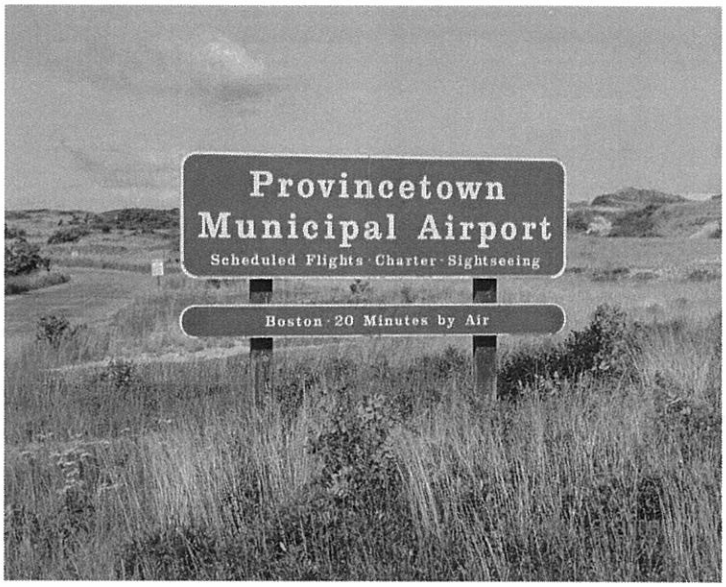
TRAFFIC OPERATION REPORT AND PARKING ANALYSIS

PROVINCETOWN MUNICIPAL AIRPORT
PROVINCETOWN, MASSACHUSETTS



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1.0 INTRODUCTION

This report evaluates traffic operations and parking demand to support the environmental analysis and permitting for the Provincetown Municipal Airport's Capital Improvements Plan. The November 2006 Report has been revised to respond to comments received on the Draft EIR/EA. The traffic analysis has been prepared in conformance with MEPA guidelines for Traffic Impact Assessment and the Cape Cod Commission's guidance documents. The report examines traffic impacts, parking, transportation demand management (TDM), bicycle facilities, and pedestrian accommodations. The operational efficiency of the existing parking facility, traffic operations at the intersection of Route 6 at Conwell Street and Race Point Road, and the intersection of Race Point Road with Airport Drive has been examined. Parking demand for existing and future conditions has also been evaluated.

Data collection revealed heavy use on the local roadways during the summer tourist season. However, traffic analysis at the intersection of Route 6 and Conwell Street showed that the existing signal could accommodate future increases in demand at the Airport. Additionally, the traffic analysis for the intersection of Airport Drive and Race Point Road also indicates that the intersection (unsignalized) can accommodate future increases. Concerning parking, the average weekday demand for parking at the Airport is met by the existing parking area, but the parking area is operating close to full capacity. The Airport's passenger parking area, however, does not meet existing peak demand periods. The need for additional parking spaces to meet existing peak demand periods, as well as future increases in passenger enplanements, is discussed further in the parking analysis section.

2.0 TRAFFIC OPERATIONS STUDY

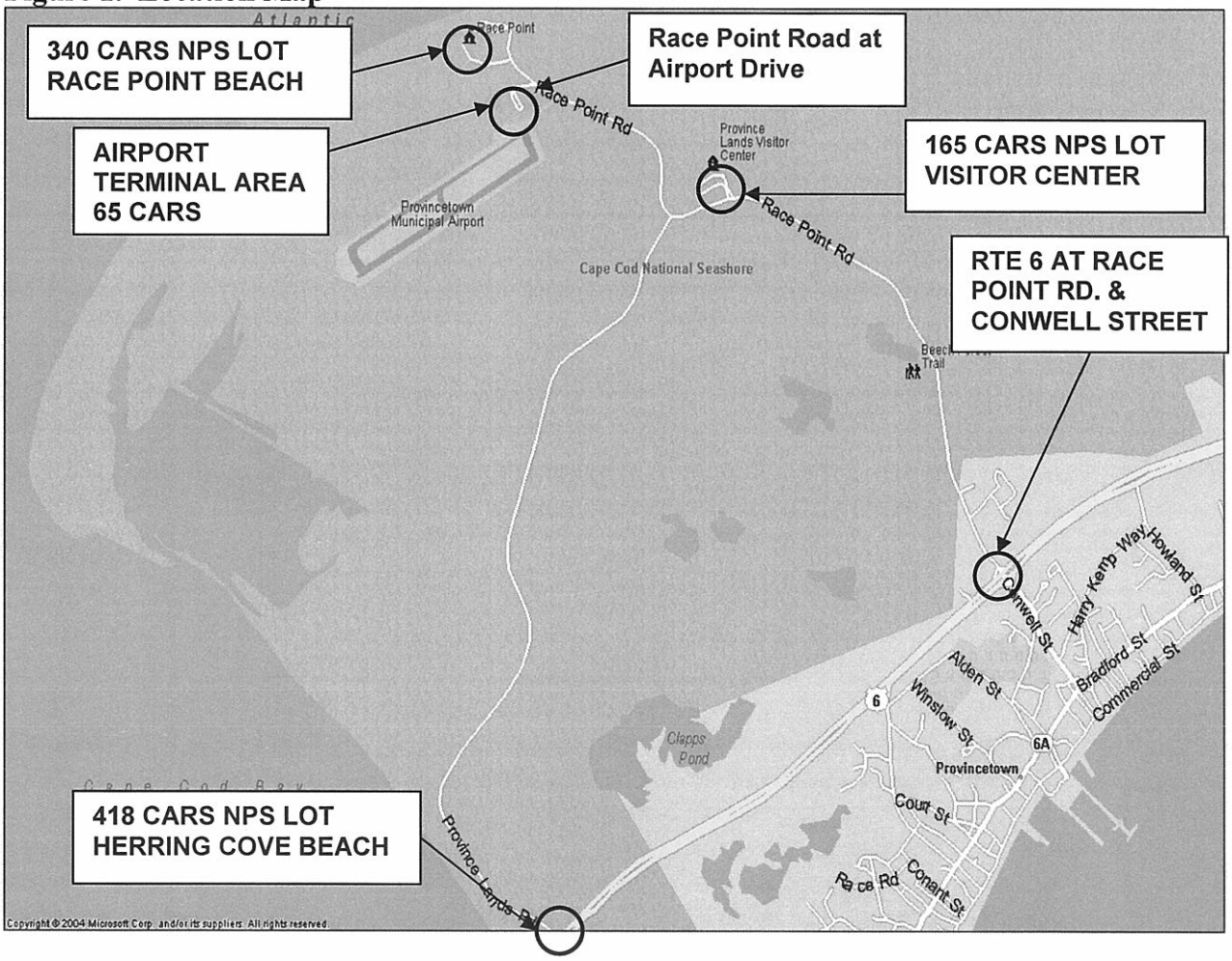
2.1 Background & Study Area

Provincetown Municipal Airport, located in Provincetown, MA, is a Primary Service Airport as defined by the Federal Aviation Administration (FAA). It serves scheduled commercial flights, private sightseeing tours, and general aviation. During the peak summer months of June, July, and August, there are six flights per day to Boston-Logan (BOS) in nine-passenger Cessna 402 commuter planes operated by Cape Air. During the peak seasons, each scheduled "flight" can actually require as many as six extra sections (aircraft) to accommodate passenger demand. In addition there are also sightseeing tours originating at the Airport, as well private general aviation activity. During the peak season in 2004, nearly 2,700 passengers arrived and departed through the Provincetown Municipal Airport monthly. The Airport is located within the Cape Cod National Seashore, part of the National Park Service (NPS), which also has a peak season with a significant increase in the number of summer visitors. The main access for both the Airport and the visitor center is Race Point Road. Figure 1 shows the location of the Airport, roads, the NPS Province Lands Visitor Center, NPS parking lots, and intersections within the study area.

Traffic on Race Point Road, leaving northbound from the intersection with Route 6 and Conwell Street, enters the National Seashore, passes an intersection with Province Lands Road, and arrives at the Airport driveway approximately two miles from the intersection with Route 6.

Race Point Road continues on to Race Point Beach, where special off-road vehicles may continue on the beach or along specific restricted Park Service roads. The NPS operates a large, five-bay parking facility at Race Point Beach that is capable of parking approximately 340 automobiles. The NPS also operates a 165 car parking lot at the Province Lands Visitor Center and a 418 car parking lot at Herring Cove Beach, at the west end of Province Lands Road. Although vehicles may arrive at the Airport via Province Lands Road, traffic counts conducted by the Cape Cod Commission (CCC) revealed traffic is very light on this road, and the vast majority of the traffic utilizes Race Point Road for Airport access. An analysis of the intersection of Province Lands Road and Route 6 was not scoped by MEPA and would not be warranted based on the CCC traffic counts.

Figure 1. Location Map



Within the study area, Race Point Road, Province Lands Road, and Conwell Street are all two lane local roads. The intersection of Race Point Road and Province Lands Road is under stop control. Route 6 is a major arterial with two travel lanes and a speed limit of 50 mph within the vicinity of the project. There are exclusive left turn lanes at the intersection with Conwell Street and Race Point Road.

2.2 Data Collection

Automatic Traffic Recorders (ATR) and Turning Movement Counts (TMC) were used to collect current traffic data in August 2006, and August/September 2007, which is within the peak period. The ATRs were placed along Airport Drive, west of Race Point Road, Race Point Road, south of Airport Drive, and on Race Point Road, north of Route 6 (near the National Park boundary). These ATRs collected average daily traffic volumes over an extended period of time and provide an hourly volume breakdown.

The TMCs were performed during the weekday morning, midday, evening and Saturday midday peak periods. The TMCs were conducted at the study area intersections of Route 6 at Race Point Road, and Race Point Road at Airport Drive. The 2007 existing traffic volumes are depicted on Figure 2, (at the end of the report) with the traffic count information provided in the *Technical Appendix* of this report.

In addition, a parking occupancy and turnover study of the Airport parking area was conducted. The results of the parking study are discussed in Section 3.0.

2.3 Level of Service Criteria

Level of Service (LOS) is a term used to describe the quality of the traffic flow on a roadway facility at a particular point in time. It is an aggregate measure of travel delay, travel speed, congestion, driver discomfort, convenience, and safety based on a comparison of roadway facility capacity to travel demand. Operating levels of service are reported on a scale of A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions. LOS A represents free-flow conditions with little or no traffic delays, while LOS F represents a forced-flow condition with long delays and traffic demands exceeding roadway capacity.

Roadway operating levels of service are calculated following procedures defined in the *2000 Highway Capacity Manual (HCM),* published by the Transportation Research Board. For signalized intersections, the operating level of service is based on travel delay. Delay can be measured in the field, but is generally calculated as a function of the traffic volume; quality of traffic progression; the green ratio; the cycle length; the v/c (volume/capacity) ratio; and the capacity of each intersection approach, as appropriate. Delay criteria for unsignalized intersections are calculated for the side street or minor street approach and for left turns from the major street. The specific criteria applied per the HCM for signalized and unsignalized intersections are summarized in Table 1.

Table 1 Intersection Level of Service Criteria		
Level of Service	**Average Stopped Delay per Vehicle (seconds)**	
	Signalized Intersection	**Unsignalized Intersection**
A	**0 - 10**	**0 - 10**
B	**>10 - 20**	**>10 - 15**
C	**>20 - 35**	**>15 - 25**
D	**>35 - 55**	**>25 - 35**
E	**>55 – 80**	**>35 - 50**
F	**>80**	**>50**
Source: *Highway Capacity Manual*, Special Report 209, Transportation Research Board; Washington, DC; 2000.		

2.4 Capacity Analysis

Existing Conditions

Existing peak hour traffic operations in the traffic study area were assessed from both a quantitative and qualitative perspective. The qualitative analysis is based on field observations made during peak traffic periods, while the quantitative analysis is based on calculated intersection operating levels of service as described in greater detail below.

Utilizing the TMC collected for this project, the Study Team conducted a level-of-service (LOS) analysis of the signalized intersection of Route 6 at Conwell Street and Race Point Road and the unsignalized intersection of Race Point Road and Airport Drive. The analysis was done by using the widely accepted software program Synchro v.6.0, which is based upon the concepts and procedures described in the HCM. The summary of the analysis is shown in Tables 2 and 3. In addition to delay, the 95th percentile queue length is shown, which represents the maximum queue length, and the volume to capacity ratio (v/c) is reported, which measures the saturation of a particular approach. Values typically fall between 0 and 1.0, with values over 1.0 implying that the approach or intersection exceeds capacity.

Table 2 Signalized Intersection Level of Service Summary

Intersection/Peak Period/Movement	2007 Existing Conditions				No Build 2024 Design Year Conditions				Build 2024 Design Year Conditions			
	V/C[a]	Delay[b]	LOS[c]	Queue[d] 50th/95th	V/C	Delay	LOS	Queue 50th/95th	V/C	Delay	LOS	Queue 50th/95th
Route 6 at Conwell Street and Race Point Road												
Weekday Morning Peak Hour:												
Route 6 EB L	0.04	2.9	A	3/12	0.05	3.1	A	4/15	0.05	3.1	A	4/15
Route 6 EB T	0.07	2.9	A	9/20	0.09	3.2	A	12/27	0.09	3.2	A	12/27
Route 6 EB R	0.02	2.8	A	0/7	0.02	3.0	A	0/8	0.02	3.0	A	0/8
Route 6 WB L	0.28	4.3	A	30/69	0.36	5.2	A	39/97	0.36	5.2	A	39/97
Route 6 WB T	0.08	3.0	A	11/23	0.10	3.3	A	14/30	0.10	3.3	A	14/30
Route 6 WB R	0.03	2.9	A	0/8	0.03	3.1	A	0/10	0.03	3.1	A	0/10
Conwell Street NB LT	0.27	27.2	C	22/52	0.32	25.4	C	28/61	0.32	25.2	C	28/61
Conwell Street NB R	0.04	25.7	C	0/26	0.05	23.6	C	0/28	0.05	23.4	C	0/28
Race Point Road SB LT	0.37	28.0	C	32/69	0.48	26.8	C	44/87	0.48	26.6	C	44/87
Race Point Road SB R	0.02	25.5	C	0/16	0.02	23.4	C	0/19	0.02	23.3	C	0/19
Overall	**0.30**	**9.6**	**A**	--	**0.38**	**9.8**	**A**	--	**0.38**	**9.7**	**A**	--
Weekday Midday Peak Hour:												
Route 6 EB L	0.08	3.5	A	7/23	0.12	4.7	A	10/30	0.12	4.7	A	10/30
Route 6 EB T	0.11	3.5	A	16/36	0.14	4.7	A	22/46	0.14	4.8	A	22/46
Route 6 EB R	0.03	3.3	A	0/11	0.03	4.4	A	0/12	0.03	4.4	A	0/12
Route 6 WB L	0.54	8.0	A	73/193	0.75	16.0	B	114/349	0.75	16.1	B	114/349
Route 6 WB T	0.13	3.7	A	20/43	0.17	5.0	A	27/55	0.17	5.0	A	27/55
Route 6 WB R	0.07	3.5	A	0/16	0.08	4.7	A	0/19	0.08	4.7	A	0/19
Conwell Street NB LT	0.58	31.2	C	49/97	0.55	23.5	C	62/116	0.56	23.8	C	63/118
Conwell Street NB R	0.07	25.2	C	0/32	0.08	19.1	B	0/34	0.08	19.1	B	0/34
Race Point Road SB LT	0.44	28.1	C	43/85	0.44	21.7	C	55/104	0.45	21.8	C	57/107
Race Point Road SB R	0.02	24.9	C	0/17	0.02	18.8	B	0/19	0.02	18.8	B	0/19
Overall	**0.55**	**10.9**	**B**	--	**0.70**	**11.9**	**B**	--	**0.70**	**12.0**	**B**	--
Weekday Evening Peak Hour:												
Route 6 EB L	0.08	3.6	A	8/26	0.12	5.0	A	11/32	0.13	5.1	A	12/33
Route 6 EB T	0.20	3.9	A	34/69	0.27	5.5	A	48/85	0.27	5.6	A	48/85
Route 6 EB R	0.03	3.4	A	0/12	0.04	4.7	A	0/13	0.04	4.7	A	0/13
Route 6 WB L	0.41	6.7	A	39/111	0.60	12.6	B	61/170	0.60	12.7	B	61/170
Route 6 WB T	0.11	3.7	A	16/37	0.14	5.1	A	23/45	0.14	5.2	A	23/45
Route 6 WB R	0.03	3.5	A	0/10	0.04	4.7	A	0/13	0.04	4.8	A	0/13
Conwell Street NB LT	0.36	24.1	C	32/67	0.36	20.9	C	42/84	0.36	20.9	C	42/85
Conwell Street NB R	0.11	22.2	C	0/40	0.13	19.2	B	0/43	0.13	19.1	B	0/43
Race Point Road SB LT	0.58	27.5	C	54/104	0.58	24.1	C	70/130	0.59	24.1	C	71/132
Race Point Road SB R	0.02	21.7	C	0/17	0.02	18.5	B	0/19	0.02	18.5	B	0/19
Overall	**0.45**	**10.1**	**B**	--	**0.59**	**11.0**	**B**	--	**0.60**	**11.0**	**B**	--
Saturday Midday Peak Hour:												
Route 6 EB L	0.11	3.4	A	9/29	0.16	4.7	A	13/39	0.16	4.7	A	13/40
Route 6 EB T	0.07	3.3	A	10/24	0.10	4.4	A	14/32	0.10	4.5	A	14/32
Route 6 EB R	0.03	3.2	A	0/10	0.03	4.2	A	0/12	0.03	4.3	A	0/12
Route 6 WB L	0.37	5.4	A	43/107	0.50	8.5	A	61/156	0.50	8.6	A	62/156
Route 6 WB T	0.11	3.5	A	15/34	0.15	4.7	A	22/46	0.15	4.7	A	22/47
Route 6 WB R	0.05	3.3	A	0/13	0.07	4.4	A	0/17	0.07	4.5	A	0/17
Conwell Street NB LT	0.54	29.8	C	45/89	0.51	22.6	C	57/108	0.51	22.6	C	57/108
Conwell Street NB R	0.05	25.3	C	0/29	0.06	19.2	B	0/31	0.06	19.1	B	0/31
Race Point Road SB LT	0.50	28.9	C	46/91	0.50	22.4	C	61/113	0.51	22.4	C	62/115
Race Point Road SB R	0.03	25.2	C	0/23	0.04	19.0	B	0/25	0.04	19.0	B	0/26
Overall	**0.40**	**11.1**	**B**	--	**0.50**	**10.5**	**B**	--	**0.50**	**10.6**	**B**	--

[a] *Volume to Capacity Ratio*
[b] *Average Delay Time in Seconds*
[c] *Level-of-Service*
[d] *Queue Length in Feet.*
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound; NEB Northeastbound; SEB = Southeastbound; SWB = Southwestbound; NWB = Northwestbound.
L = Left Turn; T = Through; R = Right Turn; LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn; LR = Shared Left/Right-turn; LTR = Shared Left/Through/Right-turn.

