The Northeast Ramp is divided into four sections labeled AE1 through AE4. These sections have PCI values that range from very good for AE1 and AE4, to excellent for AE2, to very poor at AE3. In general, the concrete surfaced aprons are of very old construction and contain large amounts of distress of all levels. Distresses common to the Northeast Ramp include: corner breaks, linear cracking, joint seal damage, small and large patching, scaling, shattered slabs, shrinkage cracking, and joint corner spalling. Basically the entire spectrum of climatic and load-related distresses for rigid pavement is apparent on the Northeast Ramp. A large portion of these distresses have deteriorated to severity levels of medium and high (AE3 section).

Resurfaced in 1978, Holding Apron 1 contains typical climatic related distresses such as longitudinal/transverse cracking and raveling/weathering. According to the 1994 *Field Investigation, Pavement Evaluation and Classification Report*, the PCI value for Holding Apron 1 was good. Holding Aprons 2 and 3 were rehabilitated in 2001 and are therefore in excellent shape.

Runway Incursion Action Team Recommendations

The FAA, through its air traffic controllers, as well as pilots and airport management at airports across the country, is focused on providing the safest travel experience for the public. Providing an airfield geometry that complies with FAA airport design criteria and minimizes any pilot/controller/ground vehicle disorientation is one way of ensuring standardized, safe ground movement. Not every airport in the country is able to provide the standard geometry recommended by the FAA due to many factors, including site constraints and the cost of replacing outdated pavements, lighting, and/or signage. Nevertheless, the FAA maintains a national program designed to assist airports in improving airfield geometry to minimize the potential for runway incursions[11], vehicle deviations, and/or operational errors.

The FAA's national Runway Incursion Action Team (RIAT) visited T.F. Green Airport in 2000, and through a collaborative effort between the FAA and airport management, recommended a number of airfield improvements to enhance airfield safety. The following actions are the major recommendations issued by the RIAT:

- Reconstruct the intersection of Runways 5R-23L and 16-34 to provide a standard geometry (Completed)
- Re-open abandoned Taxiway "S" (Completed)
- Complete parallel Taxiway "M" for Runway 5R-23L (Future)
- Consider closing Runway 5L-23R, in favor of using the pavement as a taxiway (Future)

[11] The FAA defines a runway incursion as any occurrence at an airport involving an aircraft, vehicle, person, or object on the ground that creates a collision hazard or results in loss of separation with an aircraft taking off, intending to takeoff, landing, or intending to land.

In addition, it was agreed that the Master Plan would evaluate T.F. Green's airfield geometry in order determine potential improvements that could minimize runway incursions.

Airfield Lighting

A variety of lighting aids are available for use at night or during adverse weather conditions at T.F. Green Airport.

Identification Lighting

A rotating beacon containing the universally accepted optical system for lighting airports identifies the location of the airport. This beacon projects alternating green and white beams from dusk to dawn. When activated during daylight hours, the beacon signals ground visibility of less than three miles and/or a ceiling of less than 1,000 feet. The T.F. Green Airport beacon is located on top of the RIAC parking garage.

Runway Lighting Aids

Lighting aids are necessary to provide pilots with critical takeoff and landing information concerning runway alignment, lateral displacement, rollout operations, and distance. **Table I.5-1** identifies the lighting aids available for each runway.

Table I.5-1
LIGHTING AIDS
T.F. Green Airport

Type of Lighting	5R	23L	5L	23R	16	34
Runway Edge Lights	HIRL	HIRL	None	None	HIRL	HIRL
Centerline Lights	Yes	Yes	Yes	Yes	No	No
Touchdown Zone Lights	Yes	No	No	No	No	No
Approach Lighting	ALSF-II	MALSR	None	None	None	MALSR

HIRL – High Intensity Runway Lights
ALSF-II – Approach Light System with Sequenced Flashing Lights, CAT II
MALSR – Medium Intensity Approach Light System with Runway Alignment Indicator Lights

Source: Jeppesen Sanderson, Inc., 2001

Runway edge lights are used to outline edges of runways during periods of darkness or restricted visibility conditions. The runway edge lights are white, except on the last 2,000 feet of instrument approach runways, where they are amber, indicating the touchdown zone (TDZ) during night or adverse weather. All runways except 5L-23R are outfitted with High Intensity Runway Lights (HIRL).

Runway centerline lights indicate the location of the runway centerline during night or adverse weather. All runways except Runway 16-34 have centerline lights. In addition, Runway 5R has TDZ lights. TDZ lights include two rows of transverse light bars located symmetrically about the runway centerline, normally at 100-foot intervals, extending 3,000 feet along the runway.

All runways except Runways 5L-23R and 16 are equipped with an approach light system. Runway 5R is equipped with a CAT II, Approach Light System with Sequenced Flashing Lights (ALSF-II). Runways 23L and 34 are outfitted with Runway Alignment Indicator Lights (MALSR).

Navigational Aids

T.F. Green Airport has several navigational aids, which are visual or electronic devices that provide point-to-point guidance information or position data to aircraft in flight. The navigational aids for each runway are shown below in **Table I.5-2**.

