show an average of 18% occupancy with a peak of 37%.

1.3.1. Sagamore Park-and-Ride Lot: Way-finding Signage

Signs leading to the lot can be found at the following locations:

- Route 3 Southbound, in advance of the Sagamore Rotary
- Sagamore Rotary on channelizing island at the foot of the Sagamore Bridge (includes arrow pointing left)
- Meetinghouse Lane, at park-and-ride lot entrance (“Commuter Parking”)

1.3.2. Barnstable Park-and-Ride Lot: Way-finding Signage

Signs leading to the lot can be found at the following locations:

- Route 132 at the site entrance (one sign on each side of Route 132)
- Route 132 at the fast food entrance, opposite the Route 6 off-ramp. This sign directs motorists to the northerly entrance.
- Within park-and-ride site: 2 signs for internal circulation

On Route 6 eastbound, between interchanges 5 & 6, there is a large blue sign for “Commuter Options” with the telephone number for commuter information services.

1.4. Hyannis Transportation Center

The Hyannis Transportation Center (HTC) opened in Spring 2003 and is located at the west end of the downtown Hyannis area. The facility accommodates the P&B and Bonanza intercity bus services and is a focal point for the Cape Cod RTA fixed route services and shuttles. The facility will also include the Cape Cod Central Railroad offices and passenger services and the potential to accommodate inter-regional train service. A rental car agency is also located in the HTC.

The facility includes 182 long-term (more than two hours) parking spaces and six long term handicapped spaces. Ten of the long-term spaces have been leased to the rental car agency, Alamo/National Car Rental and 20 spaces are used by employees of the Center. In addition to the long-term parking, there are 30 short-term (two hours or less) parking spaces of which four are for the handicapped.

The commuter lot was free initially and a lot count performed in the afternoon of August 5, 2003 indicated 97 vehicles used the 3 lots including 7 vehicles in the rental car spaces and an additional 4 Cape Cod RTA buses. The Cape Cod RTA began charging a \$10/day “peak season” fee on August 11th with a monthly parking pass available for \$65/month. The cost to park at the HTC dropped to \$6/day after September 2, 2003 and this “shoulder season” rate continued until Columbus Day. A lower parking fee of \$4/day will be in effect for the “off season” with the \$6/day fee required during the Spring “shoulder” season which will begin on April 2, 2004 and end on May 22, 2004. The Cape Cod RTA lots use ticket machines that take bills (no coins) and issue a ticket to be displayed on the dashboard. The usage of the long-term parking spaces as of October 2003 is about 25% occupancy based on parking receipts.

2.0 Distribution of Vehicles in Barnstable and Sagamore Park-and-Ride Lots

This section of the report includes a summary and highlights of the “License Plate Study” which is available as a separate appendix.

The license plate numbers of the cars parked in the Barnstable park-and-ride lot were collected on March 14, 2000, April 14, 2000, May 23, 2000, and June 22, 2000. The same data was collected at the Sagamore park-and-ride lot on; March 20, 2000, April 20, 2000, May 16, 2000, May 22, 2000, June 19, 2000, and June 30, 2000.

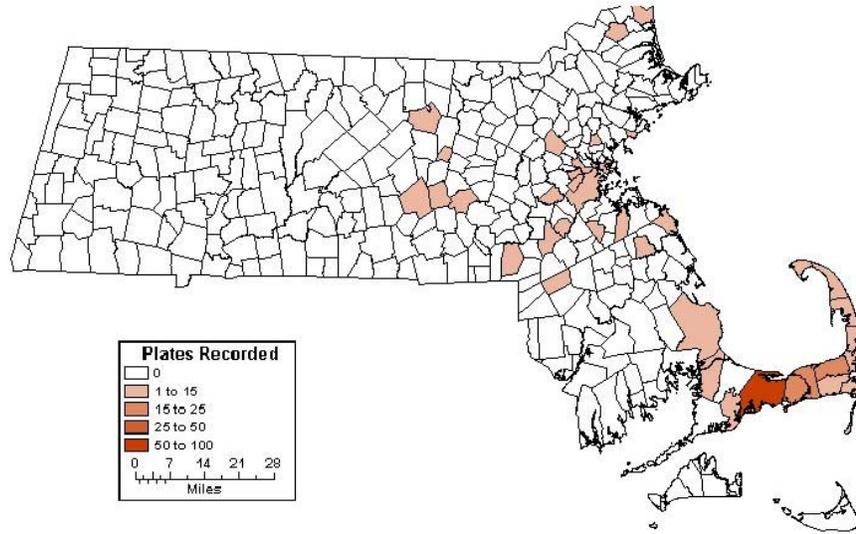
The data was sorted to eliminate duplication and the vehicles registered in Massachusetts were identified by the Department of Motor Vehicles. This information was obtained to determine the distribution of origins of vehicles.

2.1. Geographic Distribution of Barnstable Park-and-Ride Patrons

A total of 1221 different Massachusetts plates were recorded on the three days of observation. Over 850 of these plates or 70% of their origins were successfully identified. One issue to keep in mind when considering origins from off-Cape towns is that many of these motorists may have second homes in Barnstable County. This means that that day’s trip to the park-and-ride lot may in fact have originated within the county. The following distribution by town was generated.

Cape Cod Commission License Plate Survey

Distribution of Plates at Barnstable Park and Ride on 5/23/00



2.1.1. Distribution by Cape Towns

Town of Registration	Barnstable Park-and-Ride	% of lot
Barnstable	137	31.79%
Bourne	2	0.46%
Brewster	32	7.42%
Chatham	28	6.50%
Dennis	37	8.58%
Eastham	19	4.41%
Falmouth	1	0.23%
Harwich	31	7.19%
Mashpee	2	0.46%
Orleans	24	5.57%
Provincetown	4	0.93%
Sandwich	4	0.93%
Truro	0	0.00%
Wellfleet	8	1.86%
Yarmouth	54	12.53%
Total Cape Vehicles	383	88.86%

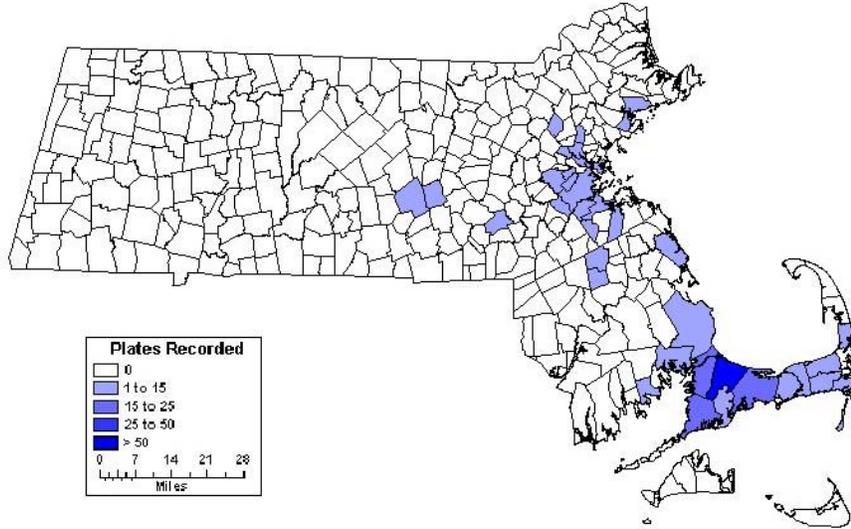
It is interesting to note that of the vehicles listed in the table above, 146 were identified from communities that are closer to the Harwich park-and-ride lot. Comments received from these towns' citizens at public meetings indicate that the frequency of service is a major motivation for using the Barnstable lot in lieu of the closer (and less congested) Harwich lot. Harwich has 75 spaces, about a third of which are used regularly.