Table 3 Unsignalized Intersection Level of Service Summary

Intersection/Peak Period/Movement	2007 Existing Conditions				No Build 2024 Design Year Conditions				Build 2024 Design Year Conditions			
	V/C[a]	Delay[b]	LOS[c]	Queue[d]	V/C	Delay	LOS	Queue	V/C	Delay	LOS	Queue
Race Point Road at the Provincetown Airport Driveway												
Weekday Morning Peak Hour:												
Provincetown Airport Driveway EB LR	0.00	8.5	A	0	0.00	8.5	A	0	0.00	8.5	A	0
Race Point Road NB LT	0.01	1.5	A	1	0.01	1.3	A	1	0.01	1.5	A	1
Race Point Road SB TR	0.02	0.0	A	1	0.02	0.0	A	0	0.02	0.0	A	0
Weekday Midday Peak Hour:												
Provincetown Airport Driveway EB LR	0.03	8.8	A	2	0.03	8.9	A	2	0.04	8.9	A	3
Race Point Road NB LT	0.01	0.7	A	1	0.01	0.6	A	1	0.02	0.8	A	1
Race Point Road SB TR	0.04	0.0	A	0	0.05	0.0	A	0	0.05	0.0	A	0
Weekday Evening Peak Hour:												
Provincetown Airport Driveway EB LR	0.02	9.7	A	2	0.03	10.0	A	2	0.03	10.0	A	2
Race Point Road NB LT	0.01	1.2	A	1	0.01	1.0	A	1	0.02	1.2	A	1
Race Point Road SB TR	0.13	0.0	A	0	0.16	0.0	A	0	0.16	0.0	A	0
Saturday Midday Peak Hour:												
Provincetown Airport Driveway EB LR	0.02	8.5	A	2	0.02	8.6	A	2	0.02	8.6	A	2
Race Point Road NB LT	0.01	1.9	A	1	0.01	1.7	A	1	0.02	1.8	A	1
Race Point Road SB TR	0.02	0.0	A	0	0.02	0.0	A	0	0.02	0.0	A	0

[a] *Volume to Capacity Ratio*
[b] *Average Delay Time in Seconds*
[c] *Level-of-Service*
[d] *Queue Length in Feet.*
NB = Northbound; SB = Southbound; EB = Eastbound.
LT = Shared Left-turn/Thorough; TR Shared Through/Right-turn; LR = Shared Left/Right-turn.

As shown in Table 2, the overall LOS during all time periods is acceptable, with all movements ranging from LOS A-C. Turning movements relevant to the Airport route, such as Race Point Road southbound, have acceptable delays (LOS C or better). All unsignalized intersections have LOS A as shown in Table 3.

Future Conditions

In order to assess the potential traffic impacts of the proposed project, existing traffic volumes were projected to a future design year. A seventeen-year traffic projection was utilized on the study area roadways for consistency with the Providence Airport 2005 Master Plan. It should be noted that this horizon exceeds the MEPA guidelines for the preparation of traffic impact studies, which typically prescribes a five-year horizon. Under the No-Build alternative, traffic increases along the study area roadways are associated with normal traffic growth patterns as well as other currently planned development projects.

The 2024 Build scenario consists of anticipated traffic associated with the project added to upon the 2024 No-Build scenario traffic volumes. The impacts of the proposed development may be determined by making comparisons to the 2024 No-Build alternative, which assumes that the project is not built. The development and analysis of these future traffic flows for both the No-Build and Build conditions are described in the following text.

Traffic Growth from Other Developments
Traffic growth on area roadways is a function of the expected land development in the immediate area, as well as the surrounding region. Several methods are used to estimate this growth. To develop the seventeen-year forecast, two components of traffic growth were considered: traffic generated by both background growth and planned projects.

First, an annual-average traffic-growth percentage was determined. After a review of CCC historical traffic volume data at several locations within the Town of Provincetown, it was determined that traffic volumes have actually decreased by approximately 0.6 percent per year over the past 10 years. However, to present a conservative (worst case) analysis and to match standard regional/local engineering practices, an increase of 1.0 percent per year compounded annual growth rate was used to account for general background traffic growth.

Second, any planned or approved specific developments were included that would generate a significant volume of traffic on study area roads within the next 17 years. Based on discussions with officials from the Town of Provincetown in February-March 2008, there are several projects planned that will add traffic to the study area in the near future:

- Proposed 19-35 Race Point Road Residential Development, Provincetown, MA. This proposed project consists of the construction of 35 residential apartment units located off Race Point Road just north of the intersection of Route 6, and to the south of the Provincetown Airport. Traffic volumes associated with this development were estimated based on trip generation calculations provided by the ITE and distributed based on existing roadway travel patterns. The network sheets are included in the *Technical Appendix*.

- Proposed Shankpainter Road Residential Development, Provincetown, MA. At this time, it is anticipated that a future development will be constructed on Shankpainter Road, located off Route 6 east of the study area. This project is at its preliminary stages and may undergo several alterations before a final construction plan is determined. In order to provide a conservative estimation of traffic conditions, it was assumed that this development would be constructed as a 40-unit apartment complex. This estimate was based on discussions with the Town of Provincetown and applied to the roadway based on trip generation calculations provided by the ITE and distributed based on existing roadway travel patterns. These trips are included in the *Technical Appendix*.

Additionally, based on a review of the MassHighway Transportation Improvement Plan, no roadway improvement projects (outside of routine maintenance) are anticipated within the study area.

The 2024 No-Build traffic volume networks were developed by applying a background growth rate and by adding traffic associated with proposed developments to be completed by others. The 2024 No-Build peak-hour traffic flow networks are represented on Figure 3.

Project Generated Traffic Growth

Anticipated traffic volumes to be generated by the proposed development were determined and assigned to the 2024 No Build roadway networks in order to develop the 2024 Build traffic scenarios. Procedures used to generate and assign trips to the roadway networks are described below and discussed in more detail in a memo included in the *Technical Appendix.*

Project Trip Generation

Anticipated 2024 traffic volumes were based on Passenger Enplanement projections published in the Provincetown Airport 2005 Master Plan. The forecasted enplanement totals were applied to a trip rate which was empirically calculated based on the existing amount of vehicular traffic entering and exiting the site. This methodology was suggested by CCC and is similar to one used to generate vehicular trips associated with the Terminal project at the Barnstable Airport. The projected number of trips was then subtracted from the existing traffic, in order to arrive at the increased amount of trips estimated to be generated by the Provincetown Airport in the future.

Presently, 141 passengers use the Provincetown Airport on a peak period average day (as stated in the 2005 Master Plan). Reviewing traffic counts conducted at the site driveway, 13 vehicles access the site (10 enter, 3 exit) during the weekday morning peak period, 52 vehicles access the airport during the weekday midday peak period (24 enter, 28 exit), 39 access the airport during the weekday evening peak period (21 enter, 18 exit) and 41 access the airport during the Saturday midday peak period (21 enter, 20 exit). Projecting these volumes based on the anticipated future passenger count results in motor vehicle trip increases ranging from 2 to 8 vehicles during the peak periods. The analysis results are summarized in Table 4.

Table 4 Trip Generation Using Empirical Method							
	(A) Existing Number of Daily Passengers[1]	(B) Existing Airport Generated Trips[2]	(C=A/B) Trip Generation Rate	(D) Projected Number of Daily Passengers[1]	(E=DxC) Projected Airport Generated Trips	**(F=E-B) Trip Increase**	**(G=F/B) Percentage of Trip Generation Increase**
Weekday Morning Peak Hour	141	13	0.09	162	15	**2**	***15.4%***
Entering		*10*			*12*	***2***	***20.0%***
Exiting		*3*			*3*	***0***	***0.0%***
Weekday Midday Peak Hour	141	52	0.37	162	60	**8**	***15.4%***
Entering		*24*			*28*	***4***	***16.7%***
Exiting		*28*			*32*	***4***	***14.3%***
Weekday Evening Peak Hour	141	39	0.28	162	45	**6**	***15.4%***
Entering		*21*			*24*	***3***	***14.3%***
Exiting		*18*			*21*	***3***	***16.7%***
Saturday Midday Peak Hour	141	41	0.29	162	47	**6**	***14.6%***
Entering		*21*			*24*	***3***	***14.3%***
Exiting		*20*			*23*	***3***	***15.0%***

[1] *Based on the 2024 Demand Forecasts Section of the 2005 Airport Master Plan, Peak Period Average Day.*
[2] *As observed in August 2007.*

Project Trip Distribution

The directional distribution of proposed new site traffic on the area roadways is based on the existing traffic flow pattern observed within the study area and is shown in Table 5. This distribution is also depicted on Figure 4.

Table 5 Trip Distribution Summary		
Road	**Direction (To/From)**	**Percent Site Traffic Distribution**
Route 6	East	40%
Route 6	West	20%
Conwell Street	South	40%
	Total	**100%**

The results indicate approximately 40 percent of the new site traffic is expected to and from the east on Route 6, 20 percent is expected to and from the west on Route 6 and 40 percent is expected to and from the south on Conwell Street.

The site generated volumes are shown in Figure 5 for the weekday morning, midday, and evening and Saturday midday peak hours.

Future Traffic Volumes

Projected site-generated traffic volumes were combined with the 2024 No Build peak hour traffic volumes. The resulting traffic flows, illustrated on Figure 6, represent the 2024 Build weekday morning, midday, evening, and Saturday midday peak periods.

Summary of LOS Analysis Results

Level of Service analyses were conducted utilizing Synchro software methodology to determine the Existing, No Build and Build peak hour operating levels of service at the study area intersections. The results for signalized intersection are shown in Table 2, with the unsignalized intersections shown on Table 3.

Signalized Intersection of Route 6 at Conwell Street and Race Point Road

Under all conditions (2007 Existing, 2024 No Build and 2024 Build), this intersection currently operates at LOS A during the weekday morning peak hour and at LOS B during the weekday midday, evening and Saturday midday peak hours.

Unsignalized Intersection at Race Point Road and Airport Drive

Under all conditions, the critical movements (all movements from the Provincetown Airport driveway) at this unsignalized intersection operate at LOS A during the weekday morning, midday, and evening and Saturday midday peak hours.

2.5 Motor Vehicle Crash Data

Crash data was obtained from the MassHighway Crash Database for accidents occurring within the study area over the most recent three-year period, 2004-2006. Crash data for a given location is provided in terms of severity (property damage only, injury or fatality), collision type, and number of accidents. A summary of this crash data is shown in Table 6. A total of 6 crashes occurred within the study area roadways, all at the intersection of Route 6 at Race Point Road and Conwell Street. Approximately 50 percent of the accidents were either angle type or rear end crashes, indicating turning conflicts with through movements or failures to yield. No fatalities occurred within the study area during this period.

Crash data for a given location is normally identified as either a spot location (intersection, bridge or major driveway), or road section (mid-block) of varying length. The accident rate basis for calculations presented in Table 6 is based on spot locations. The formula for calculating the crash rate for an intersection or spot location is typically expressed in million entering vehicles (MEV).

High-accident locations can be identified where frequency of occurrence exceeds the average rates for similar locations or conditions. The calculated rates for each intersection were compared with MassHighway's 2005 Average Accident Rates for District 5, which includes the South Shore and the Cape. The average MEV for District 5 is 0.84 for signalized intersections and 0.59 for unsignalized intersections. The calculated crash rate for the intersection of Route 6 at Race Point Road and Conwell Street is 0.33, lower than average for signalized intersections. The crash rate calculations are provided in the *Technical Appendix*.

Table 6 Accident Data Summary

	Number of Accidents		Crash Rate[b]	Severity			Type			
Location	Total	Avg/Year		PD[a]	PI[b]	F[c]	CM[d]	RE[e]	HO[f]	Other
Route 6 at Race Point Road and Conwell Street	6	2.00	0.33	1	5	0	1	2	2	1
Race Point Road at the Provincetown Airport Driveway	0	0.00	0.00	0	0	0	0	0	0	0
Total	**6**	-	-	**1**	**5**	**0**	**1**	**2**	**2**	**1**

[a]Property Damage Only; [b]Personal Injury; [c]Fatality; [d]Cross Movement (or angle); [e]Rear End; [f]Head On.

[b]Crash Rate Per Million Entering Vehicles (MEV)

3.0 PARKING CAPACITY ANALYSIS

3.1 Data Collection

The parking study was conducted on Thursday, August 24, 2006, immediately after the TMCs and was taken during three time periods, from 9:10 AM to 9:40 AM, 1:40 PM to 2:10 PM, and 6:20 PM to 6:50 PM. At three 10-minute intervals within each time period, the field engineer wrote down the license plates of all of the vehicles in the parking lot. The three intervals helped create a better understanding of the parking turnover and occupancy during the set time periods.

3.2 Parking Data Review

The existing PVC parking lot has a total of 62 spaces, including 3 spaces designated for handicapped plate vehicles and 5 for the Enterprise Rental Car Company. Employee parking is in a separate area and is not included in this analysis. The parking occupancy data was analyzed and sub-divided into three categories, regular passenger parking, rental car spaces, and handicapped spaces. Table 7 reviews the occupancy of the existing spaces taken during a single weekday in August 2006. The percentage has not been averaged or adjusted. Additional qualitative observations were made during a week in the summer of 2007. Occupancy was higher than that observed in 2006.

Table 7 Parking Lot Weekday Occupancy			
	AM Period	**Midday Period**	**PM Period**
Passenger Parking	63.2 %	83.9 %	66.1 %
Rental Cars	100.0 %	100.0 %	100.0 %
Handicapped	0.0 %	22.2 %	0.0 %
Overall	63.1 %	82.3 %	74.7 %

As shown in Table 7, during the midday the parking lot is fairly well occupied. The rental car spaces were always occupied because the car rental company transfers cars as needed from the employee lot. The field engineer observed that there were additional rental cars parked in conventional two hour spaces. It is important to note, applying duration data to the occupancy numbers, that 16 spaces were occupied by vehicles during the entire day. Excluding the 5 rental car spaces, these long-term occupants account for 27% (16 out of 59) of the overall parking occupancy. In terms of turnover, there was very little turnover observed during any of the observation periods. During all intervals, there were no changes at any of the parking spaces in at least 85% of the available spaces.

3.3 Parking Generation

Recognized guidelines for parking and trip generation are published by the Institute of Transportation Engineers (ITE) for many different land uses based upon studies taken across the United States. The land use code 021 (Commercial Airport) is normally used for estimating the number of spaces required at a similar Airport. However, Table 8 summarizes the number of spaces necessary at the Airport during the peak hour, based upon the number of passenger enplanements, obtained from the 2005 Airport Master Plan. The projections utilizing enplaning passengers, shown in Table 8, is a more accurate projection to use compared to flights, because of the variation of the definition of a flight and specific operating condition at the Airport. Since Cape Air aircraft are much smaller than the typical commercial flight, a flight at the airport can actually involve several planes as explained in Section 2.1.

Current peak period parking space needs range from 62 to 126 spaces using passengers over weekday or weekend data. It is projected that for the highest demand period of 2024 on a Saturday during the peak season, 145 spaces are predicted to be necessary compared to the 62 existing spaces. Thus, there is a need for up to 83 additional spaces to meet future needs.

Table 8 Parking Generation Summary

Generator Type	Peak Period	2004 Existing Conditions			2024 Projected Conditions		
		Passengers[1]	Average Parking Rate[2]	Parking Spaces Required	Passengers[1]	Average Parking Rate	Parking Spaces Required
Enplaning Passengers	Weekday	141 enplaning passengers	0.44	62	162 enplaning passengers	0.44	72
	Saturday		0.89	126		0.89	145
	Sunday		0.84	119		0.84	137

[1] *Information from the Provincetown Municipal Airport 2005 Master Plan*
[2] *Values from ITE parking Generation handbook, 2nd Edition, 1987.*

4.0 TRANSPORTATION DEMAND MANAGEMENT REVIEW (TDM)

Currently, there are three measures in place that will continue to reduce parking demand, referred to collectively as Transportation Demand Management (TDM). These measures are rental car availability, taxi cabs, and a shuttle bus service to Provincetown managed by the Cape Cod Regional Transit Authority (CCRTA). Enterprise Rent-A-Car currently operates out of the Airport and has 5 dedicated spaces in the parking lot. There was turnover in these spaces as the rental agency rented out the vehicles and accepted the return of old ones.

The primary taxi cab companies in Provincetown typically have one taxi that is coordinated with the arrival of the scheduled Cape Air commercial service.

The Provincetown shuttle bus previously had a scheduled stop at the Airport to pick up passengers for transit to Provincetown center, approximately 2.5 miles to the south of the Airport. The shuttle bus modified the schedule to a call when needed system, where the bus will stop at the Airport when called en-route. The shuttle bus does not seem to be synchronized with Cape Air commercial flights.

Another underutilized TDM application is parking enforcement. The Airport Commission has reported in the past that tourists traveling to Race Point Beach would utilize the Airport parking lot (no fee) as opposed to paying the National Seashore fee at the beach. Especially on the weekends, this problem has contributed to the parking shortage at the Airport.

5.0 BICYCLE AND PEDESTRIAN ACCOMMODATIONS REVIEW

Bicycles are typically not a mode of transportation used to go to the Airport. However the Provincetown Airport is immediately adjacent to the Province Lands Bicycle Path, a dedicated off-road paved path that leads most of the way to Provincetown center. One could hypothesize that a customer or employee could use their bicycle if they were taking a private sightseeing tour or utilizing general aviation (i.e. private plane).