Table I.5-2
NAVIGATIONAL AIDS
T.F. Green Airport

Runway	Landing Aids
5R	CAT II ILS, VOR, NDB
23L	CAT I ILS, GPS, VOR/DME, VASI
5L	VASI
23R	VASI
16	GPS, VOR/DME, VASI
34	CAT I ILS/DME, GPS, VOR, VOR/DME, VASI

ILS – Instrument Landing System
VOR – Visual Omnidirectional Range
NDB – Nondirectional Beacon
GPS – Global Positioning System
DME – Distance Measuring Equipment
VASI – Visual Approach Slope Indicator

Source: Jeppesen Sanderson, Inc., 2001

Runways 5R, 23L, and 34 are equipped with an Instrument Landing System (ILS). An ILS allows for precision approaches to the airport. Different types of ILSs exist depending upon their accuracy and the accuracy of the equipment on the aircraft. Known as ILS categories, the distinction lies in the difference between decision height and visibility requirements. Runways 23L and 34 have CAT I ILSs. The CAT I ILS consists of a localizer (horizontal guidance); glide slope (vertical guidance); and middle marker and outer marker or compass locator (to identify distance from the runway).

Runway 5R has a CAT II ILS. A CAT II ILS has more stringent requirements and requires the inner marker. An authorized CAT III ILS approach is pending for Runway 5R, which will improve the airport's all-weather reliability to an even greater degree than exists today.

Runway 34 has a published ILS/Distance Measuring Equipment (DME) approach. The ILS/DME facility provides course and distance information from collocated components under a frequency-pairing plan.

There are published Global Positioning System (GPS) approaches to Runways 23L, 16, and 34. GPS is a United States satellite based radio navigational, positioning, and time transfer system operated by the Department of Defense.

Runways 5R and 34 have published Visual Omnidirectional Range (VOR) approaches. A VOR is a ground-based electronic navigational aid transmitting very high frequency navigation signals that provides bearing information. Runways 23L, 16, and 34 have published VOR/DME approaches. As with the ILS/DME facility discussed above, VOR/DME facilities provide course and distance information from collocated components under a frequency-pairing plan.

Runway 5R has a published approach using a Nondirectional Beacon (NDB). An NDB is a radio beacon transmitting nondirectional signals whereby the pilot of an aircraft equipped with direction finding equipment can determine his bearing to or from the radio beacon.

The runways at T.F. Green Airport also have visual aids to guide an aircraft's approach. All runways except Runway 5R have a Visual Approach Slope Indicator (VASI). VASIs are systems of lights arranged to provide visual guidance information during the approach to a runway.

In addition, the T.F. Green VORTAC is located near the center of the airfield. A VORTAC is a navigational aid providing VOR azimuth, Tactical Air Navigation (TACAN) azimuth, and TACAN DME at one site.

Runway visual range (RVR) capability exists at the airport through the use of touchdown and rollout transmissometers for approaches to Runway 5R and a touchdown transmissometer for the approach to Runway 34. These are controlled by the ATCT and their function is to help determine runway visibility conditions.

Communications Facilities

A Remote Transmitter/Receiver (RTR) is located to the northwest of the passenger terminal and north of the fuel farm. An RTR is an unmanned communications facility remotely controlled by air traffic personnel. The RTR provides ground-to-ground communications between ATC specialists and pilots.

In addition, an Automatic Terminal Information Service (ATIS) facility is located north of Taxiway "C", south of Runway 16-34, and east of Runway 5L-23R. An ATIS continuously broadcasts recorded noncontrol information, including weather, time, and runway information. Its purpose is to improve controller effectiveness and to relieve frequency congestion by automating the repetitive transmission of essential but routine information.

Obstructions

Analysis of obstructions is based on criteria defined in Federal Aviation Regulation (FAR) Part 77, *Objects Affecting Navigable Airspace*. A primary focus of Part 77 is the establishment of standards for determining obstructions to safe flight on, and in the vicinity of an airport, as well as setting forth requirements for notifying the FAA of certain proposed construction or alteration activities, and providing for aeronautical studies of obstructions to air navigation. While it is the responsibility of the FAA to determine the effect of these obstructions on the safe and efficient use of airspace, it is the airport operator who has the responsibility to ensure that the aerial approaches to the airport remain adequately cleared and protected.

To determine whether an object is an obstruction to air navigation, Part 77 establishes several imaginary surfaces in relation to an airport and to each runway end. The size of the imaginary surfaces depends upon the type of approach to the runway in question. The principal imaginary surfaces include:

1. Primary Surface: Longitudinally centered on the runway at the same elevation as the nearest point on the runway centerline.
2. Horizontal Surface: Located 150 feet above the established airport elevation, the perimeter of which is established by swinging arcs of specified radii from the center of each the primary surface end, connected via tangent lines.
3. Conical Surface: Extends outward and upward from the periphery of the horizontal surface at a slope of 20:1 for a horizontal distance of 4,000 feet.
4. Approach Surface: Longitudinally centered on the extended centerline, and extending outward and upward from each runway end at a designated slope based on the runway approach.
5. Transitional Surface: Extends outward and upward at a right angle to the runway centerline at a slope of 7:1 up to the horizontal surface.