2.2. Geographic Distribution of the Sagamore Park-and-Ride Patrons

A total of 261 Massachusetts plates were recorded on April 20, 2000. From this observation, 177 of these plates or 68% were successfully identified. The following distribution by town was generated.

Cape Cod Commission License Plate Survey

Distribution of Plates at Sagamore Park and Ride on 5/22/00

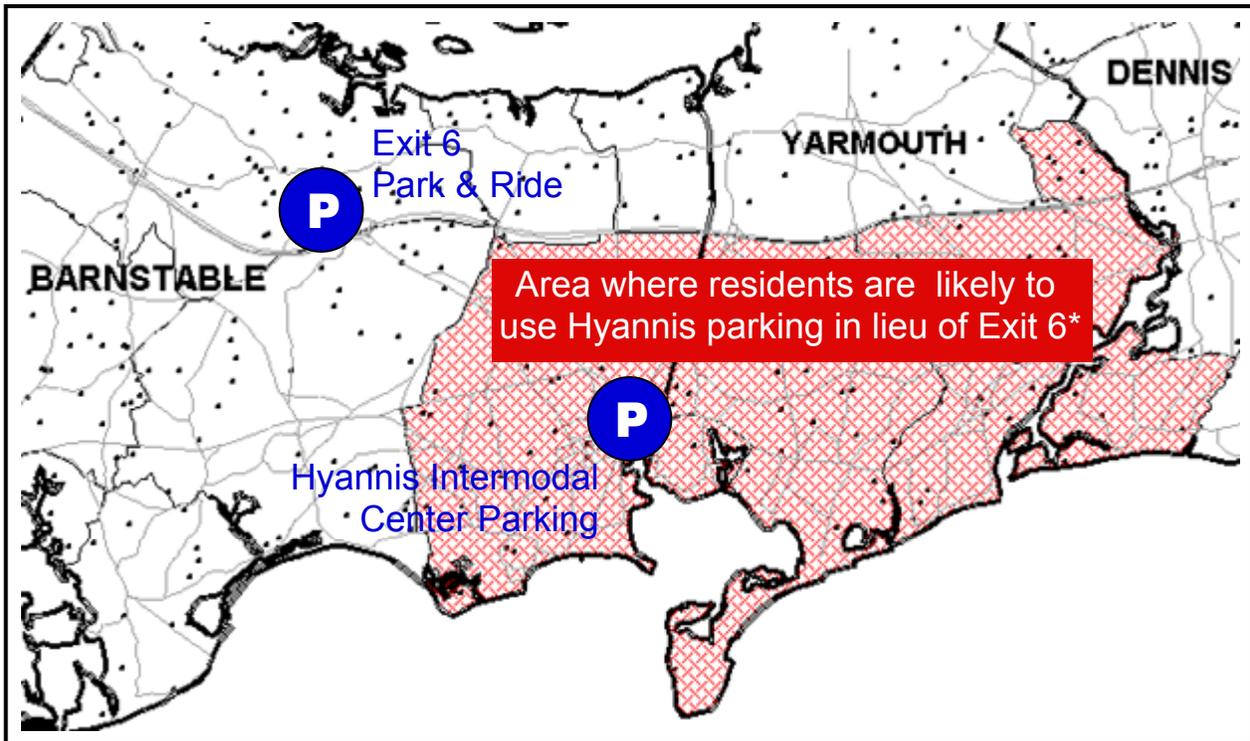


2.2.1. Distribution by Cape Towns

Town of Registration	Sagamore Park-and-Ride	% of lot
Barnstable	21	11.86%
Bourne	21	11.86%
Brewster	0	0.00%
Chatham	2	1.13%
Dennis	0	0.00%
Eastham	0	0.00%
Falmouth	19	10.73%
Harwich	1	0.56%
Mashpee	11	6.21%
Orleans	1	0.56%
Provincetown	0	0.00%
Sandwich	56	31.64%
Truro	0	0.00%
Wellfleet	0	0.00%
Yarmouth	2	1.13%
Total Cape Vehicles	134	75.71%

2.3. Geographic analysis for potential Barnstable park-and-ride lot diversion to Hyannis Transportation Center Parking

The following figure shows areas where Barnstable park-and-ride patrons may potentially shift to the Hyannis Transportation Center parking facilities. The shaded area contains several zip codes where diversions may occur. By analyzing the pattern of vehicle origins identified in the 2001 License Plate study, approximately 11% of the current demand at the Exit 6 park-and-ride lot may eventually divert to Hyannis now that the Center is operational. To identify this percentage, it was assumed that half of the Hyannis and West Dennis vehicles would continue to use Exit 6, and that the other parts of the shaded area (especially southern Yarmouth) would divert to Hyannis. Based on these assumptions, there would be a potential reduction in demand at the Barnstable lot of approximately 40 vehicles per day at the Exit 6 lot. **However, only a portion of this potential reduction is likely to be realized as the parking at the transportation center is not free and parking at the Barnstable park-and-ride lot is free.** The proposed parking fee structure announced in May 2002 is described in section 1.4.



*Based on vehicle origins identified in License Plate studies performed in 2001. This assumes similar policies (e.g., free parking) at both locations.

3.0 Usage of the Park-and-Ride Lots

3.1. Vanpools

Three vanpools originate from the Barnstable lot and stop at the Sagamore lot and four vanpools originate at the Sagamore lot. Six of the seven vanpools have destinations in the Boston area and the seventh van goes to the Marlboro/Sudbury area. No vanpools are known to use the Harwich park-and-ride lot.

3.2. Casino Trips

The park-and-ride lots are used for transporting customers by bus to Foxwoods and Mohegan Sun Casinos in Connecticut. Copies of schedules are available in the appendix. The Foxwoods schedule indicates that there is currently one bus (Tremblays) per day which picks up riders at four locations including:

Barnstable park-and-ride lot	-	7:30 a.m.
Sagamore park-and-ride lot	-	7:45 a.m.