Race Point Road does not have any sidewalks throughout its entire length and pedestrians are prohibited from using the bicycle path as a walkway. Within the Airport terminal drop-off zone, there is adequate pedestrian access.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Traffic

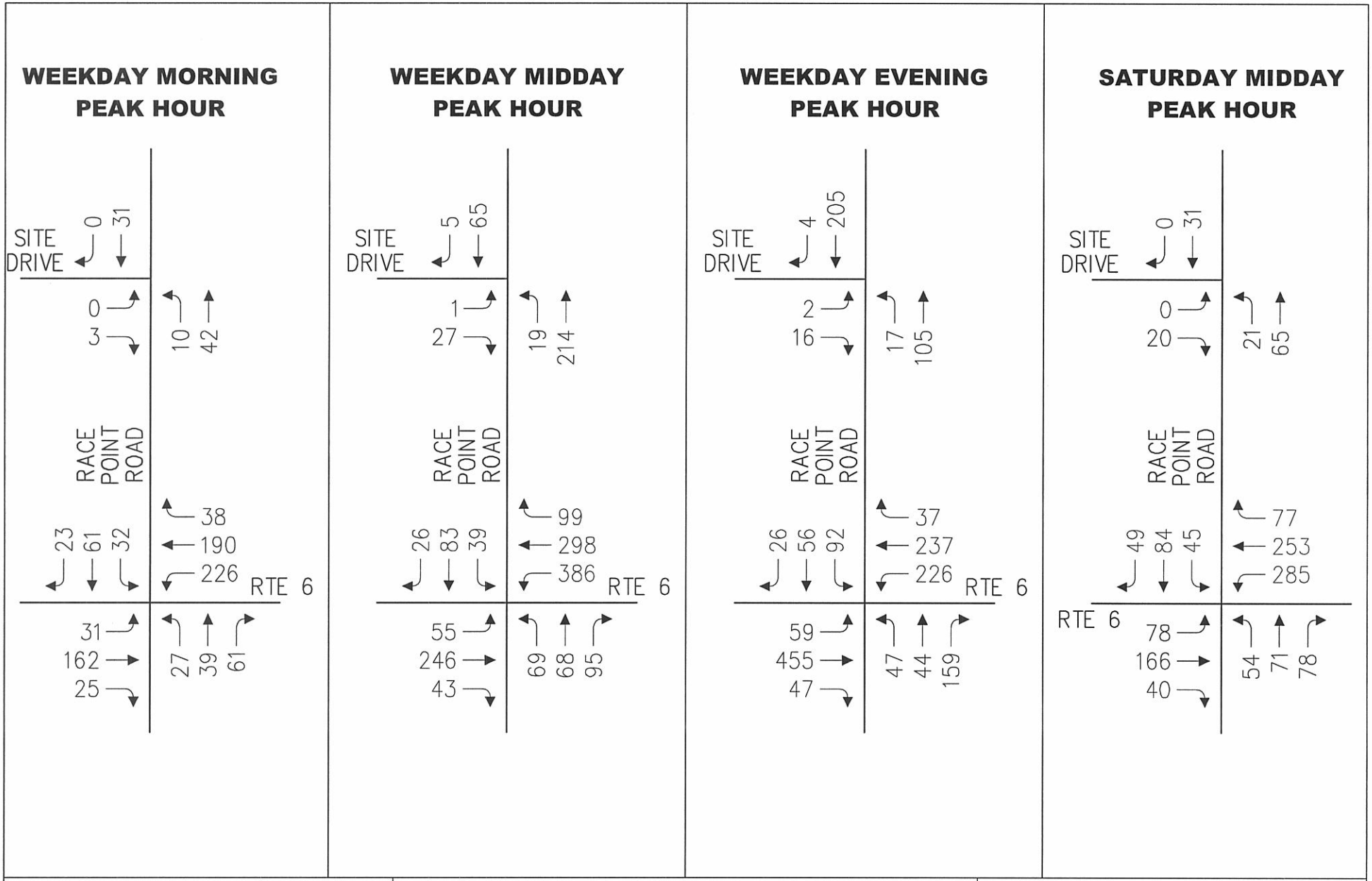
The Study Team observed parking and traffic operations within the study area of the Provincetown Municipal Airport in August of 2006. The traffic signal of Route 6 at Conwell Street at Race Point Road adequately handled traffic from the Airport on Race Point Road with acceptable delays and queues, and it is likely that it will continue to do so in the future condition.

Parking

Although parking demand observed on a single weekday during the peak summer period was met by the existing parking lot, the current number of spaces does not meet the needs for the existing peak weekend periods or the 2024 future projections for both weekday and weekends. There is a need for at least 83 additional spaces during the planning period.

Transportation Demand Measures (TDM)

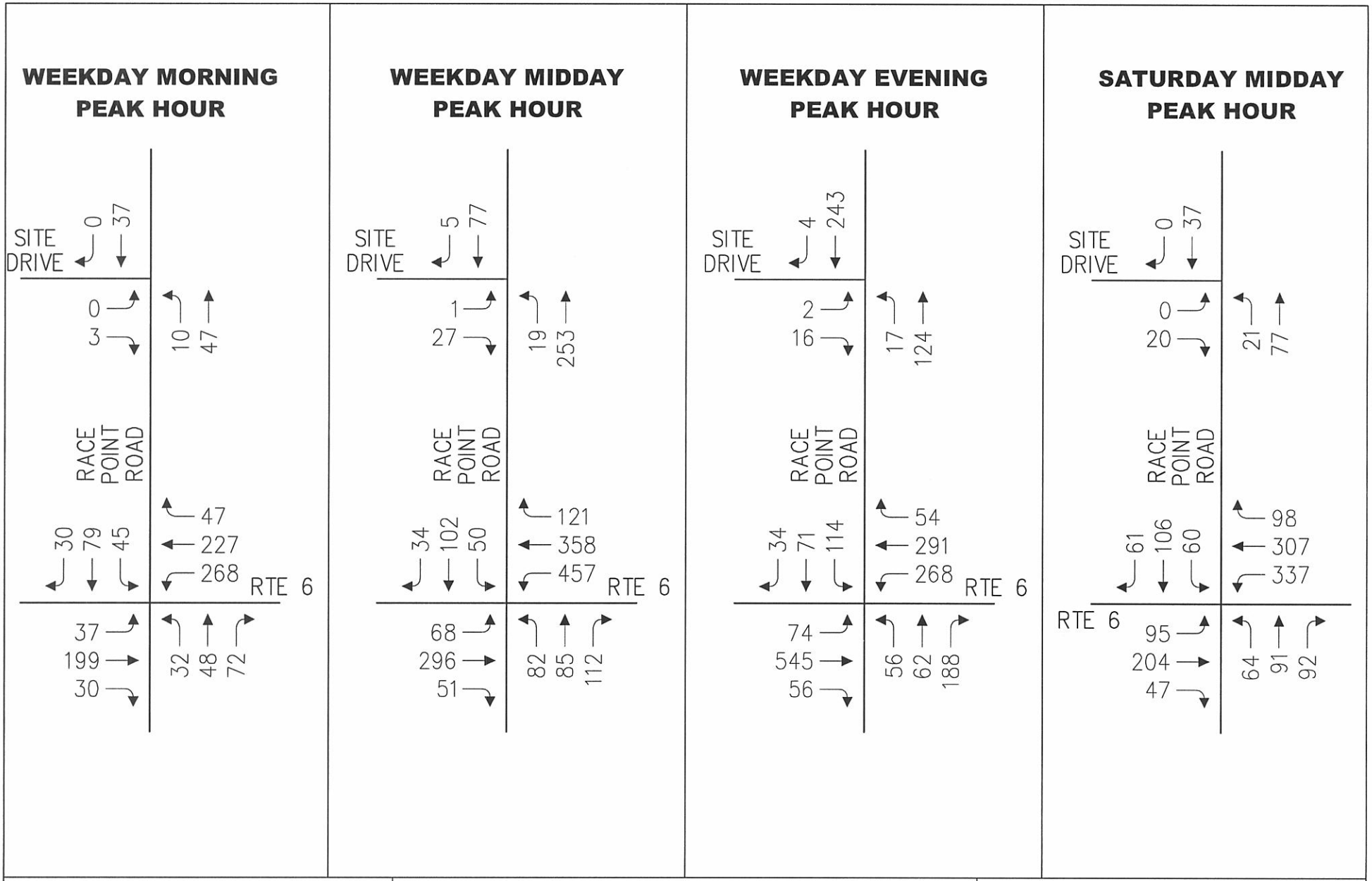
The Airport should continue to enhance TDM measures through coordination with CCRTA, Enterprise Rent-A-Car, the National Park Service, and the Provincetown Police Department for parking enforcement. The Airport should work with Enterprise to determine the number of rental car spaces necessary during the summer peak season. Coordination between three entities (Cape Air, Cape Cod Regional Transit Authority, and the Airport Commission) might enhance ridership on the shuttle bus. Enforcement of the parking rules, with fines and towing, might address the issue of non-airport use of the lot. Similarly, long term parking without the long term permit should not be allowed. Bicycle racks are provided at the Airport. All of these measures will help to alleviate increased parking demand.



JACOBS Edwards and Kelcey

TRAFFIC OPERATION REPORT AND PARKING REPORT
FOR THE
PROVINCETOWN AIRPORT
IN
THE TOWN OF PROVINCETOWN, MASSACHUSETTS

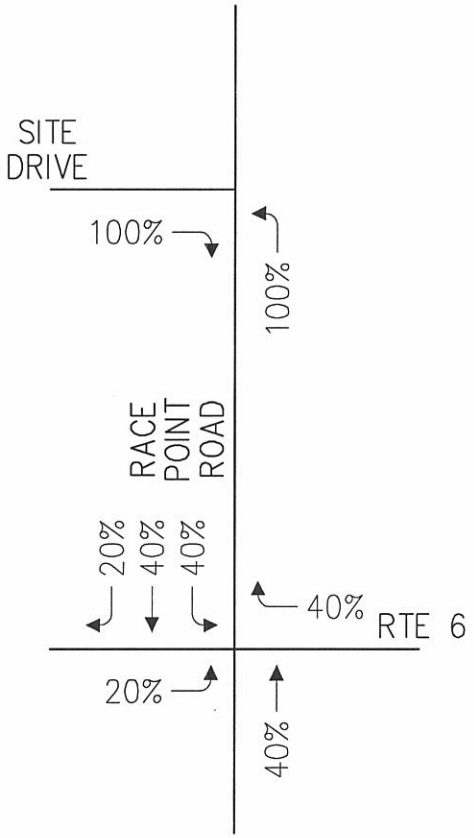
FIGURE 2
2007 EXISTING TRAFFIC VOLUMES



JACOBS Edwards and Kelcey

TRAFFIC OPERATION REPORT AND PARKING REPORT
FOR THE
PROVINCETOWN AIRPORT
IN
THE TOWN OF PROVINCETOWN, MASSACHUSETTS

FIGURE 3
2024 NO BUILD
TRAFFIC VOLUMES

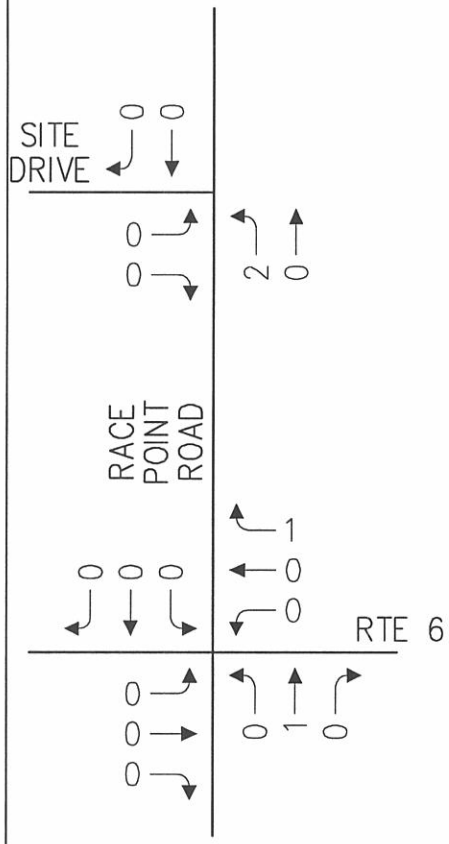


JACOBS
Edwards and Kelcey

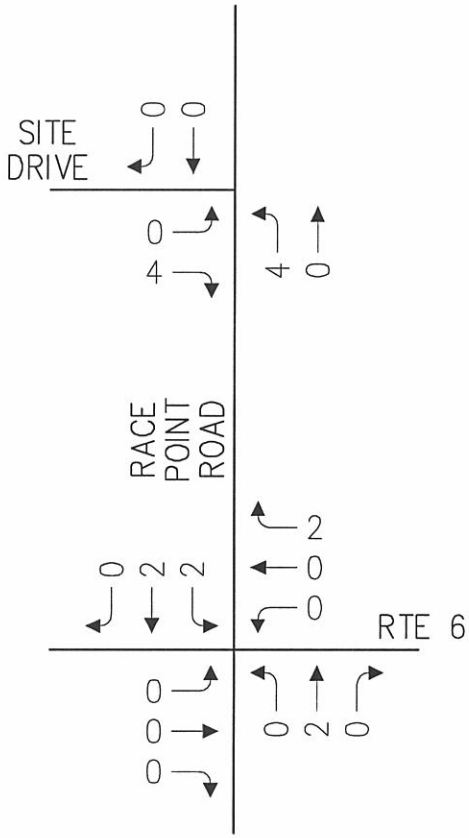
TRAFFIC OPERATION REPORT AND
PARKING REPORT
FOR THE
PROVINCETOWN AIRPORT
IN
THE TOWN OF PROVINCETOWN, MASSACHUSETTS

FIGURE 4
TRIP DISTRIBUTION MAP

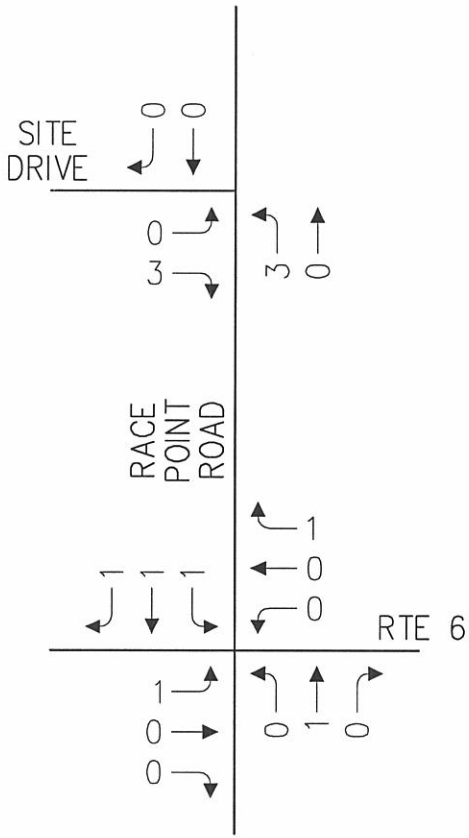
WEEKDAY MORNING PEAK HOUR



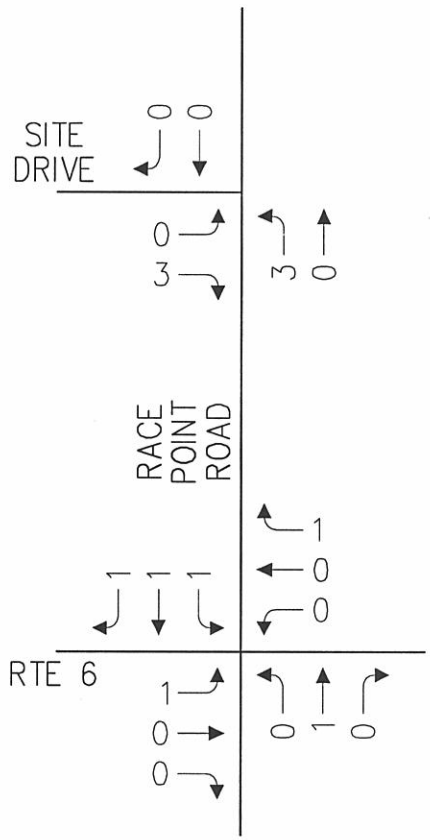
WEEKDAY MIDDAY PEAK HOUR



WEEKDAY EVENING PEAK HOUR



SATURDAY MIDDAY PEAK HOUR



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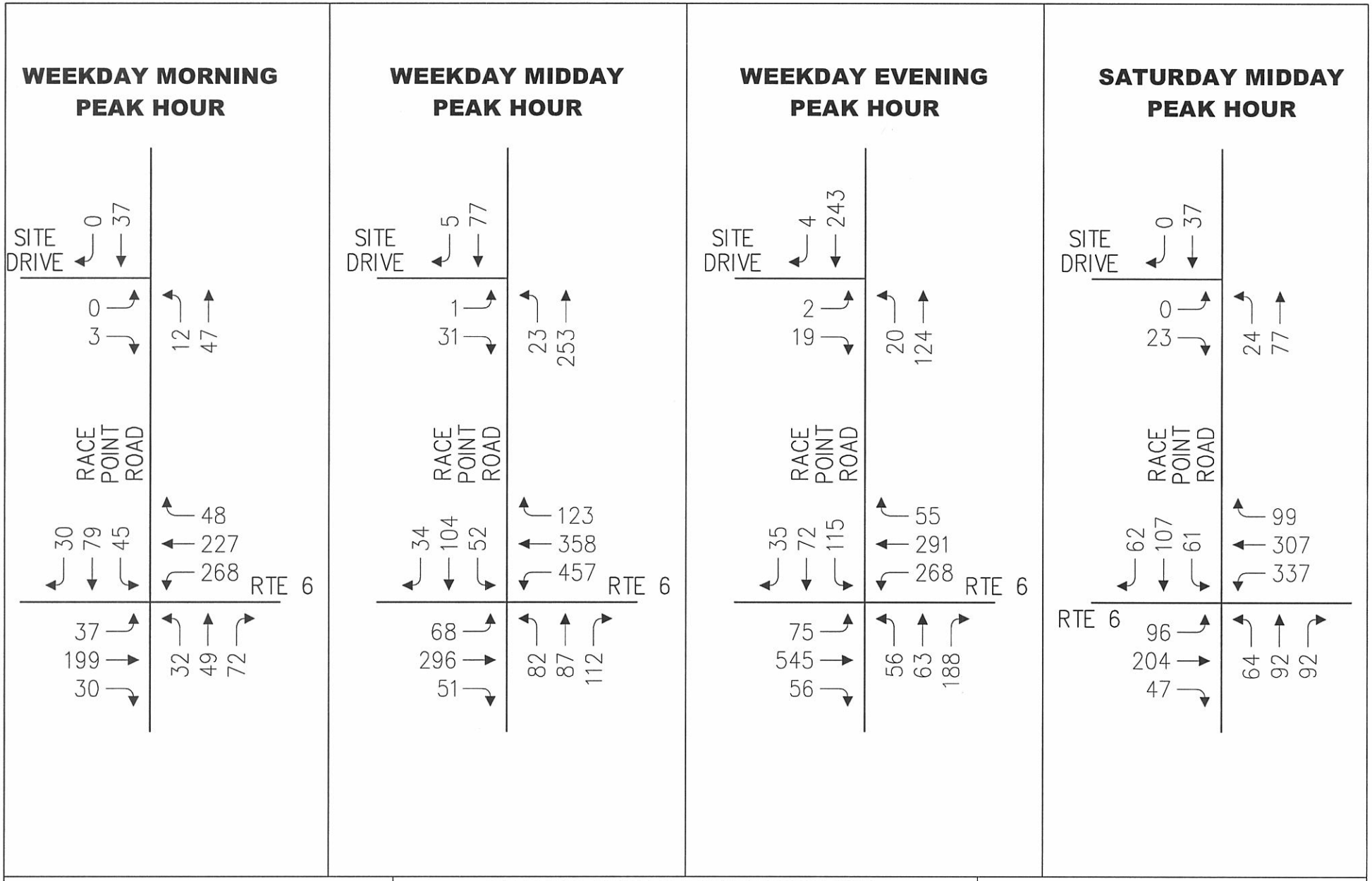
TRAFFIC OPERATION REPORT AND PARKING REPORT
FOR THE
PROVINCETOWN AIRPORT
IN
THE TOWN OF PROVINCETOWN, MASSACHUSETTS