During observations, a Tremblays bus labeled “Foxwoods” departed at 7:05 a.m. from the Barnstable park-and-ride lot. Return trips leave Foxwoods at 5 p.m. and arrive as traffic conditions permit. The roundtrip fare is \$22.

3.3. Ski Trips

Plymouth and Brockton Street Railway Company operates trips to various ski areas. The 2002 schedule included seven trips beginning January 2nd and ending March 24th. P&B picks riders up at the Barnstable and Sagamore lots as well as in Plymouth. P&B also provides service from both lots for the Cape Cod Ski Club with day trips throughout the winter on Wednesdays and Sundays.

3.4. Observed Users

On Thursday, March 28, 2002, Cape Cod Commission transportation staff participated in an extensive data collection effort at both the Barnstable and Sagamore park-and-ride lots. Starting before 3 a.m. at Barnstable and soon thereafter at Sagamore, staff were at the sites counting the numbers of parked cars and then counting the number of passengers boarding the first bus. Throughout the day and evening, staff recorded parking lot usage and numbers of passengers boarding and disembarking from the various buses until after the last outbound bus left Sagamore at 10 p.m.

While it was difficult to count users of carpools and vans, observations of the various bus services were made. The following sections include summaries of these observations.

3.4.1. Barnstable Park-and-Ride Lot Users

Observations showed that the majority of passengers boarding and disembarking from buses at the park-and-ride lot were using P&B scheduled services. The following table summarizes the observations for the Barnstable park-and-ride lot taken on Thursday, March 28, 2002:

Service	Time	Boarding Passengers	Disembarking Passengers
P&B Scheduled Services	All Day	262	291
Tremblays (Girls' Hockey Team)	7:05 a.m.	30	
Tremblays (Foxwoods)	7:30 a.m.	6	
Northside	6:22 p.m.		8
Tremblays (Foxwoods)	7:31 p.m.		10

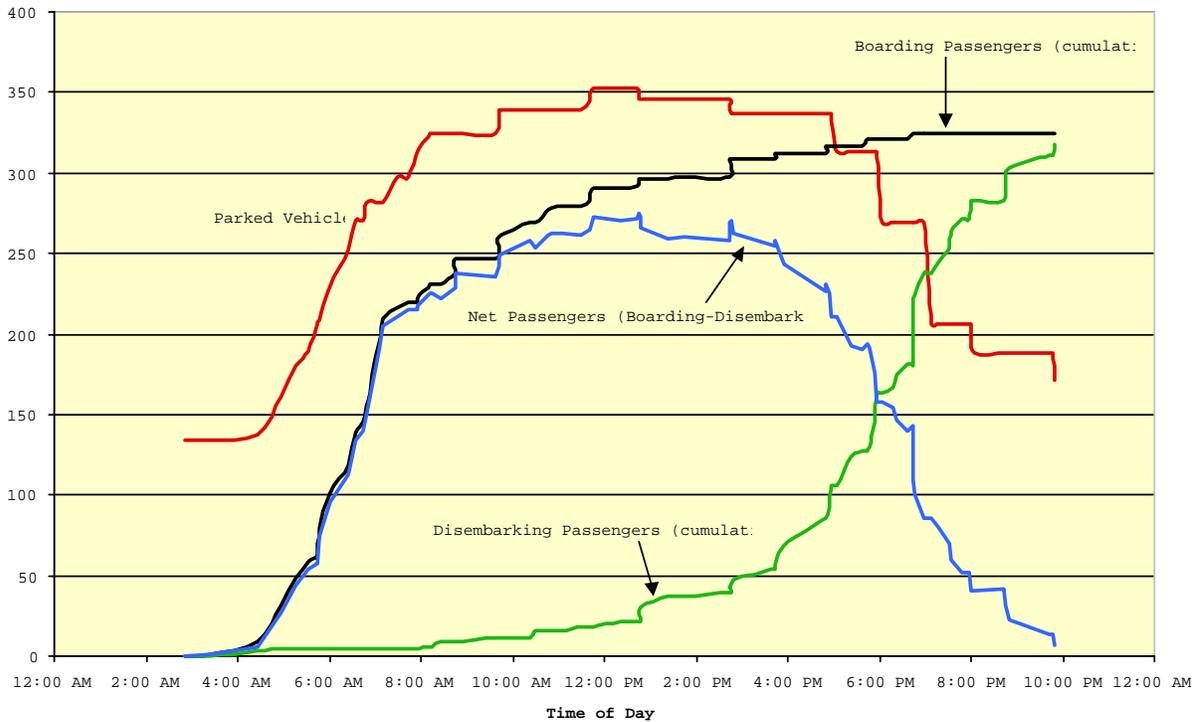
Other users' activity at the lot included carpools, vanpools, "kiss and ride" (i.e., drop-offs or pick-ups) and limousines. In many instances, these activities occurred at distant parts of the lot or during busy commuter bus times. Some notations were made on data collection field sheets. Since these results are incomplete they are not presented.

It should also be noted that Bonanza Bus Lines (Coach USA) started a new service from Hyannis with a stop in the Barnstable park-and-ride lot the first week in April, 2002, just after the lot observations were made. The new service continues on to Bourne (Tedeschi's Market), New Bedford, Fall River, Providence (with a connection to T.F. Green Airport), and finally to New York. Currently this service operates seven round trips per day from the Barnstable park-and-ride lot. A one-way fare to New York is \$26.

The local "Villager Breeze" route operated by the Cape Cod Regional Transit Authority (Cape Cod RTA) does not serve the Barnstable park-and-ride lot directly. The service operates on Route 132, within walking distance of the lot. The Cape Cod RTA also operates the "b-Bus" which is a dial-a-ride service that can be used to access the lot.

During the March 28, 2002 boarding and alighting counts, observations of parking usage were also recorded. The figure on the following page summarizes the data collected. Several variables are shown on the graph including the number of parked vehicles, the cumulative number of boarding passengers, the cumulative number of disembarking passengers, and the "net" passengers (difference of boarding – disembarking).

Barnstable Park & Ride Lot



It is interesting to note that the shape of the curve for the number of parked vehicles is similar to the curve for the “net” passengers. This “bell shaped” curve indicates a relatively balanced daily demand for boardings and alightings with a small residual net number of passengers that had boarded in excess of those that had alighted. The curve for parked cars indicated some residual parking (134 vehicles were parked at the beginning of the data collection, 171 remained at the end). These residual numbers observed on a Thursday are consistent with the overnight counts taken for this study that indicate the accumulation of vehicles prior to a weekend and a decline after the weekend.

The curves also demonstrate the activity of the lot. The shape of the boarding curve is very steep in the morning (when city-bound commuting is most intense) and flattens in the mid-day/evening. The disembarking curve stays relatively flat until the afternoon then rises sharply as the commuters return to the lot.