FIGURE 5

PROJECTED SITE GENERATED TRAFFIC VOLUMES



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TRAFFIC OPERATION REPORT AND PARKING REPORT
FOR THE
PROVINCETOWN AIRPORT
IN
THE TOWN OF PROVINCETOWN, MASSACHUSETTS

FIGURE 6
2024 BUILD
TRAFFIC VOLUMES

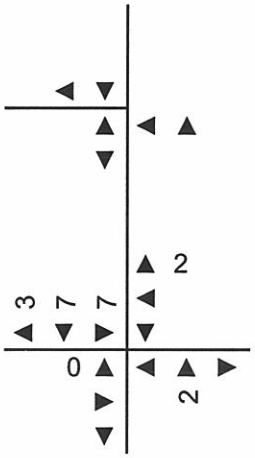
TECHNICAL APPENDIX

The Appendix contains the following:

1. Turning Movement Counts 2006
2. Turning Movement Counts 2007
3. Network Sheets
4. Crash Data Calculations
5. March 26, 2008 Memo

1. Turning Movement Counts 2006

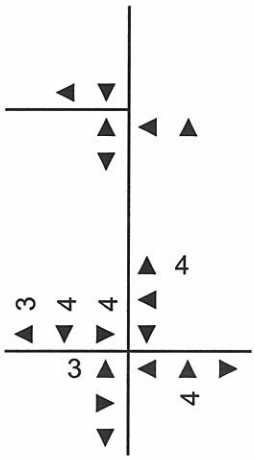
19-35 Race Point Road Residential Development Weekday Morning Peak Hour Traffic Volumes



Dwelling Units	**35**
Trip Equation	**T = 0.49(X) + 3.73**
Trip Split	**20% Entering**
	80% Exiting

Trips	
In	**4**
Out	**17**
Total	**21**

19-35 Race Point Road Residential Development Weekday Midday Peak Hour Traffic Volumes

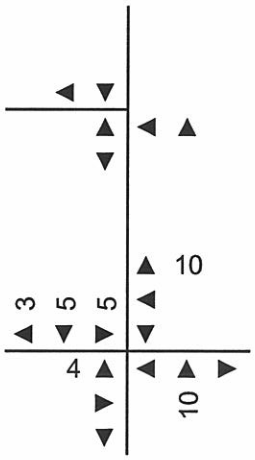


Dwelling Units	**35**
Trip Equation*	**T = 6.01(X) + 150.35**
Trip Split*	**50% Entering**
	50% Exiting

Trips	
In	**11**
Out	**11**
Total	**22**

**Average Daily Trip Rate used and scaled to midday levels*
Note: Midday 'K' factor approximately 6% (737/12,641)
Count volume west of Conwell Street (from TMCs) = 737
CCC Count Station AADT Volume (21017) = 12,641

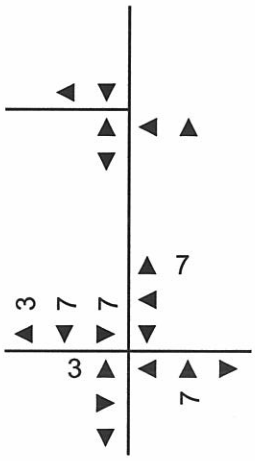
19-35 Race Point Road Residential Development Weekday Evening Peak Hour Traffic Volumes



Dwelling Units	**35**
Trip Equation	**T = 0.55(X) + 17.65**
Trip Split	**65% Entering**
	35% Exiting

Trips	
In	**24**
Out	**13**
Total	**37**

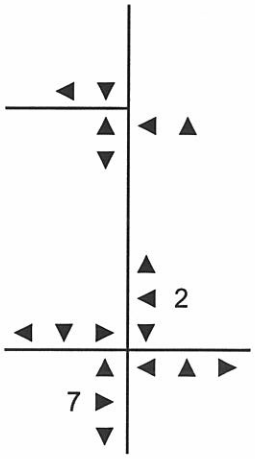
19-35 Race Point Road Residential Development Weekday Evening Peak Hour Traffic Volumes



Dwelling Units	**35**
Trip Equation	**T = 0.41(X) + 19.23**
Trip Split	**50% Entering**
	50% Exiting

Trips	
In	**17**
Out	**17**
Total	**34**

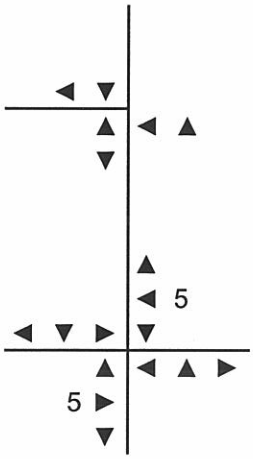
Shanks Painter Road Residential Development Weekday Morning Peak Hour Traffic Volumes



Dwelling Units	**40**
Trip Equation	**T = 0.49(X) + 3.73**
Trip Split	**20% Entering**
	80% Exiting

Trips	
In	**5**
Out	**18**
Total	**23**

Shanks Painter Road Residential Development Weekday Midday Peak Hour Traffic Volumes

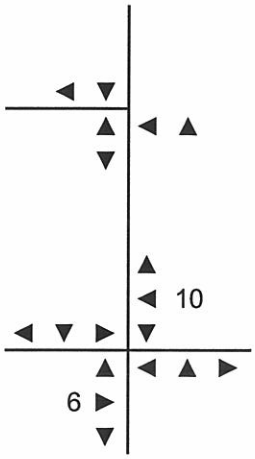


Dwelling Units	**40**
Trip Equation*	**T = 6.01(X) + 150.35**
Trip Split*	**50% Entering**
	50% Exiting

Trips	
In	**12**
Out	**12**
Total	**24**

**Average Daily Trip Rate used and scaled to midday levels*
Note: Midday 'K' factor approximately 6% (737/12,641)
Count volume west of Conwell Street (from TMCs) = 737
CCC Count Station AADT Volume (21017) = 12,641

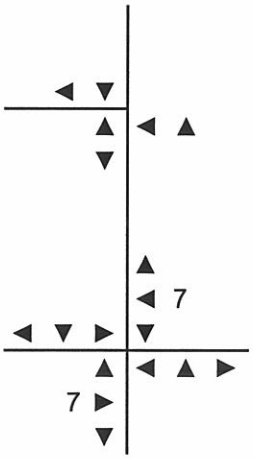
Shanks Painter Road Residential Development Weekday Evening Peak Hour Traffic Volumes



Dwelling Units	**40**
Trip Equation	**T = 0.55(X) + 17.65**
Trip Split	**65% Entering**
	35% Exiting

Trips	
In	**26**
Out	**14**
Total	**40**

Shanks Painter Road Residential Development Weekday Evening Peak Hour Traffic Volumes



Dwelling Units	**40**
Trip Equation	**T = 0.41(X) + 19.23**
Trip Split	**50% Entering**
	50% Exiting

Trips	
In	**18**
Out	**18**
Total	**36**

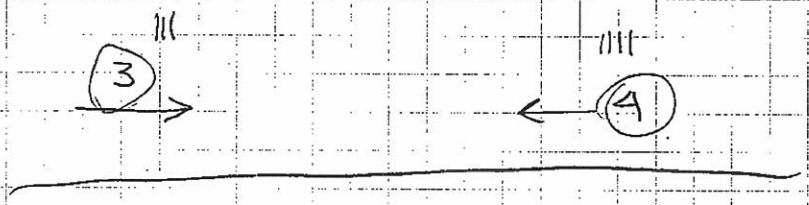
2. Turning Movement Counts 2007

EDWARDS AND KELCEY
CONSULTING ENGINEERS

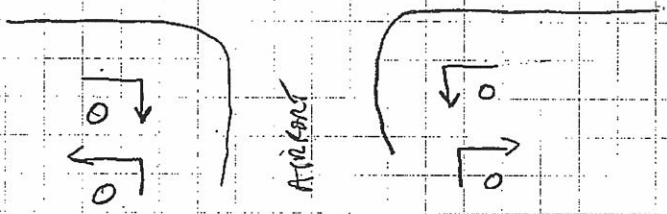
PROJECT ..... TURNING COUNTS ..... FILE NO. .....
SUBJECT ..... RACE POINT ROAD + AIRPORT DRIVE ..... SHEET NO. ..... OF .....
COMPUTED BY ..... MG ..... CHECKED BY ..... MG ..... DATE FRIDAY 8/24/07

7:00 AM – 7:15 AM

7 AUTOS
0 PED
0 BIKES



RACE POINT ROAD



NO PEDESTRIANS
NO BICYCLES

EDWARDS AND KELCEY
CONSULTING ENGINEERS

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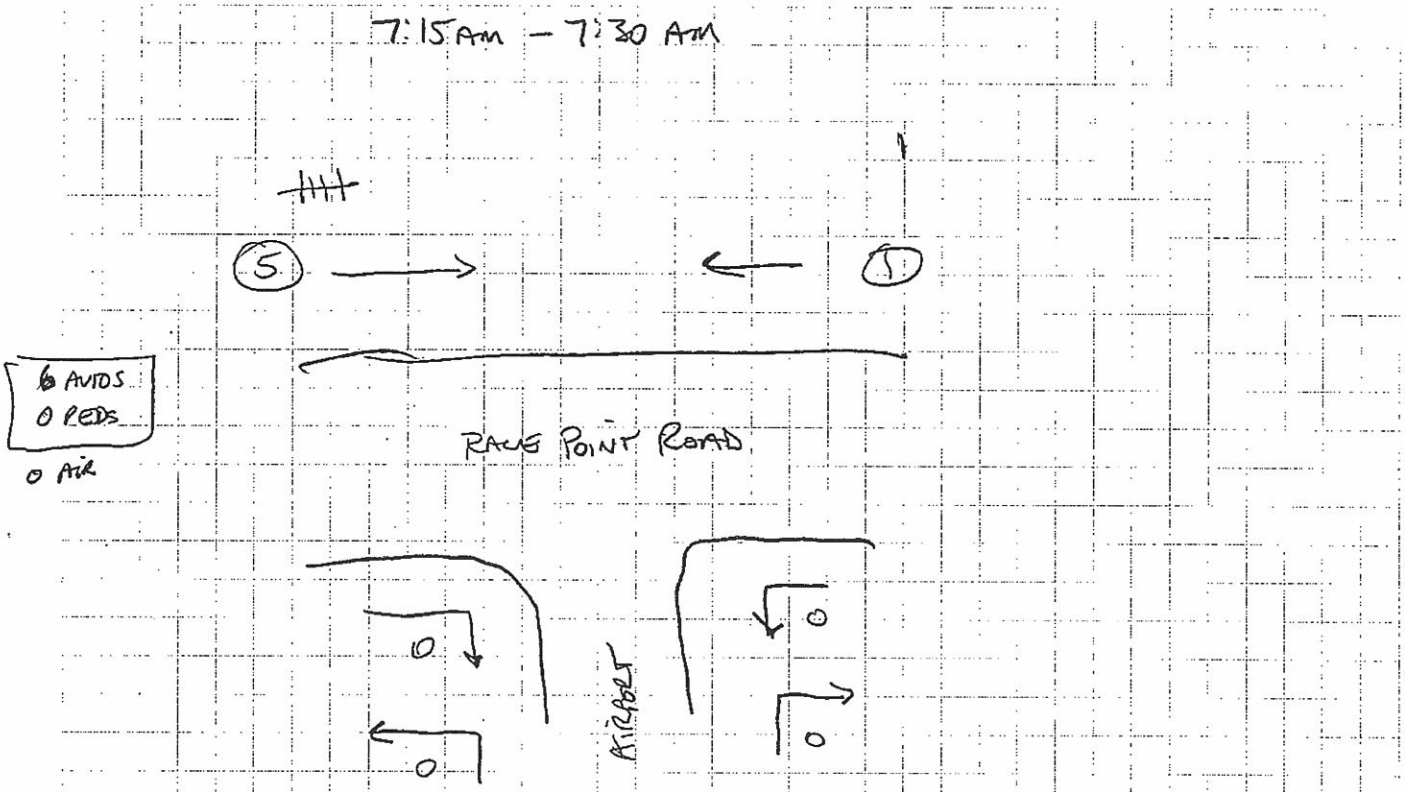
7:15 AM – 7:30 AM



EDWARDS AND KELCEY
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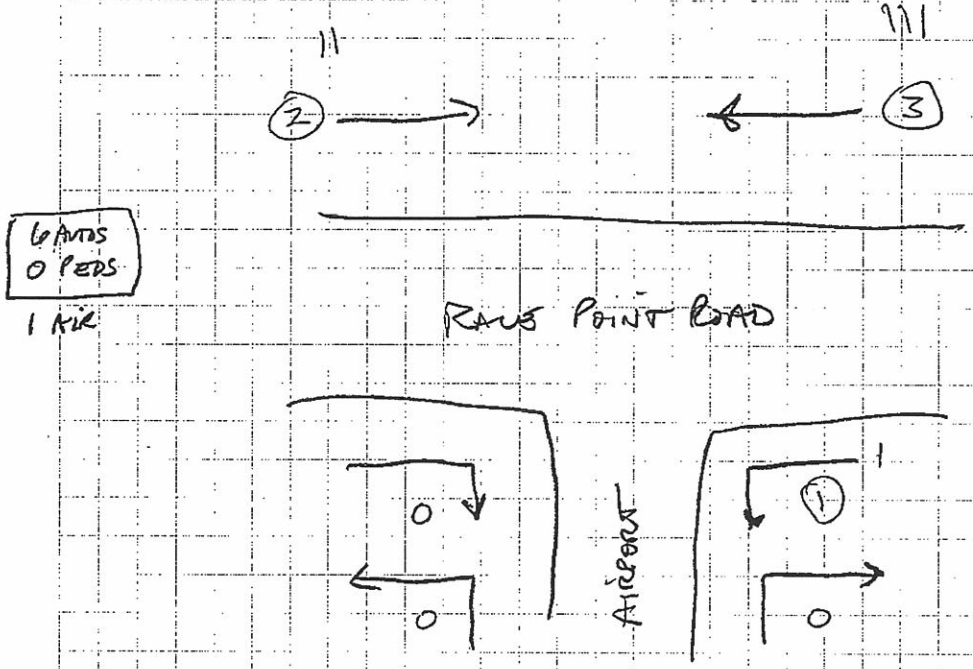

EDWARDS AND KELCEY
CONSULTING ENGINEERS

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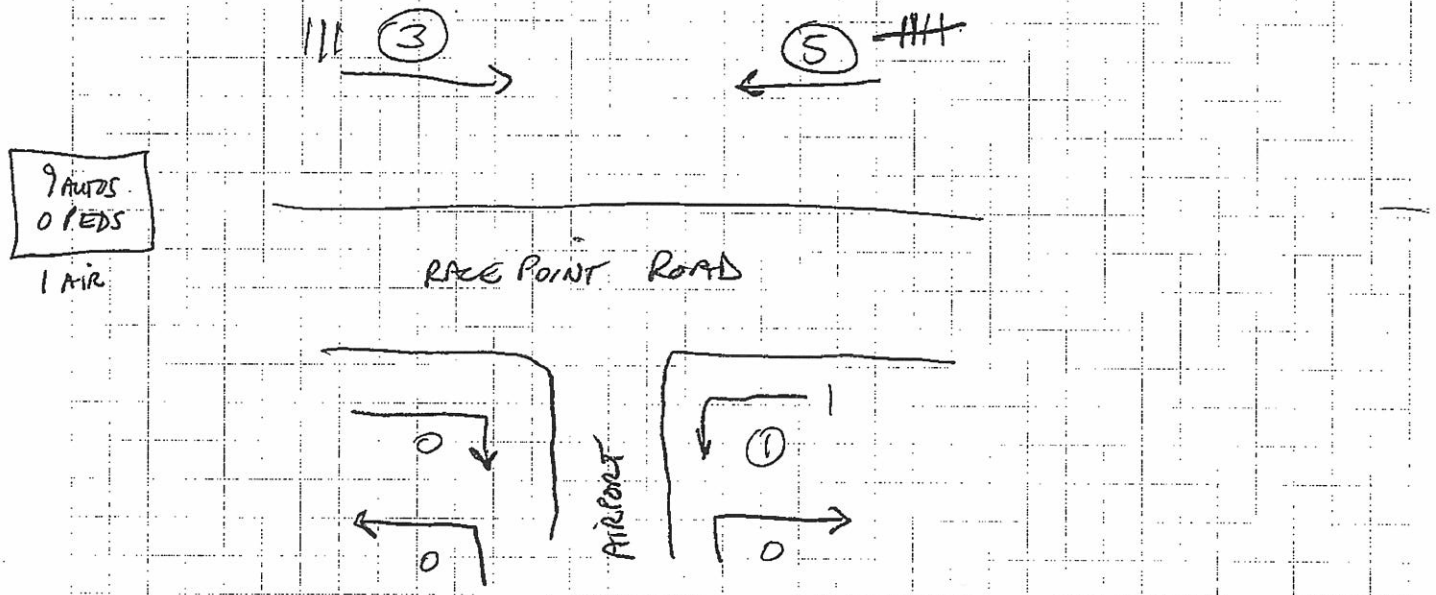
COMPUTED BY ..... CHECKED BY ..... DATE .....