3.4.2. Sagamore Park-and-Ride Lot Users

Observations showed that the majority of passengers boarding and disembarking from buses at the park-and-ride lot were using P&B scheduled services. The following table summarizes the observations for the Barnstable park-and-ride lot taken on Thursday, March 28, 2002:

Service	Time	Boarding Passengers	Disembarking Passengers
P&B Scheduled Services	All Day	227	252
Tremblays (Girls' Hockey Team)	7:24 a.m.	17	
Tremblays (Foxwoods)	7:51 a.m.	0	
Cape Cod Adventures	10:20 a.m.	11	
P&B Charter	6:07 p.m.		9
Tremblays (Foxwoods)	7:11 p.m.		2

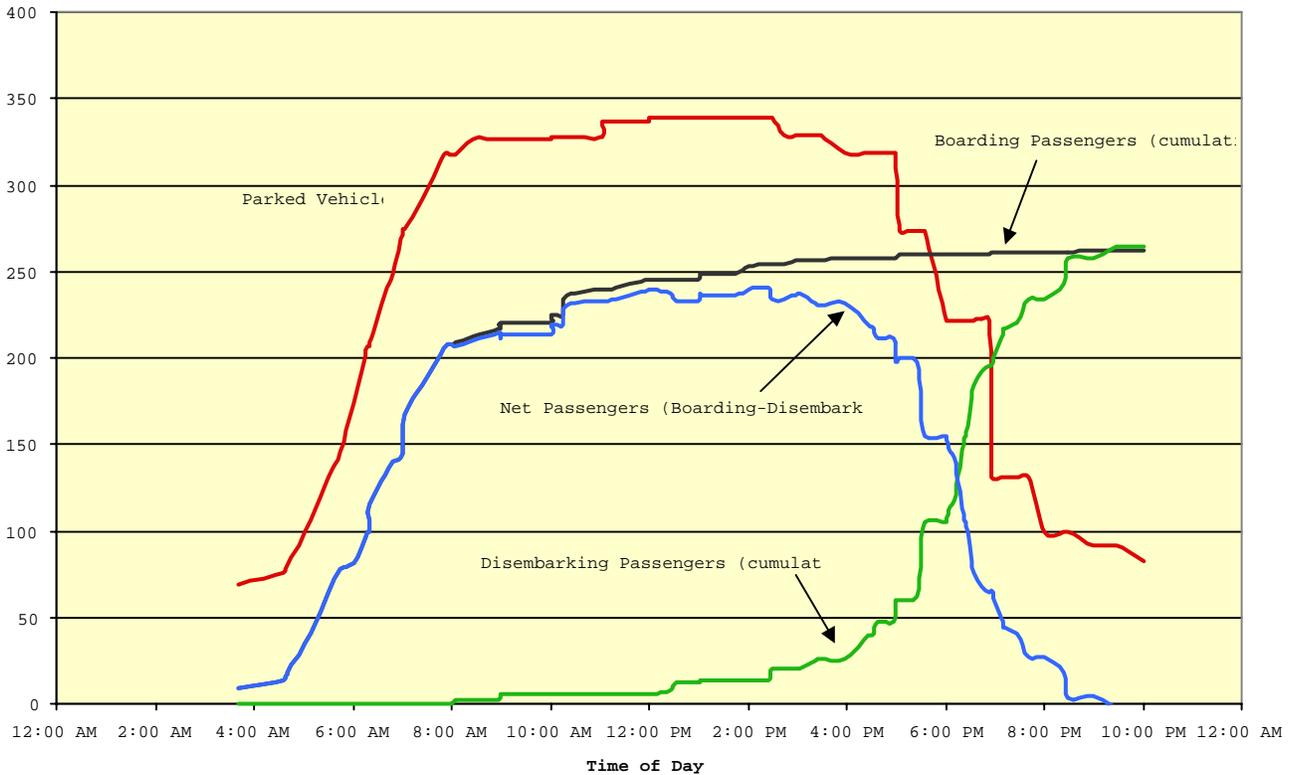
Other users' activity at the lot included carpools, vanpools, "kiss and ride" (i.e., drop-offs or pick-ups) and limousines. In many instances, these activities occurred at distant parts of the lot or during busy commuter bus times. Some notations were made on data collection field sheets. Since these results are incomplete they are not presented.

No Cape Cod RTA fixed route services stop at or near the Sagamore park-and-ride lot. The Cape Cod RTA does operate the "b-Bus" which is a dial-a-ride service that can be used to access the lot.

During the March 28, 2002 boarding and alighting counts, observations of parking usage were also recorded. The figure on the following page summarizes the data collected. Several variables are shown on the graph including the number of parked vehicles, the cumulative number of boarding passengers, the cumulative number of disembarking passengers, and the "net" passengers (difference of boarding – disembarking). It is interesting to note that the shape of the curve for the number of parked vehicles is similar to the curve for the net difference. These curves are separated due to residual parking (69 vehicles were parked at the beginning of the data collection, 83 remained at the end).

The curves also demonstrate the activity of the lot. The shape of the boarding curve is very steep in the morning (when city-bound commuting is most intense) and flattens in the mid-day/evening. The disembarking curve stays relatively flat until the afternoon then rises sharply as the commuters return to the lot.

Sagamore Park & Ride Lot

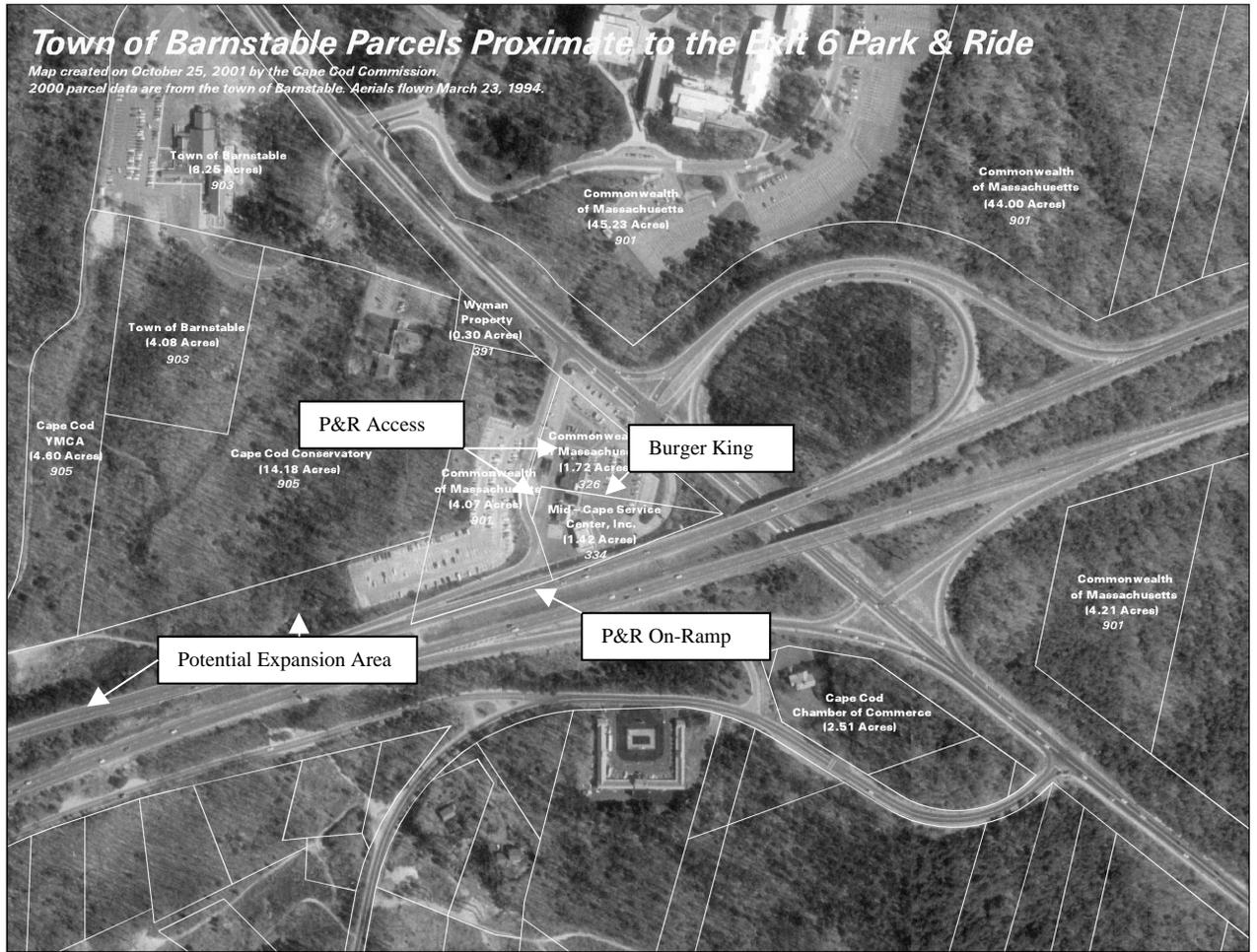


4.0 Potential for Expansion and New Service

One option to consider, given the growing popularity of leaving cars behind while commuting, is to increase the number of parking spaces. The following sections include discussions on expansion and service possibilities at the Cape Cod park-and-ride lots.

4.1. Barnstable Park-and-Ride Lot – Adjacent Parcels

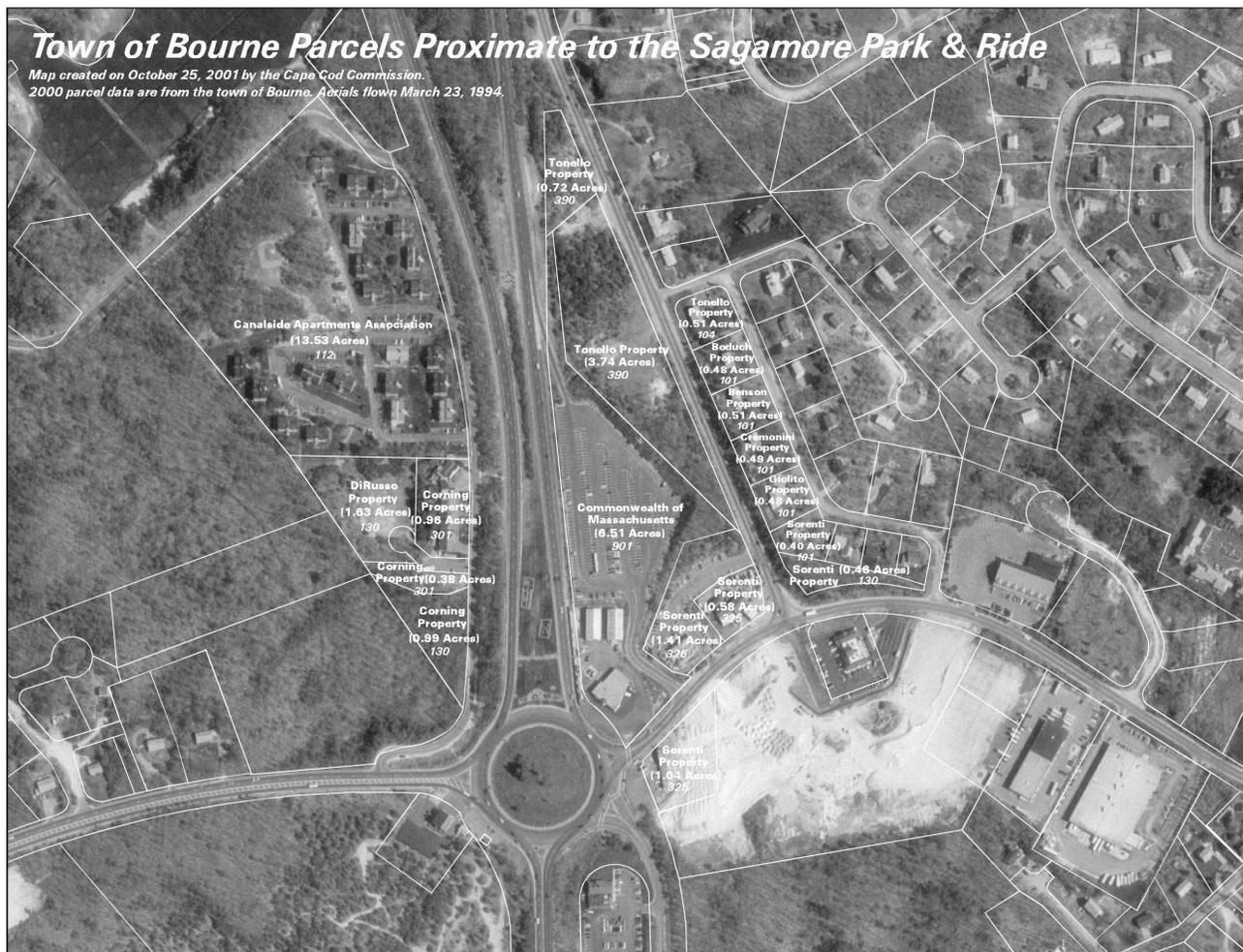
The following figure shows an aerial photograph of the Barnstable park-and-ride lot with property lines and built structures of adjacent parcels.



Note that the lot (aerial photo taken before expansion), in the northwest quadrant of the Route 6/Route 132 interchange, is constrained by the highways on two sides. To the northwest, the lot is bounded by property owned by the Cape Cod Conservatory. There is potential for expansion along the Route 6 right-of-way to the west, however, this would result in unfavorable walking distances for patrons and encourage ‘creative’ parking on landscaped areas. The terrain around the existing parking would also require extensive earthwork and retaining structures for expansion along the right-of-way. Another limitation is the competing use of the property for motorist services and a fast-food franchise. The leaseholder of the fast-food establishment has been vigorous in enforcing a ban on commuter parking in the areas nearest to the restaurant.