7:45 AM — 8:00 AM



EDWARDS AND KELCEY
CONSULTING ENGINEERS

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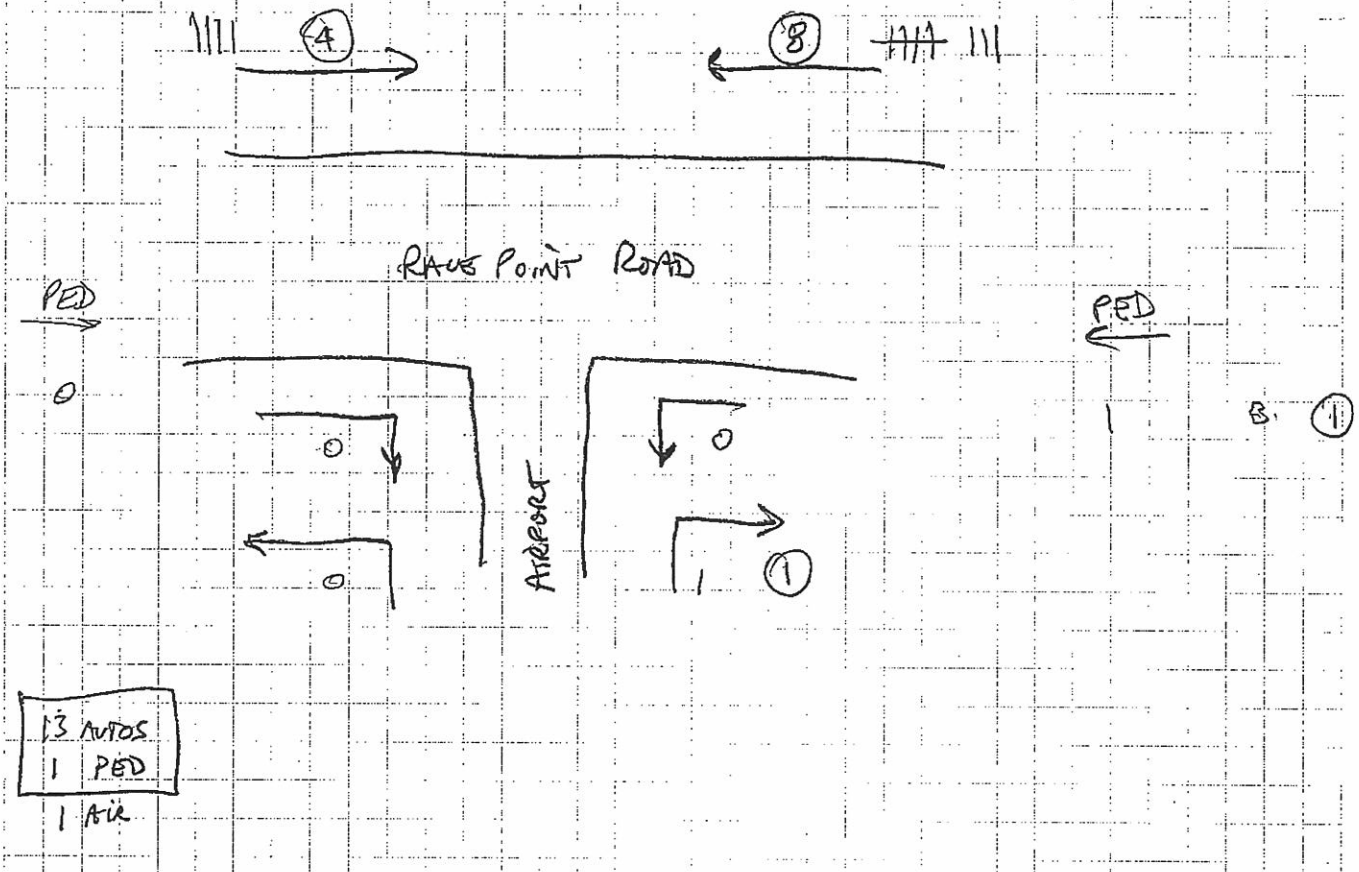
SUBJECT ..... SHEET NO. .....OF .....
COMPUTED BY ..... CHECKED BY ..... DATE .....

8:00 AM – 8:15 AM



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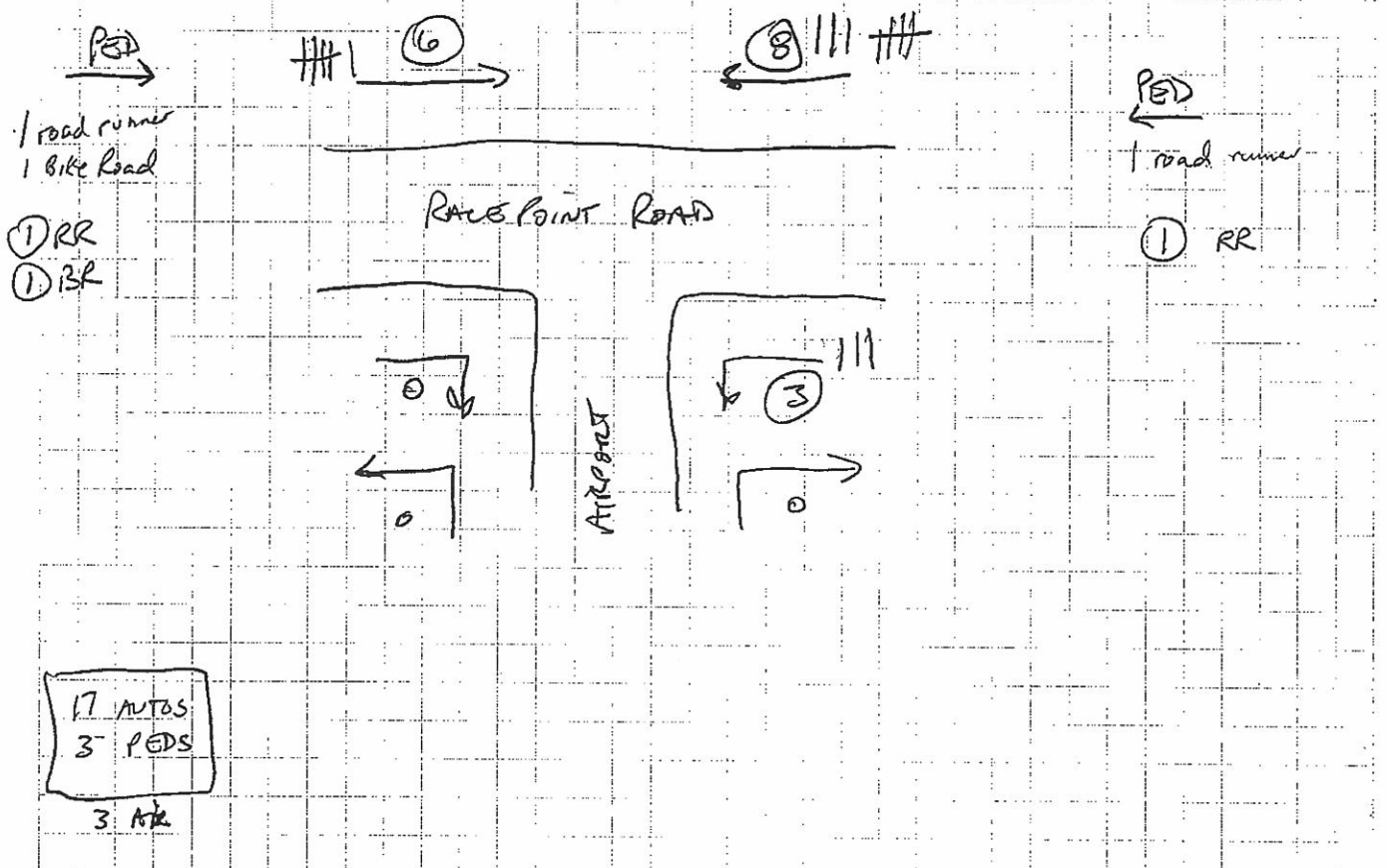

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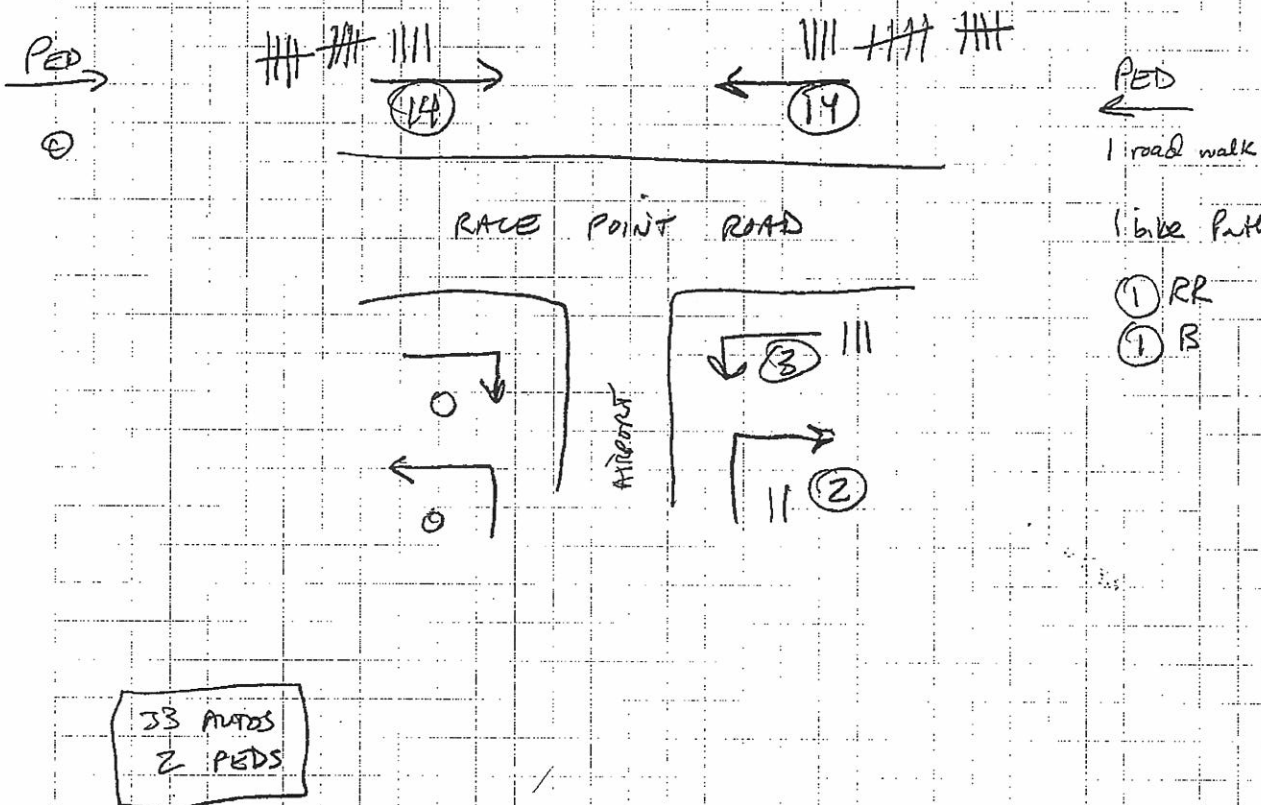

33 AUTOS
2 PEDS

5 AIR

EDWARDS AND KELCEY
CONSULTING ENGINEERS

PROJECT ..... FILE NO. .....
SUBJECT ..... SHEET NO. .....OF .....
COMPUTED BY ..... CHECKED BY ..... DATE .....

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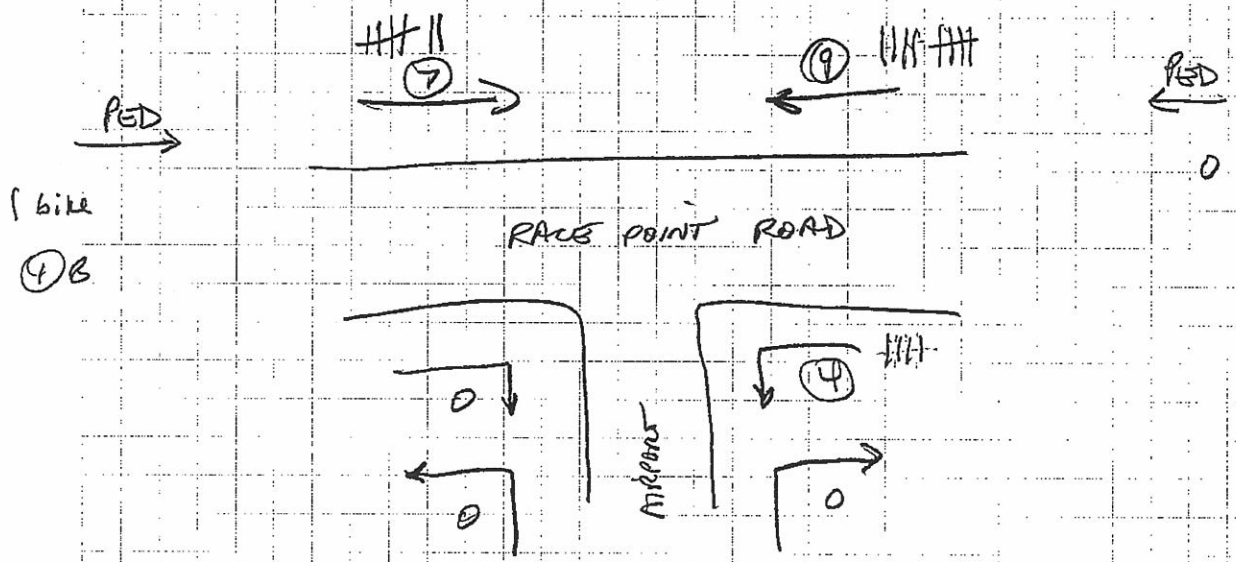

20 AUTOS
1 PED

4 HR

EDWARDS AND KELCEY
CONSULTING ENGINEERS

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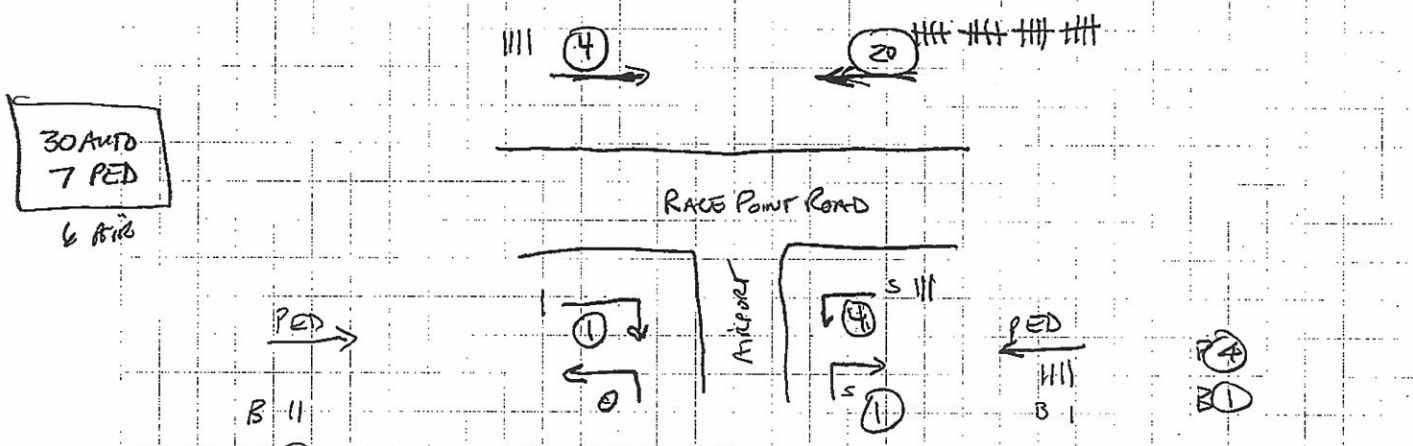
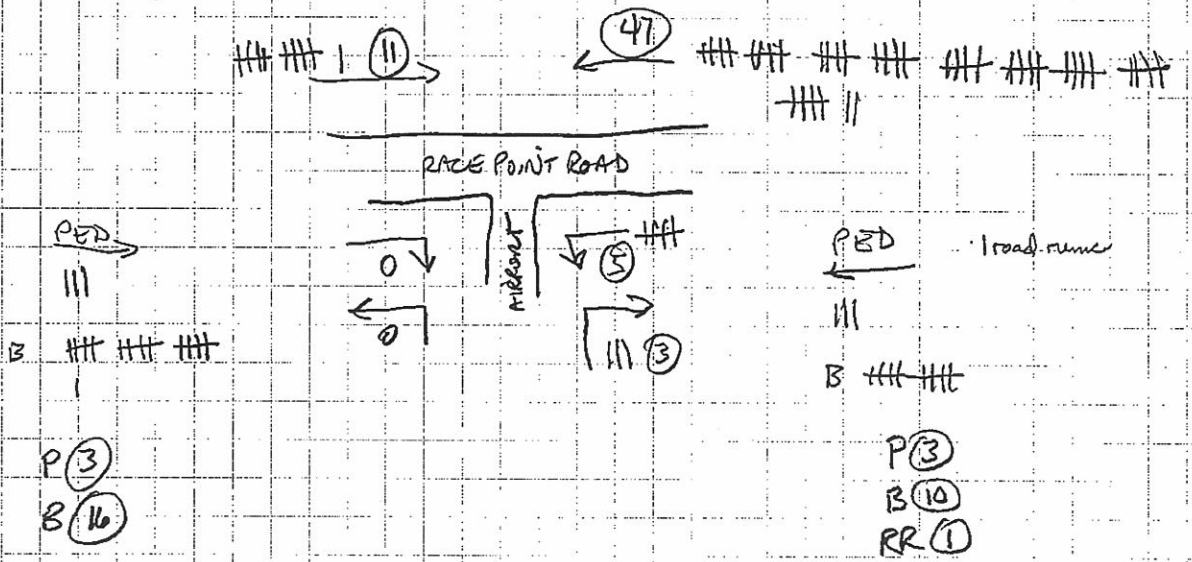
COMPUTED BY ..... CHECKED BY ..... DATE .....

11:08 – 11:15 AM



11:15 – 11:30 AM



66 AUTO
33 PED
8 BIKE

EDWARDS AND KELCEY
CONSULTING ENGINEERS

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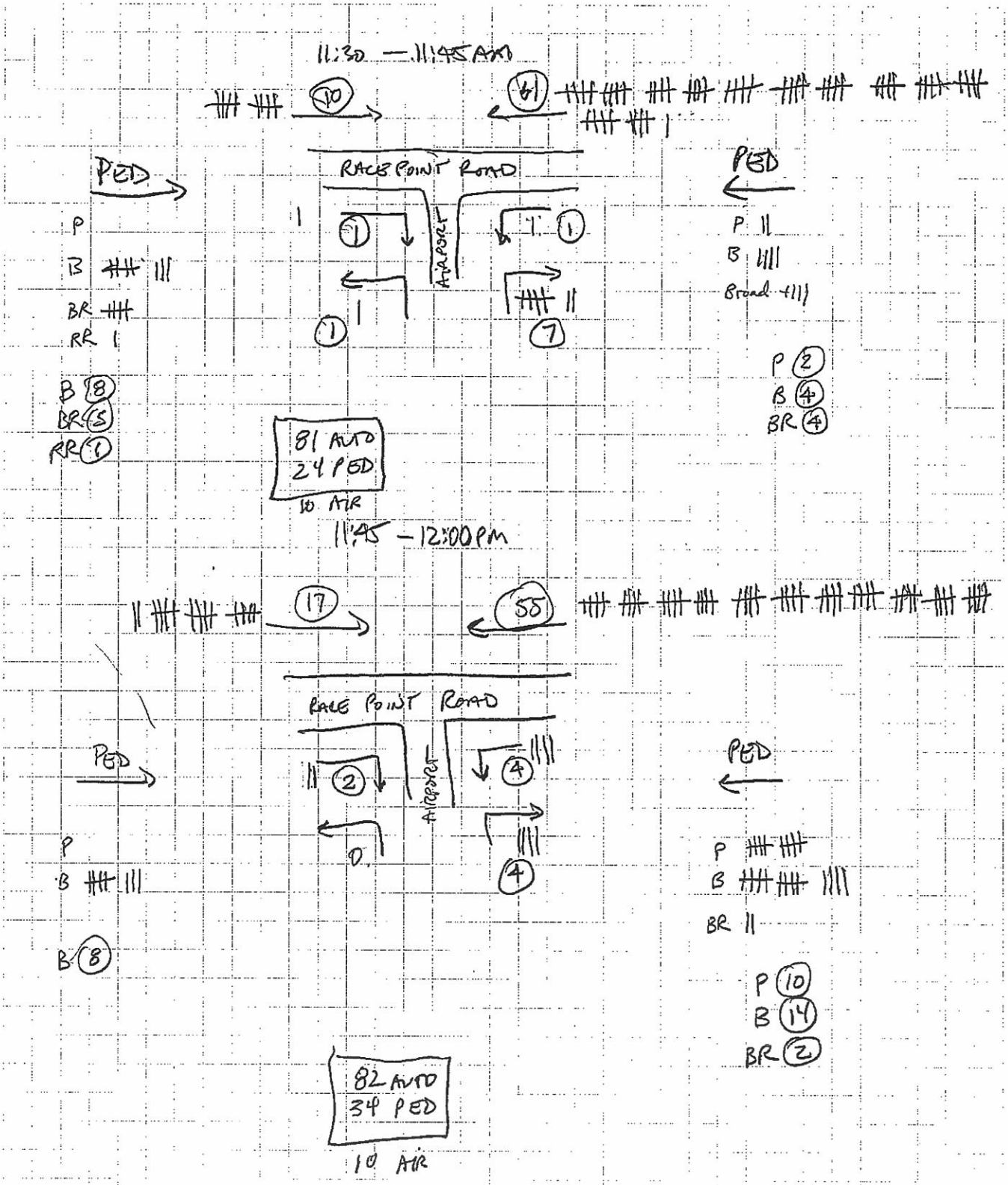
SUBJECT ..... SHEET NO. .....OF .....
COMPUTED BY ..... CHECKED BY ..... DATE .....



EDWARDS AND KELCEY
CONSULTING ENGINEERS

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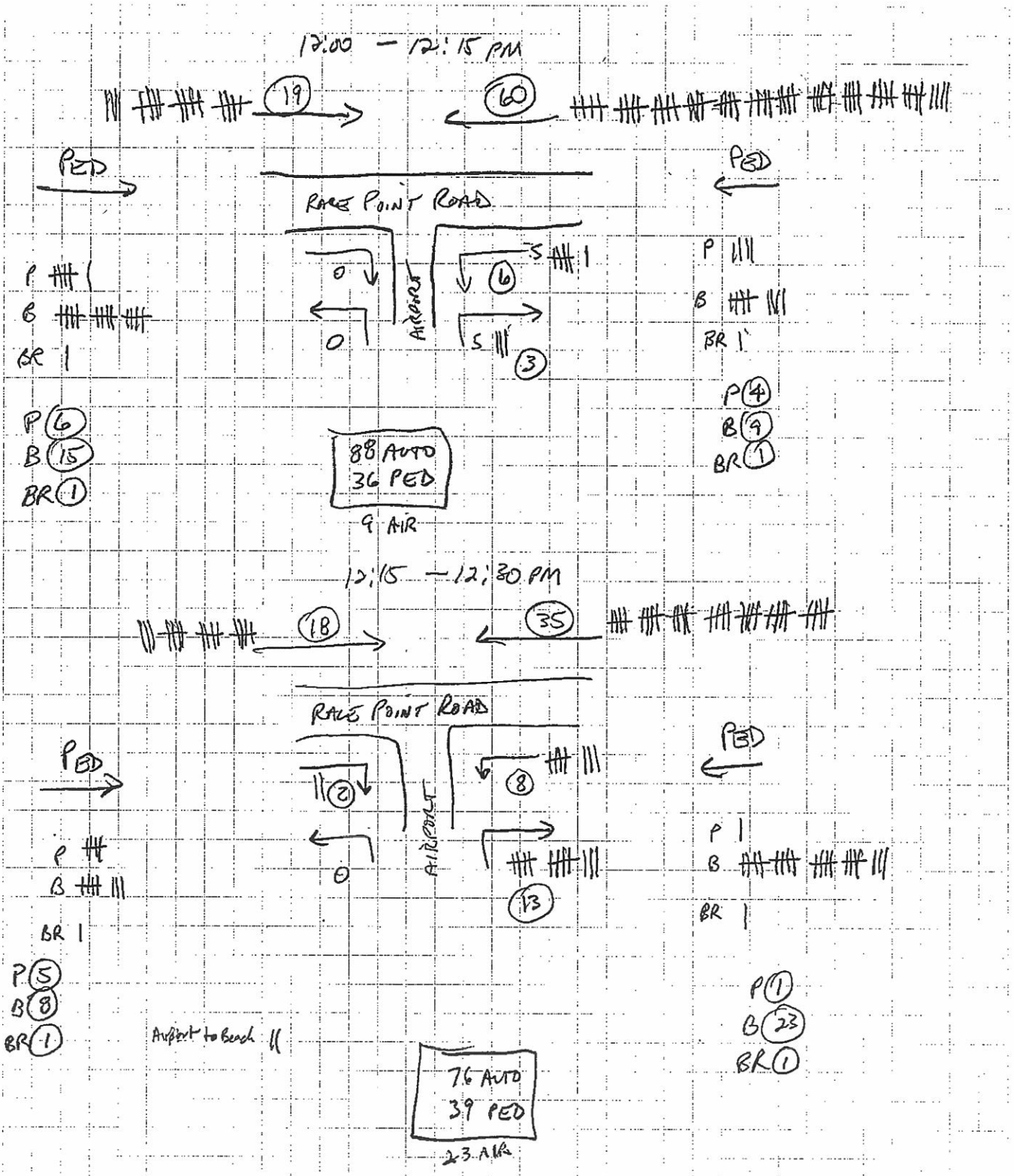
COMPUTED BY ..... CHECKED BY ..... DATE .....



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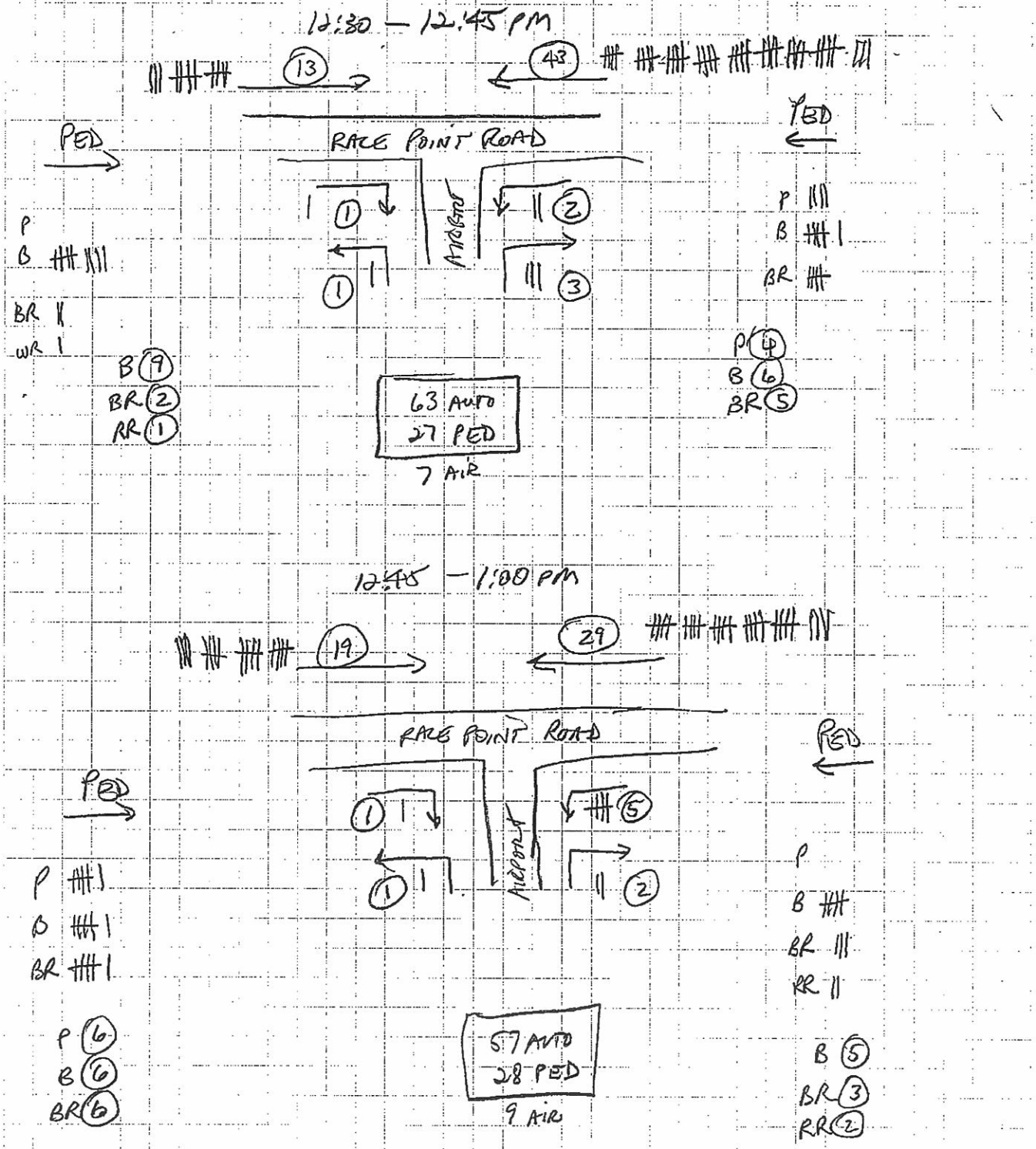

EDWARDS AND KELCEY
CONSULTING ENGINEERS

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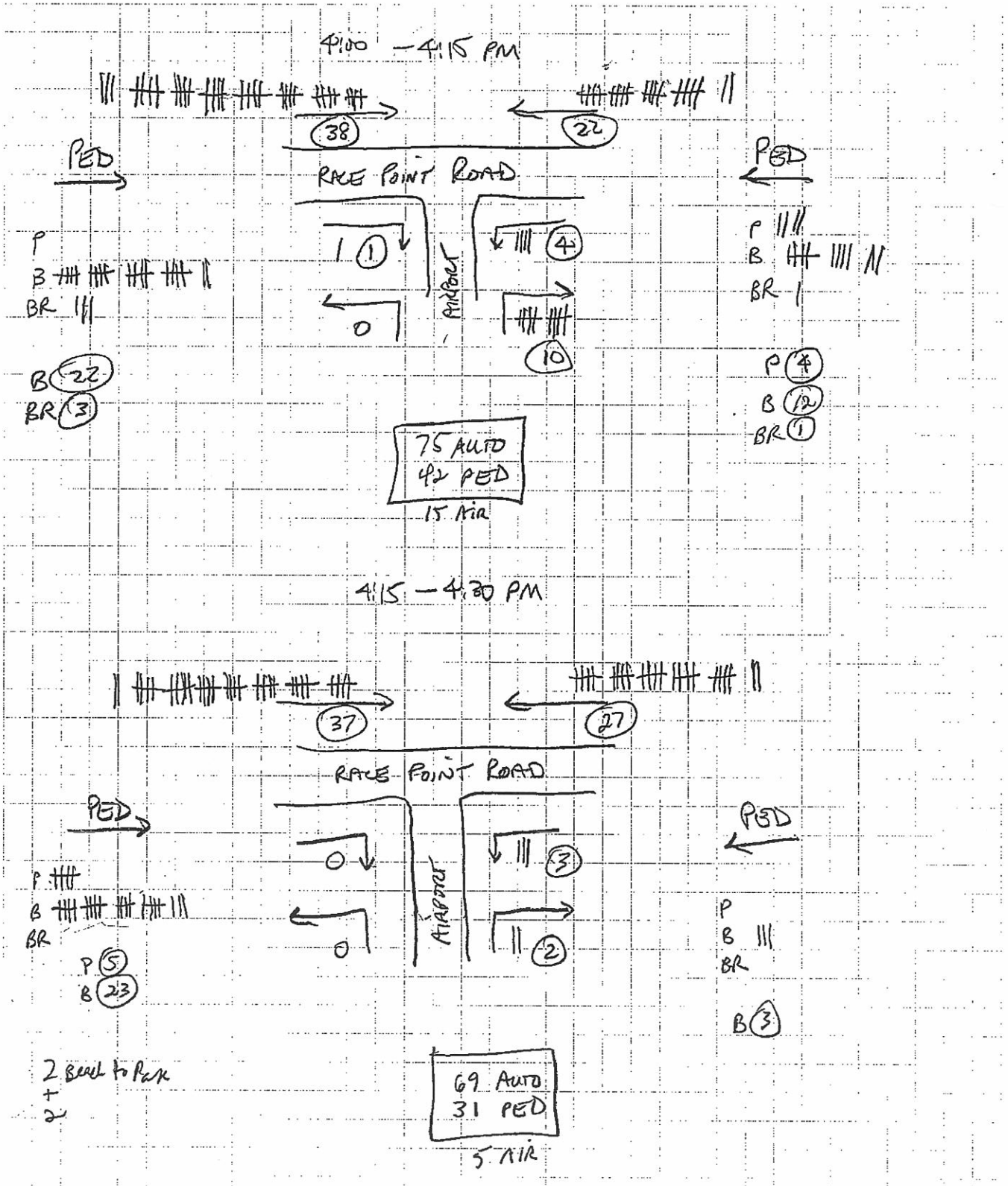