A possible option for expansion of parking would be to construct an additional level over the existing parking lot. This would maintain existing walking distances, create precipitation-free areas, and satisfy expected increases in park-and-ride activities. A parking structure may have the additional advantage of creating a separate pay lot for overnight and extended parking. Location of this structure should be considered over the existing parking adjacent to Route 6 as this is in a low area and would have less visual impact.

4.2. Sagamore Park-and-Ride Lot – Adjacent Parcels



In the *Sagamore Grade Separation Study* the flyover and associated ramps may bisect the existing park-and-ride lot. The report states, however, the commitment of MassHighway to maintain the current parking capacity in this area. New iterations of the grade-separation proposal show the lot being relocated to a nearby parcel southeast of the existing rotary that would be more convenient to travelers' services. According to the project's consultants, the relocated lot may include a minor increase in the amount of parking supply.

4.3. Service Expansion to Harwich

Based on the license plate survey at the Barnstable park-and-ride lot, 32% of the Cape Cod cars were registered in Harwich or East of Harwich. Using this as a potential market for diversion to the Harwich lot, based on 1100 commuters/day, the potential diversion is

approximately 350 riders or, based on auto occupancy of 1.2 persons per vehicle, results in 292 vehicles which is well beyond the capacity of the lot.

The parking lot includes 75 spaces and in 2001 it had an observed average occupancy of 18% with observed peak occupancy of 37%. Based on the peak occupancy, there are 47 available spaces. The observations were taken prior to the current schedule which has increased the travel time from Harwich considerably as all buses that serve Harwich divert to downtown Hyannis and then serve the Rte 132 lot. Previously (before June 29, 2002), the Harwich lot was included in the Orleans service that did not serve downtown Hyannis. The Orleans service has been included in the Provincetown service and the added stop increases travel time by bus to Boston from the Harwich lot by 20 minutes.

Observations were made during weekdays during the summer of 2003 and the lot had an average occupancy of 25% however there were a few days with uncharacteristically large numbers. To make a more reasonable comparison the median was chosen to represent the 2003 summer occupancy. This number median occupancy was 22%, an increase of 4% over the 2001 occupancy despite a reduction in service.

Currently service from Provincetown includes two round trips a day during winter weekdays and six round trips a day during the summer. All of these trips stop at the Harwich Park and Ride. The initial Harwich counts taken for this study were done in the summer of 2001 when 9 round trips per day stopped there. The observations made in the summer of 2003 were made when 6 round trips per day stopped there.

The increase in utilization despite a reduction in service frequency suggests that the lot is being used for other purposes besides park and ride associated with the P&B intercity bus service. This is supported by the sporadic incidents where the parking lot occupancy exceeds the mean by more than double. There was no pattern observed in the data and additional investigation may be required to understand this phenomena.

5.0 Overnight Parking - Study Methodology

This includes a summary and highlights of the “Overnight Study” available as a separate appendix.

The P&B bus service includes a last bus to Cape Cod with a scheduled arrival at the Sagamore lot at 1:45 a.m. and at the Barnstable lot at 2:00 a.m.. The earliest departure from the park-and-ride lots occurs at 3:25 am from the Barnstable lot and 3:40 a.m. from the Sagamore lot. This early departure was added during the course of the study and, prior to this addition, the earliest bus was one hour later.

Observations were made during the period between when the last bus arrived and the first bus departed each lot in order to determine the number of vehicles parking overnight. The observations were made at times to allow for vehicles associated with the last bus to leave and well in advance of the first departure to avoid confusing such vehicles with

overnight parking. The Barnstable lot is also adjacent to an all-night fast food drive up window and is often used by patrons to eat. The observations did not include these late night diners.

The overnight observations were made during three time periods: May 10-14, 2001, August 21-28, 2001, and October 13-19, 2001. Two forms of observations were made:

- Total vehicle counts – this count was made to determine the total number of vehicles in the lots, assumed to be the number of vehicles staying overnight from the day before.
- Remaining Vehicles – this count was made of “tagged vehicles” or vehicles that had been tagged with a marker placed under the driver side windshield wiper. Vehicles were tagged on weekdays and a Saturday morning during different time periods to determine length of stay characteristics.

5.1. Overnight Parking – Observations and Conclusions

The following sections of the report present data tables and results from the full report that can be found in the appendix.

5.1.1. Sagamore Park-and-Ride Lot: Overnight Parking Data

The following table shows the number of vehicles at the Sagamore park-and-ride lot (tagged on earlier dates) that were observed on subsequent dates.

Sagamore Park and Ride Lot - May 2001 Counts					
Date		Time	Count of Vehicles	Remaining from original count	% of Original Count
10-May-01	Thursday	3:40 AM	63	Original Count	
11-May-01	Friday	3:55 AM	58	58	92.06%
12-May-01	Saturday	4:00 AM	72	38	60.32%
13-May-01	Sunday	4:00 AM	74	29	46.03%
14-May-01	Monday	4:00 AM	34	18	28.57%

Sagamore Park and Ride Lot - August 2001 Counts					
Date		Time	Count of Vehicles	Remaining from original count	% of Original Count
22-Aug-01	Wednesday	4:10 AM	60	Original Count	
23-Aug-01	Thursday	3:25 AM	68	37	61.67%
24-Aug-01	Friday	3:20 AM	70	24	40.00%
25-Aug-01	Saturday	3:15 AM	75	17	28.33%
26-Aug-01	Sunday	3:15 AM	78	12	20.00%
27-Aug-01	Monday	3:20 AM	41	9	15.00%
28-Aug-01	Tuesday	3:20 AM	52	6	10.00%

Sagamore Park and Ride Lot - October 2001 Counts					
Date		Time	Count of Vehicles	Remaining from original count	% of Original Count
13-Oct-01	Saturday	3:25 AM	68	Original Count	
14-Oct-01	Sunday	3:10 AM	56	48	70.59%
15-Oct-01	Monday	3:15 AM	34	25	36.76%
16-Oct-01	Tuesday	3:10 AM	60	15	22.06%
17-Oct-01	Wednesday	3:00 AM	56	12	17.65%
18-Oct-01	Thursday	3:15 AM	66	11	16.18%
19-Oct-01	Friday	3:10 AM	71	10	14.71%

5.1.2. Barnstable Park-and-Ride Lot: Overnight Parking Data

The following table shows the number of vehicles at the Barnstable park-and-ride lot (tagged on earlier dates) that were observed on subsequent dates.