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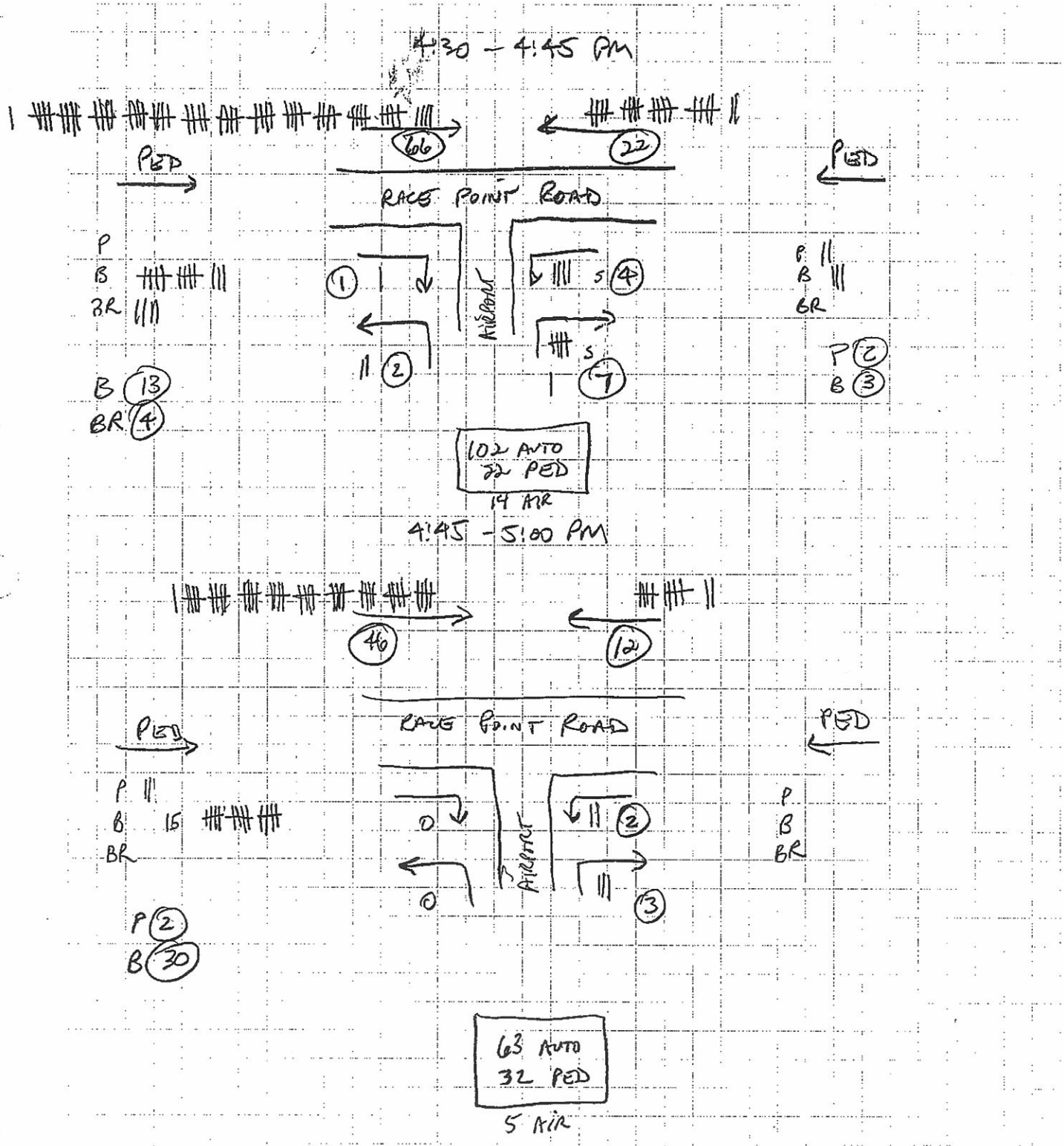

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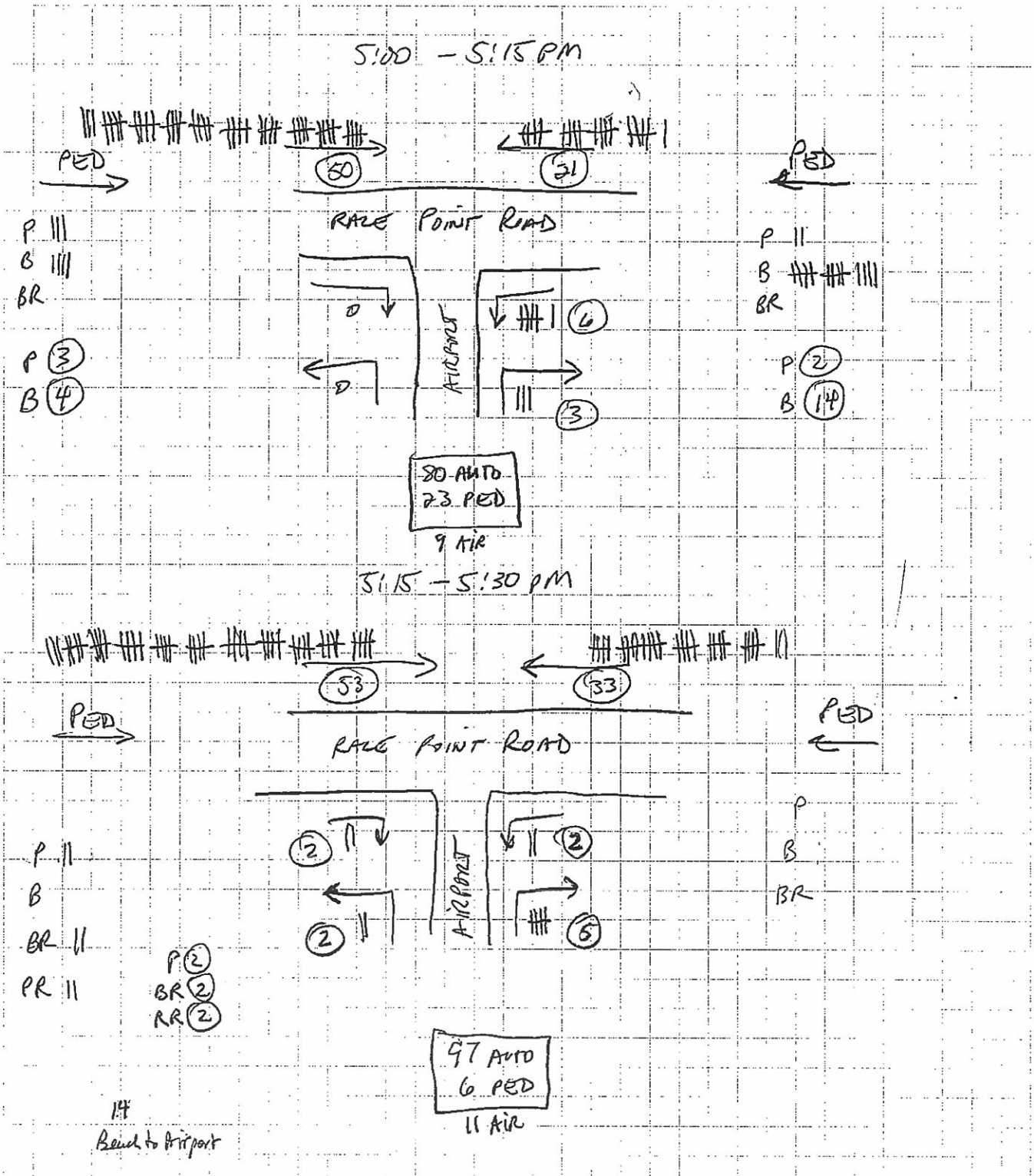

EDWARDS AND KELCEY
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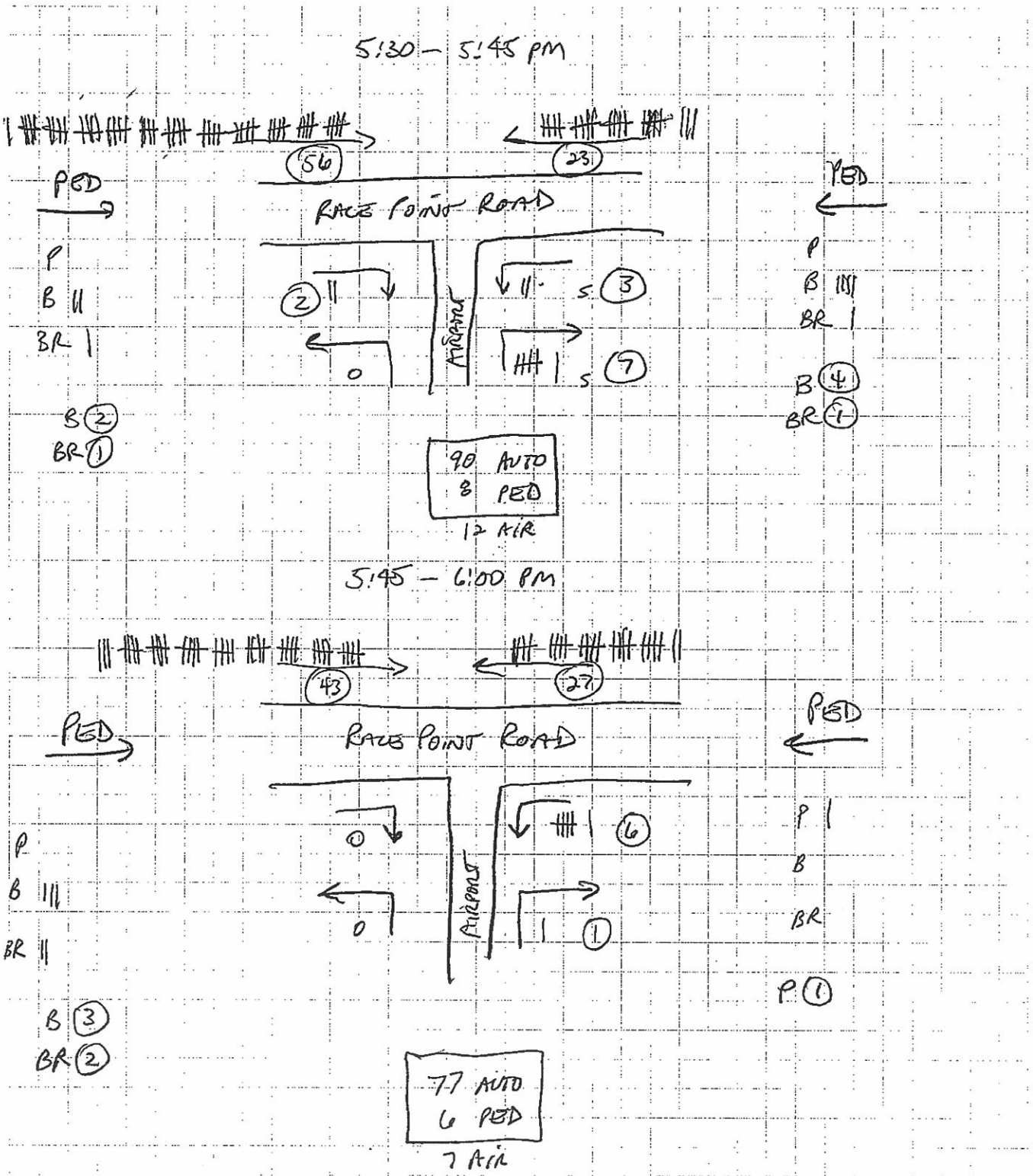


3. Network Sheets

Edwards and Kelcey
343 Congress Street
Boston MA, 02210

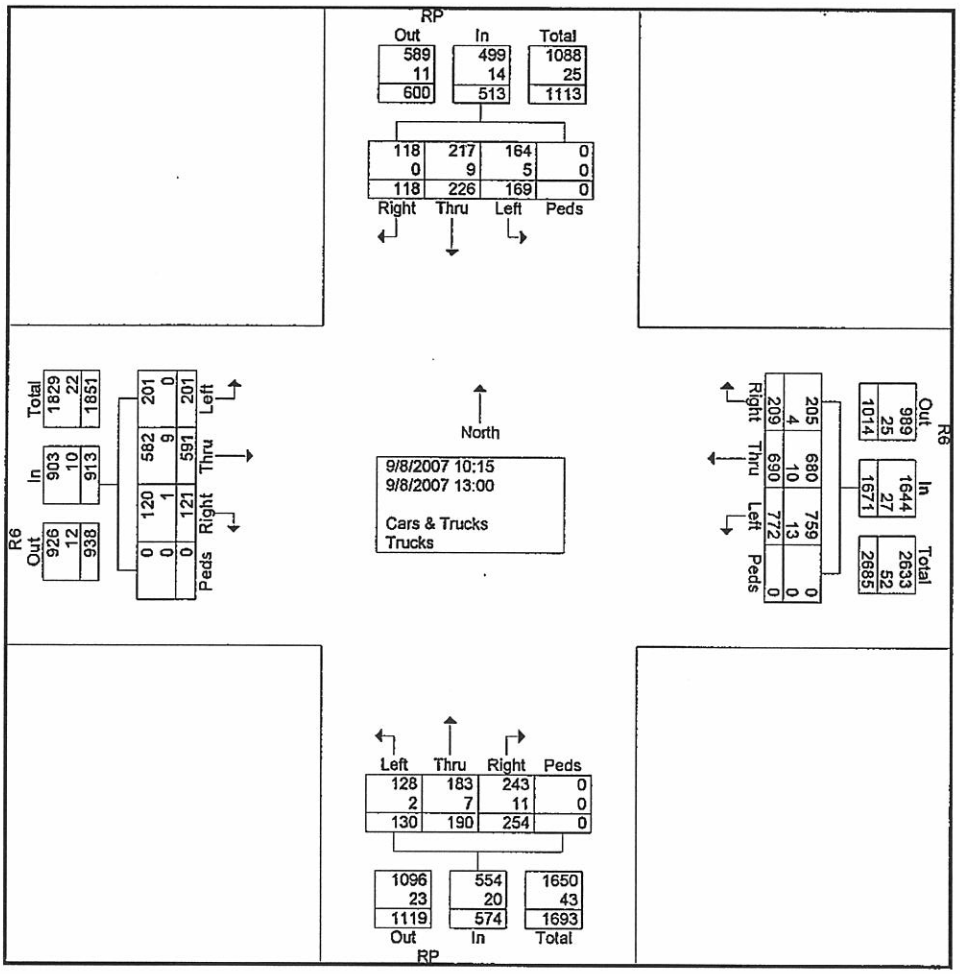
File Name : rte6_conwell_sat
Site Code : 00000000
Start Date : 9/8/2007
Page No : 1

Groups Printed- Cars & Trucks - Trucks

	RP Southbound				R6 Westbound				RP Northbound				R6 Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
10:15	15	20	11	0	63	65	16	0	9	12	24	0	23	47	12	0	317
10:30	8	16	7	0	68	71	19	0	5	12	20	0	11	53	10	0	300
10:45	9	19	12	0	73	59	26	0	12	27	20	0	15	32	5	0	309
Total	32	55	30	0	204	195	61	0	26	51	64	0	49	132	27	0	926
11:00	9	27	10	0	71	72	23	0	12	13	17	0	18	52	6	0	330
11:15	10	17	19	0	71	66	16	0	13	16	21	0	20	42	11	0	322
11:30	17	21	8	0	70	56	12	0	17	15	20	0	25	40	18	0	319
11:45	17	18	10	0	54	57	16	0	9	16	31	0	16	54	10	0	308
Total	53	83	47	0	266	251	67	0	51	60	89	0	79	188	45	0	1279
12:00	11	27	8	0	63	43	16	0	8	18	23	0	16	46	6	0	285
12:15	16	12	7	0	46	60	12	0	16	19	23	0	14	44	6	0	275
12:30	16	14	14	0	67	40	20	0	7	13	16	0	13	55	9	0	284
12:45	16	19	9	0	65	49	20	0	8	20	19	0	12	55	12	0	304
Total	59	72	38	0	241	192	68	0	39	70	81	0	55	200	33	0	1148
13:00	25	16	3	0	61	52	13	0	14	9	20	0	18	71	16	0	318
Grand Total	169	226	118	0	772	690	209	0	130	190	254	0	201	591	121	0	3671
Apprch %	32.9	44.1	23	0	46.2	41.3	12.5	0	22.6	33.1	44.3	0	22	64.7	13.3	0	
Total %	4.6	6.2	3.2	0	21	18.8	5.7	0	3.5	5.2	6.9	0	5.5	16.1	3.3	0	
Cars & Trucks	164	217	118	0	759	680	205	0	128	183	243	0	201	582	120	0	3600
% Cars & Trucks	97	96	100	0	98.3	98.6	98.1	0	98.5	96.3	95.7	0	100	98.5	99.2	0	98.1
Trucks	5	9	0	0	13	10	4	0	2	7	11	0	0	9	1	0	71
% Trucks	3	4	0	0	1.7	1.4	1.9	0	1.5	3.7	4.3	0	0	1.5	0.8	0	1.9

Edwards and Kelcey
343 Congress Street
Boston MA, 02210

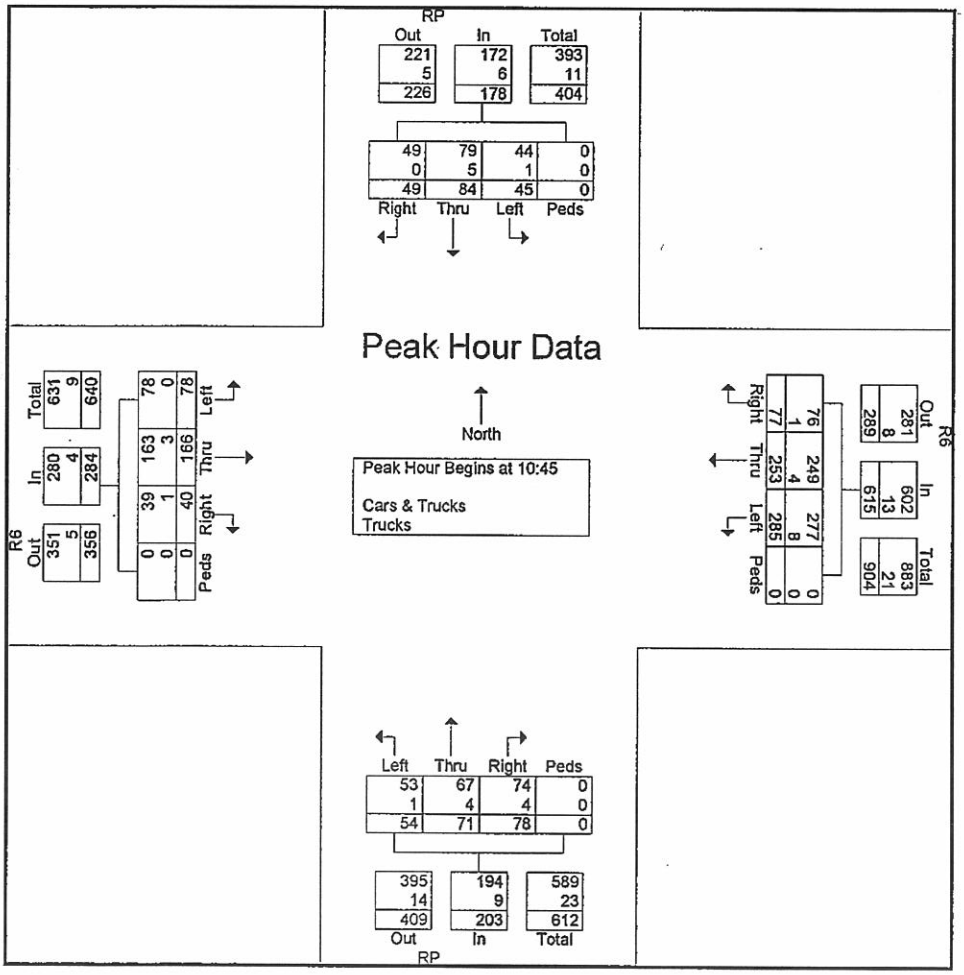
File Name : rte6_conwell_sat
Site Code : 00000000
Start Date : 9/8/2007
Page No : 2



Edwards and Kelcey
343 Congress Street
Boston MA, 02210

File Name : rte6_conwell_sat
Site Code : 00000000
Start Date : 9/8/2007
Page No : 3

	RP Southbound					R6 Westbound					RP Northbound					R6 Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 10:15 to 13:00 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 10:45																					
10:45	9	19	12	0	40	73	59	26	0	158	12	27	20	0	59	15	32	5	0	52	309
11:00	9	27	10	0	46	71	72	23	0	166	12	13	17	0	42	18	52	6	0	76	330
11:15	10	17	19	0	46	71	66	16	0	153	13	16	21	0	50	20	42	11	0	73	322
11:30	17	21	8	0	46	70	56	12	0	138	17	15	20	0	52	25	40	18	0	83	319
Total Volume	45	84	49	0	178	285	253	77	0	615	54	71	78	0	203	78	166	40	0	284	1280
% App. Total	25.3	47.2	27.5	0		46.3	41.1	12.5	0		26.6	35	38.4	0		27.5	58.5	14.1	0		
PHF	.662	.778	.645	.000	.967	.976	.878	.740	.000	.926	.794	.657	.929	.000	.860	.780	.798	.556	.000	.855	.970
Cars & Trucks	44	79	49	0	172	277	249	76	0	602	53	67	74	0	194	78	163	39	0	280	1248
% Cars & Trucks	97.8	94.0	100	0	96.6	97.2	98.4	98.7	0	97.9	98.1	94.4	94.9	0	95.6	100	98.2	97.5	0	98.6	97.5
Trucks	1	5	0	0	6	8	4	1	0	13	1	4	4	0	9	0	3	1	0	4	32
% Trucks	2.2	6.0	0	0	3.4	2.8	1.6	1.3	0	2.1	1.9	5.6	5.1	0	4.4	0	1.8	2.5	0	1.4	2.5



4. Crash Data Calculations

MassHighway

CRASH RATE WORKSHEET

CITY/TOWN : Provincetown COUNT DATE : 2007

DISTRICT : 5 UNSIGNALIZED : SIGNALIZED : X

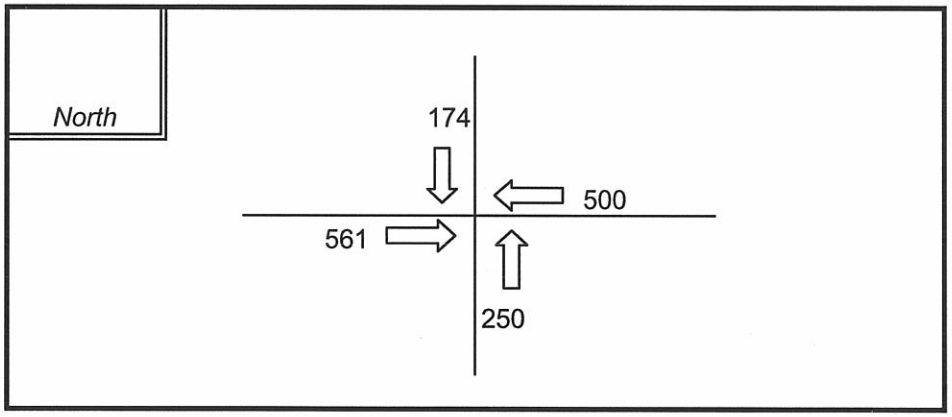
~ INTERSECTION DATA ~

MAJOR STREET : Route 6

MINOR STREET(S) : Race Point Road

Conwell Street

INTERSECTION DIAGRAM (Label Approaches)



Peak Hour Volumes

APPROACH :	1	2	3	4	5	Total Entering Vehicles
DIRECTION :	NB	SB	EB	WB		
VOLUMES (AM/**PM**) :	250	174	561	500		**1,485**

" K " FACTOR : **0.090** APPROACH ADT : **16,500** **ADT** = TOTAL VOL/"K" FACT.

TOTAL # OF CRASHES : 6 # OF YEARS : 3 AVERAGE # OF CRASHES (**A**) : **2.00**

CRASH RATE CALCULATION : **0.33** RATE = $\frac{(A * 1{,}000{,}000)}{(ADT * 365)}$

Comments :

5. March 26, 2008 Memo

Technical Memorandum

Date: March 26, 2008

To: Project File

Attn: Michael Garrity

From: Andrew J. Arseneault

Subject: Trip Generation Methodology
Project Study Area
Provincetown Municipal Airport (CIP)

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1. BACKGROUND

A traffic study (*Traffic Operation Report and Parking Analysis*, November 2006) was prepared to support preparation of the Draft Environmental Impact Report (DEIR) for the Provincetown Airport Capital Improvement Project (CIP). The study was prepared in response to the Certificate on the Environmental Notification Form (ENF), comment letters, and the MEPA traffic guidelines. The MEPA Certificates for the ENF and the DEIR (EOEEA No. 13789) scoped the inclusion of two intersections: Route 6 at Conwell Street and Race Point Road, and Race Point Road at Airport Drive. Comments were received on the DEIR from MEPA, the CCC and other agencies. Some of the comments questioned the trip generation methodology used to generate the anticipated motor vehicles accessing the site and subsequently the impact of the generated trips on the study area. This memorandum seeks to offer a recommendation on both of these outstanding issues. Additionally, the traffic operations and parking analysis study will be revised for the Final EIR in response to the MEPA Certificate and other comments on the DEIR.

The CIP project will also be reviewed by the Cape Cod Commission (CCC) as a Development of Regional Impact (DRI). As part of the review process, a pre-application meeting for the project was held with several CCC staff on August 19, 2007. Several issues related to the traffic impacts for the CIP were discussed at that meeting, in addition to other environmental issues. After that meeting a follow-up meeting specific to traffic was held with Robert Munford and B. Clay Schofield, CCC staff traffic specialists, on August 27, 2007 to further discuss the two issues of trip generation and study area. It is recommended that this memo be forwarded to the CCC staff for their review and comment prior to submission of the FEIR and DRI application.

The traffic study prepared for the DEIR included trip generation based on the standard methodology published by the Institute of Transportation Engineers (ITE) in the *Trip Generation Handbook*, 7th Edition. In addition to investigating the ITE methodology, the CCC transportation staff suggested using an alternative trip generation methodology, similar to the one used for the Barnstable Municipal Airport DRI. These two methods are compared in this memo and a recommendation is made.

2. TRIP GENERATION

ITE Trip Generation

The standard method of generating projected traffic volumes for transportation projects is from the Institute of Traffic Engineers (ITE) Trip Generation Handbook 7th Edition. The ITE Trip Generation Handbook is based on several field investigations of various land uses (i.e. Commercial Airport, General Aviation Airport, waterport/marine terminal, truck terminal, park-and-ride lot with bus service, light rail transit station with parking). It provides a statistical breakdown of the motor vehicle trips generated by a project based on various independent factors (i.e. employees, commercial flights, motor vehicle trips versus based aircraft, motor vehicle trips versus scheduled flights). The land use deemed most appropriate for the CIP project at the Airport is Land Use Code (LUC) 22, General Aviation Airport. Although the project meets many of the criteria for a commercial airport designation it functions more appropriately as a GA airport in terms of traffic. The trip generation calculation worksheets, as well as the applicable Demand Forecasts Tables of the Provincetown Municipal Airport 2005 Master Plan, are included in the Appendix for this memorandum.

The standard ITE method estimates a relatively small increase in motor vehicle trips, as shown in Table 1a and 1b. Both the independent variables of trips versus based aircraft, and trips versus scheduled flights have been analyzed and are shown on Tables 1a and 1b respectively. Trip generation calculations were performed for all periods available from the ITE method. Saturday periods are not included with the ITE method.

Table 1a Trip Generation Versus Based Aircraft Using ITE Method

	(A) Trip Generation Rate[1]	(B) Existing Based Aircraft[2]	(C=BxA) Calculated Existing Airport Generated Trips[3]	(D) Projected Based Aircraft[2]	(E=DxA) Projected Airport Generated Trips[3]	**(F=E–C) Trip Increase**	**(G=F/C) Percentage of Trip Generation Increase**
Weekday Morning Peak Hour	0.24	6	1	7	2	**1**	***100%***
Entering	*(83%)*		*1*		*2*	***1***	***100%***
Exiting	*(17%)*		*0*		*0*	***0***	***0%***
Weekday Evening Peak Hour	0.37	6	2	7	3	**1**	***50%***
Entering	*(45%)*		*1*		*1*	***0***	***0%***
Exiting	*(55%)*		*1*		*2*	***1***	***100%***

[1]Based on ITE LUC 22, General Aviation Airport, vs. Based Aircraft.
[2]Based on the Demand Forecasts Section of the Provincetown Municipal Airport 2005 Master Plan.
[3]Based on ITE Average Trip Generation Rate.

Table 1b Trip Generation Versus Scheduled Flights Using ITE Method							
	(A) Trip Generation Rate[1]	(B) Existing Scheduled Flights[2]	(C=BxA) Calculated Existing Airport Generated Trips[3]	(D) Projected Scheduled Flights[2]	(E=DxA) Projected Airport Generated Trips[3]	**(F=E-C) Trip Increase**	**(G=F/C) Percentage of Trip Generation Increase**
Weekday Morning Peak Hour	0.24	40	10	44	11	**1**	***10.0%***
Entering	*(83%)[4]*		*8*		*9*	***1***	***12.5%***
Exiting	*(17%)[4]*		*2*		*2*	***0***	***0.0%***
Weekday Evening Peak Hour	0.30	40	12	44	13	**1**	***8.3%***
Entering	*(45%)[4]*		*6*		*6*	***0***	***0.0%***
Exiting	*(55%)[4]*		*6*		*7*	***1***	***16.7%***
Saturday Midday Peak Hour	0.20	40	8	44	9	**1**	***12.5%***
Entering	*(50%)[4]*		*4*		*5*	***1***	***25.0%***
Exiting	*(50%)[4]*		*4*		*4*	***0***	***0.0%***

[1]Based on ITE LUC 22, General Aviation Airport, vs. Average Flights per Day.
[2]Based on the Demand Forecasts Section of the 2005 Airport Master Plan.
[3]Based on ITE Average Trip Generation Rate.
[4]No value provided, split assumed based on other Independent Variables for LUC 22.

Empirical Trip Generation

An alternative methodology was suggested by the CCC at the August 27, 2007 meeting which determines a trip generation rate based on the existing number of passengers (as reported by Cape Air and included in the 2005 Master Plan). This trip rate would then be applied to the 2024 forecasted number of passengers (as stated in the 2005 Master Plan). This method of determining trip generation is based on the method that the CCC accepted in the Barnstable Municipal Airport DRI.

Presently, 141 passengers use the Provincetown Airport on an average peak weekday. Traffic counts were taken at the site driveway and indicate that 13 vehicles access the site (10 enter, 3 exit) during the weekday morning peak period, 52 vehicles access the airport during the weekday midday peak period (24 enter, 28 exit), 39 access the airport during the weekday evening peak period (21 enter, 18 exit) and 41 access the airport during the Saturday midday peak period (21 enter, 20 exit). Projecting these volumes based on the anticipated future passenger count results in motor vehicle trip increases ranging from 2 to 8 vehicles during the peak periods. The analysis results are summarized in Table 2.

Table 2 Trip Generation Using Empirical Method							
	(A) Existing Number of Daily Passengers[1]	(B) Existing Airport Generated Trips[2]	(C=A/B) Trip Generation Rate	(D) Projected Number of Daily Passengers[1]	(E=DxC) Projected Airport Generated Trips	**(F=E-B) Trip Increase**	**(G=F/B) Percentage of Trip Generation Increase**
Weekday Morning Peak Hour	141	13	0.09	162	15	**2**	***15.4%***
Entering		*10*			*12*	***2***	***20.0%***
Exiting		*3*			*3*	***0***	***0.0%***
Weekday Midday Peak Hour	141	52	0.37	162	60	**8**	***15.4%***
Entering		*24*			*28*	***4***	***16.7%***
Exiting		*28*			*32*	***4***	***14.3%***
Weekday Evening Peak Hour	141	39	0.28	162	45	**6**	***15.4%***
Entering		*21*			*24*	***3***	***14.3%***
Exiting		*18*			*21*	***3***	***16.7%***
Saturday Midday Peak Hour	141	41	0.29	162	47	**6**	***14.6%***
Entering		*21*			*24*	***3***	***14.3%***
Exiting		*20*			*23*	***3***	***15.0%***

[1]Based on the Demand Forecasts Section of the 2005 Airport Master Plan.
[2]As observed in August 2007.

Trip Generation Summary and Recommendations

Of the two different methods of determining the projects impact on trip generation, the Empirical Trip Generation procedure results in more conservative (i.e. higher) traffic volume increases during the peak periods compared to the ITE method. Both methods estimate trip increases within the same order of magnitude and have increases during the same periods. Additionally, the percentage of increased trips, when compared to existing trips (using the scheduled flights independent variable), is comparable under both methods.

Based on the trip generation methodologies discussed above and standard engineering practices, it is recommended that the conservative Empirical Trip Generation method (as calculated in Table 2) be used to develop the anticipated trip increases for the Provincetown Municipal Airport.

3. STUDY AREA

Based on CCC guidelines, the study area associated with a development should include every intersection which has an increase greater than 1% in vehicular traffic. However, it is unclear

whether this parameter would be applicable for this project since it is projected that there will be relatively minor traffic volume increase. A study of the surrounding roadways was investigated. When investigating the existing traffic flow patterns within the area, it was determined that approximately 40% of site related traffic will travel to and from the east on Route 6, 40% to/from the south on Conwell Street and 20% to/from the east on Route 6.

Applying these percentages to the most conservative trip generation estimate, it was shown that approximately 1 to 4 vehicles would be added to Route 6 east of the Conwell Street/Race Point Road intersection during the peak periods (1 during the weekday morning, 4 during the weekday midday and 2 during the weekday evening). The nearest intersection to the east is the intersection of Route 6 at Howland Street, a tee-intersection located approximately 0.5 miles away. Based on traffic volumes collected by the CCC, the traffic volume increases at this intersection are expected to be less than 1%. The vehicle increases south of the study area also ranged from 1 to 4 vehicles (1 during the weekday morning, 4 during the weekday midday and 2 during the weekday evening). The closest intersection south of the study area is Conwell Street at Hensche Lane, another tee-intersection approximately 550 feet to the south. Again, based on the latest CCC Traffic Counting Report, these increases were anticipated to be less than 1%. Two additional vehicles were projected to exit the study area east during the weekday evening peak period, with no vehicles projected during the weekday morning and midday periods. The closest intersection east of the study area is Sandy Hill Lane, a tee-intersection 625 feet east of Conwell Street/Race Point Road. This intersection is also projected to result in a less than 1% increase to traffic volumes.

Study Area Recommendation

Based on the relatively small traffic increases projected at the intersections, it is recommended that the current study area is retained. This study area was scoped by the MEPA Certificate on the ENF.

ATTACHMENTS

1. Trip Generation Work Sheets, August 2007
2. Demand Forecast Tables, 2005 Master Plan

1. Trip Generation Work Sheets, August 2007

General Aviation Airport

Current Peak Day Based Aircraft	6
Anticipated Peak Day Based Aircraft	7

Weekday Morning Peak Hour

Current Peak Day Based Aircraft

$T = 0.24 * X$
$T = 0.24 * 40$
$T = 1$
$T \approx 1$

Anticipated Peak Day Based Aircraft

$T = 0.24 * X$
$T = 0.24 * 44$
$T = 1.68$
$T \approx 2$

Projected New

$\Delta = 2-1$
$\Delta = 1$

Weekday Evening Peak Hour

Current Peak Day Based Aircraft

$T = 0.37 * X$
$T = 0.37 * 40$
$T = 2$
$T \approx 2$

Anticipated Peak Day Based Aircraft

$T = 0.37 * X$
$T = 0.37 * 44$
$T = 3$
$T \approx 3$

Projected New

$\Delta = 3-2$
$\Delta = 1$

General Aviation Airport

Current Peak Day Scheduled Flights	40
Anticipated Peak Day Scheduled Flights	44

Average Weekday Daily

Current Peak Day Scheduled Flights

T = 1.97 * X
T = 1.97 * 40
T = 78.80
T ≈ 79

Anticipated Peak Day Scheduled Flights

T = 1.97 * X
T = 1.97 * 44
T = 86.68
T ≈ 87

Projected New

Δ = 87-79
Δ = *8*

Weekday Morning Peak Hour

Current Peak Day Scheduled Flights

T = 0.24 * X
T = 0.24 * 40
T = 9.60
T ≈ 10

Anticipated Peak Day Scheduled Flights

T = 0.24 * X
T = 0.24 * 44
T = 10.56
T ≈ 11

Projected New

Δ = 11-10
Δ = *1*

Weekday Evening Peak Hour

Current Peak Day Scheduled Flights

T = 0.30 * X
T = 0.30 * 40
T = 12.00
T ≈ 12

Anticipated Peak Day Scheduled Flights

T = 0.30 * X
T = 0.30 * 44
T = 13.20
T ≈ 13

Projected New

Δ = 13-12
Δ = *1*

Appendix 2. Forecast Demand Tables

Table 4-4 Forecast Scheduled Aircraft Operations (2004-2024)

Year	Annual Operations	Peak Month	Peak Day	Peak Hour
2004	4,140	1,035	40	10
2009	4,245	1,062	41	11
2014	4,352	1,088	42	11
2024	4,574	1,144	44	12

Source: Final-2005 Master Plan, Provincetown Municipal Airport

Table 4-5 Forecast of PVC Scheduled Passenger Enplanements

Year	Enplaned Passengers	Peak Month	Average Day	Peak Hour
2004	10,792	2,698	141	46
2009	11,175	2,794	146	47
2014	11,572	2,893	151	49
2024	12,408	3,102	162	52

Source: Final-2005 Master Plan, Provincetown Municipal Airport