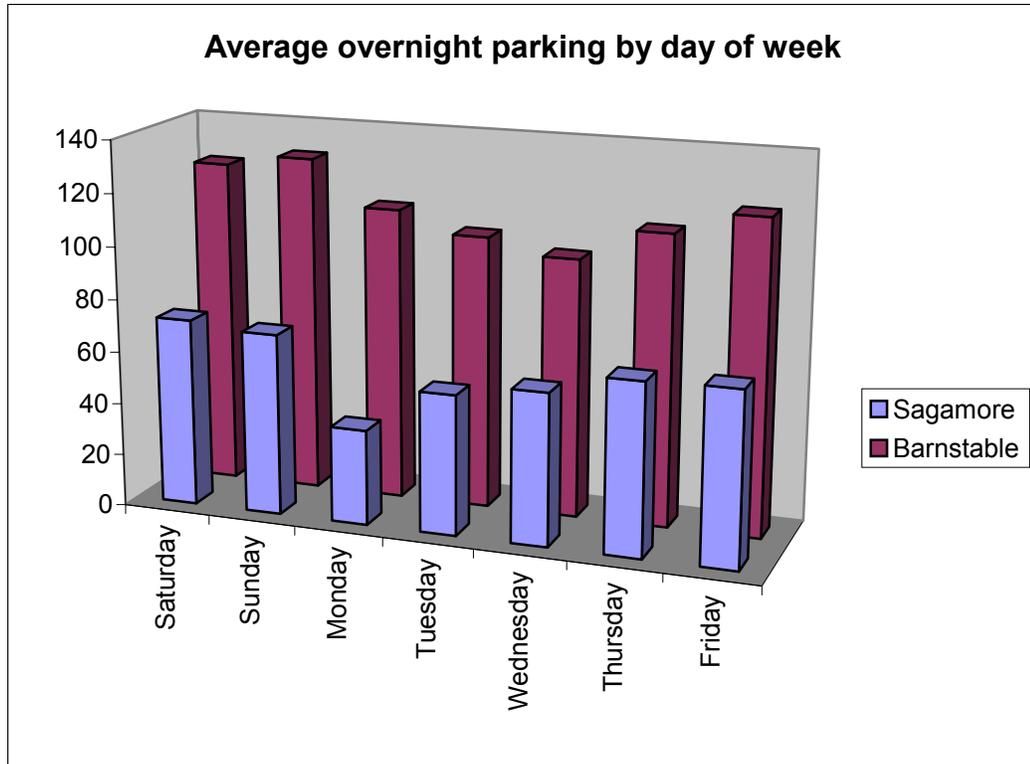
Barnstable Park and Ride lot - May 2001 Counts					
Date		Time	Count of Vehicles	Remaining from original count	% of Original Count
10-May-01	Thursday	3:20 AM	111	Original Count	
11-May-01	Friday	3:20 AM	128	79	71.17%
12-May-01	Saturday	3:25 AM	142	59	53.15%
13-May-01	Sunday	3:25 AM	140	49	44.14%
14-May-01	Monday	3:30 AM	119	38	34.23%

Barnstable Park and Ride lot - August 2001 Counts					
Date		Time	Count of Vehicles	Remaining from original count	% of Original Count
22-Aug-01	Wednesday	3:20 AM	91	Original Count	
23-Aug-01	Thursday	2:50 AM	103	60	65.93%
24-Aug-01	Friday	2:30 AM	100	49	53.85%
25-Aug-01	Saturday	2:40 AM	110	33	36.26%
26-Aug-01	Sunday	2:35 AM	108	27	29.67%
27-Aug-01	Monday	2:45 AM	102	23	25.27%
28-Aug-01	Tuesday	2:35 AM	100	18	19.78%

Barnstable Park and Ride lot - October 2001 Counts					
Date		Time	Count of Vehicles	Remaining from original count	% of Original Count
13-Oct-01	Saturday	2:45 AM	121	Original Count	
14-Oct-01	Sunday	2:30 AM	138	93	76.86%
15-Oct-01	Monday	2:45 AM	114	65	53.72%
16-Oct-01	Tuesday	2:40 AM	111	38	31.40%
17-Oct-01	Wednesday	2:35 AM	106	31	25.62%
18-Oct-01	Thursday	2:45 AM	118	24	19.83%
19-Oct-01	Friday	2:40 AM	130	22	18.18%

5.2. Average number of Vehicles Parked Overnight, by Day of Week

The following table presents the average number of observed vehicles parked overnight (between 2:00 a.m. and 3:00 a.m.) at each lot by the day of the week. These figures are based on an average of all of the observations taken during the course of this study.



5.2.1. Percentage of lot capacities occupied by vehicles parked overnight

The following table presents, by day of week, the portion of the lot capacities occupied by overnight vehicles. These figures are based on an average of all of the observations taken during the course of the study and are an indication of the additional daily commuter parking that could be made available by an effective restriction of overnight parking. On average, this would result in 60 additional spaces at Sagamore and 114 additional spaces at Barnstable.

Day of week	Sagamore	Percent of Capacity	Barnstable	Percent of Capacity
Saturday	72	19.01%	124	34.06%
Sunday	69	18.39%	129	35.25%
Monday	36	9.64%	112	30.59%
Tuesday	54	14.19%	104	28.49%
Wednesday	58	15.38%	99	26.99%
Thursday	66	17.42%	111	30.32%
Friday	66	17.60%	119	32.69%
Avg. Daily	60	15.95%	114	31.20%

5.3. Length of Stay – Vehicles Initially Parked on a Wednesday (August 22, 2001)

The estimated average length of stay for vehicles parked beginning on a Wednesday night for at least one overnight, less than 10 days, is 2.9 days in the Sagamore park-and-ride lot and 3.5 days in the Barnstable park-and-ride lot. The remaining vehicles staying 10 days or more are estimated as less than 7% or approximately 4 vehicles for the Sagamore lot and less than 14% or approximately 14 vehicles for the Barnstable lot.

Night Counted (August 22-28, 2001)		Barnstable Park-and-Ride Lot		Sagamore Park-and-Ride Lot	
		Number of Residual* Vehicles	Percentage of Weekday (Wed.) Sample	Number of Residual* Vehicles	Percentage of Weekday (Wed.) Sample
Wednesday		91	100%	60	100%
Thursday	1 Night	60	66%	37	62%
Friday	2 Nights	49	54%	24	40%
Saturday	3 Nights	33	36%	17	28%
Sunday	4 Nights	27	30%	12	20%
Monday	5 Nights	23	25%	9	15%
Tuesday	6 Nights +	18	20%	6	10%

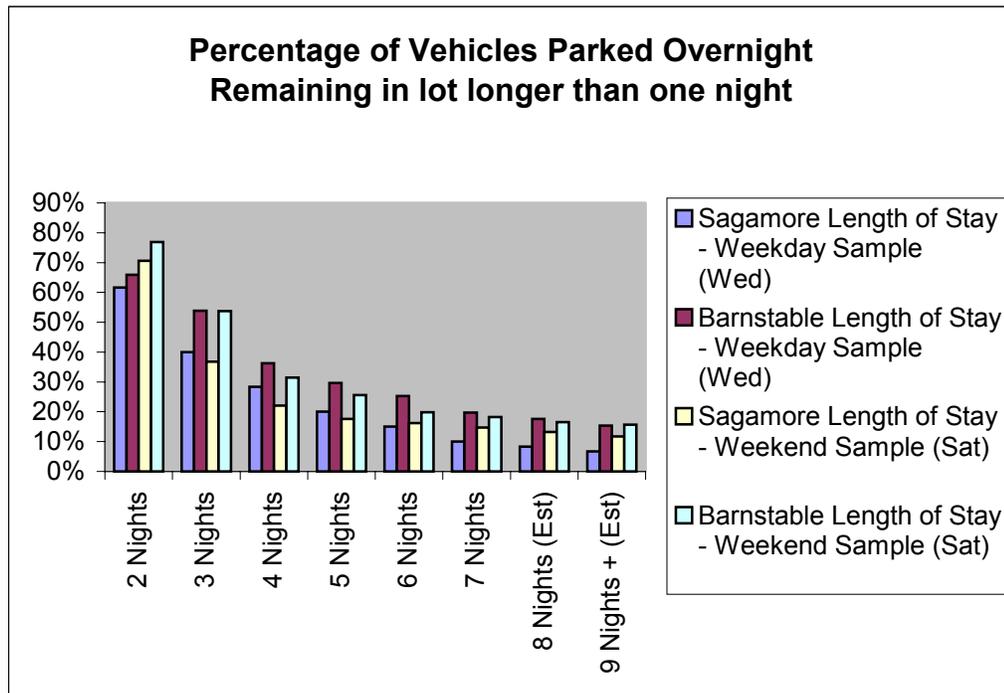
*Residual Vehicles: On the first night of parking, an informational flyer was placed on the windshields of cars in the lot. Each subsequent night the number of vehicles that had flyers were counted.

5.4. Length of Stay – Vehicles Initially Parked on a Saturday (October 13, 2001)

The estimated average length of stay for vehicles parked beginning on a Saturday night for at least one overnight, less than 10 days, is 3.1 days in the Sagamore park-and-ride lot and 3.3 days in the Barnstable park-and-ride lot. The remaining vehicles staying 10 days or more is estimated as less than 12% or approximately 8 vehicles for the Sagamore lot and less than 16% or approximately 20 vehicles for the Barnstable lot.

Night Counted (October 13-20, 2001)		Barnstable Park-and-Ride Lot		Sagamore Park-and-Ride Lot	
		Number of Residual* Vehicles	Percentage of Weekend (Sat.) Sample	Number of Residual* Vehicles	Percentage of Weekend (Sat.) Sample
Saturday		121	100%	68	100%
Sunday	1 Nights	93	77%	48	71%
Monday	2 Nights	65	54%	25	37%
Tuesday	3 Nights	38	31%	15	22%
Wednesday	4 Nights	31	26%	12	18%
Thursday	5 Nights	24	20%	11	16%
Friday	6+ Nights	22	18%	10	15%

*Residual Vehicles: On the first night of parking, an informational flyer was placed on the windshields of cars in the lot. Each subsequent night the number of vehicles that had flyers were counted.



5.5. Other Observations

The following sections summarize other issues that affect the lots including the use of the lots for lodging and bans on overnight parking.

5.5.1. Overnight

During the summer months, a large number of recreational vehicles use the Sagamore lot. The maximum number observed included 15 RVs on Saturday August 25, 2001. (There are also a number of occupied automobiles and light trucks, people who are spending the night in their cars. One particular automobile was observed consistently throughout summer in the Barnstable lot with between 1 and 4 people spending the night. Typically, one or two tractor trailers were parked overnight in Sagamore with an occasional trailer without a tractor left there overnight.

5.5.2. Barnstable Parking Prohibition

The project began before the expansion of the Barnstable lot and was suspended during construction of additional parking. The construction project included posting the lot, prohibiting overnight parking. The counts before and after the parking ban were compared to determine the effectiveness of this signage. Comparing the counts done in August (prior to construction) to the October counts (after construction), overnight parking actually went up 15% in October. This may indicate that the signage has little or no effect on curbing overnight parking.

6.0 Conclusions & Recommendations

A combination of Cape Cod's location, parking limitations at employment centers (e.g., Boston), efficient bus and ridsharing services, and convenient highway access has made MassHighway's park-and-ride lots on the Cape among the most popular in the Commonwealth. The fact that park-and-ride lot capacity is being strained can be viewed not so much as a "problem" but as a healthy indication that travelers are willing and eager to leave their cars behind.

To capitalize on the success of the Cape Cod park-and-ride lots, the following recommendations are offered:

- Install additional way-finding signs for both lots. Signs should be standard "Commuter Parking" or "Park-and-Ride" with direction information appropriate to the installation location in the following locations:

Sagamore Park-and-Ride Lot

@ Route 6 westbound, on Sagamore Bridge

@ Route 6 Scenic Highway eastbound

Barnstable Park-and-Ride Lot

@ Route 6 eastbound, between interchanges 5 & 6

@ Route 6 westbound, between interchanges 7 & 6

@ Interchange 6 off-ramp Route 6 eastbound

@ Interchange 6 off-ramp Route 6 westbound

Other recommendations include:

- Within each lot, include signage indicating telephone numbers for reporting problems (litter, vandalism, etc.).
- For Barnstable park-and-ride lot, revise future leases to allow for primary purpose (commuter parking) to be permitted throughout the site. This is expected to include the areas along the eastern perimeter of the parking area. These spaces are currently leased to the businesses in the facility and could provide additional park-and-ride spaces. Observations have indicated that this parking is not necessary for these businesses. Clear signage and delineation of the spaces permitted to be used for the purposes of park-and-ride must be provided.
- Consider construction of additional parking at Barnstable park-and-ride lot. Construction of another level would allow for "premium" covered spaces – justifying a potential parking charge. The construction of structured parking may not be feasible due to cost, and a cost benefit study should be done as well as an examination of the visual and other impacts of such a facility. At-grade options should also be considered which may require substantial cut and fill to expand into the adjacent hillside; or laterally along Route 6 which would increase walking distances.

- Improve safety and internal traffic circulation by enforcing ban on illegally parked vehicles. By installation of 10” vertical curbs, warning signage, and an active towing program, the parking of vehicles on landscaped areas and unmarked spaces can be eliminated.
- Encourage P&B to provide more frequent express service to the Harwich park-and-ride lot and to Orleans to intercept more patrons from Outer Cape communities. This would provide more parking availability at the Sagamore and Barnstable parking facilities.
- Coordinate parking policies with the Hyannis Transportation Center (HTC). Relocate all overnight parking to HTC through signage and vigorous enforcement of parking regulations.