Four documents were reviewed by the Master Plan Team related to obstructions to the Part 77 surfaces in the vicinity of T.F. Green Airport. These included:

- *Obstruction Study and Action Plan* (1992)
- Obstruction Chart (NOAA, 1994)
- *Runway 16-34 Obstruction Study* (1999)
- *CAT III Tree Clearing Analysis* (2000)

The most comprehensive plan was the 1992 airport-wide study that focused on penetrations to the imaginary surfaces as defined by FAR Part 77. Numerous penetrations were noted at locations all around the airport by both natural and man-made obstructions. Since that study was prepared, RIAC has accomplished a significant amount of tree clearing. However, no consistent documentation has been kept to correlate the obstructions removed to the obstructions noted in the report. In addition, the survey data from this report is nearly 10 years old, therefore, vegetation that was not previously noted (because it was more than five feet below the surface) may, in fact, be a penetration today.

The airport's obstruction chart was updated in 1995. This drawing shows the limits of the surfaces defined by FAR Part 77. The survey, conducted by NOAA in August 1994, identifies major obstructions within the outer limits of the Conical Surface. The profile sections of each runway end indicate numerous penetrations to each of the standard FAR Part 77 approach surfaces for each runway.

Two studies have been conducted for specific project areas. The first study identified both natural and man-made obstructions off the departure end of Runway 34. This study looked at the obstructions that were most critical to the takeoff performance capabilities of commercial airlines. Numerous obstructions were noted, and a list is maintained by RIAC's Planning and Development Department indicating the current status of each obstruction. In general, the obstructions to the approach to Runway 16 include trees, utility poles, and some structures.

The second study identified tree-clearing requirements along the east side of Runway 5R. This project was part of the airport's certification requirements to obtain CAT III ILS capability to Runway 5R. After the initial survey, the necessary tree clearing was performed to clear the transitional surface on the east side of Runway 5R. This study also identified additional trees that were within ten feet of the surface for monitoring and future removal if necessary.

An updated aerial photogrammetry effort is being conducted to update all previous obstruction identification information. As soon as this information becomes available in late 2001, the results will be incorporated into this Master Plan.

Runway Data Summary

Table I.5-3 shows a summary of the runway data discussed in this section.

Table I.5-3
RUNWAY DATA
T.F. Green Airport

	RUNWAY					
	5R-23L		5L-23R		16-34	
Length (feet)	7,166		4,432		6,081	
Width (feet)	150		75		150	
Surface Material	Asphalt		Concrete with Asphalt Overlay		Concrete	
Load Bearing Strength (pounds)						
Single Wheel	102,000		33,000		102,000	
Dual Wheel	170,000		N/A		170,000	
Dual Tandem	295,000		N/A		295,000	
Double Dual Tandem	590,000		N/A		590,000	
Approach Aids						
ILS	Yes [1]	Yes	No	No	No	Yes
RVR	Yes	No	No	No	No	Yes
NDB	Yes	No	No	No	No	No
VOR/DME	Yes	Yes	No	No	Yes	Yes
GPS	No	Yes	No	No	Yes	Yes
VASI	No	Yes	Yes	Yes	Yes	Yes
Approach Lighting	ALSF-II	MALSR	No	No	No	MALSR
Lighting	HIRL		None		HIRL	
Marking	Precision		Visual		Precision	

[1] CAT I and II ILS.
[2] VOR only.

Sources: Jeppeson Sanderson, Inc., 2001

I.5.2 Passenger Terminal Facilities

The terminal facilities encompass the terminal building, including its ticketing and bag claim areas, airline operations areas and offices, concession areas, security stations, RIAC administrative offices, concourses, and aircraft gates and hold rooms. In addition, this section describes the terminal facilities include the curb in front of the building, and the terminal loop roadway serving the terminal. An enlarged view of the terminal facilities is provided in **Exhibit I.5-3**.

Terminal and Gate Facilities

The 15-gate Bruce Sundlun Terminal building was constructed in 1996. Due to the rapid growth in air passengers, a four-gate expansion was completed in 1998. The

terminal is located approximately 600 feet west of Runway 5L-23R and consists of 311,000 square feet of space on three levels. The first level includes space for public circulation, baggage claim, airline operations areas, and surface transportation facilities. The second level contains public circulation space, airline ticketing and administrative offices, security, concessions, and airport administration space. The third level contains the remainder of RIAC's administrative offices.

The two existing passenger concourses, which contain additional concessions, gate, and hold room facilities, are extensions of the second level of the terminal building core. As shown on **Exhibit I.5-4**, the terminal has a total of 22 aircraft parking positions. In the spring of 2001, the last available airline gate was leased. This means that any new entrant airline, or expanded operations by an existing airline, will be required to "gate share." Thus, the capacity of the "new" terminal needs to be further evaluated.

To increase the efficiency of the terminal for short-term needs, construction will commence in the summer of 2001 to add a fourth floor for RIAC administrative offices. When completed in 2002, administrative space will be relocated from the second floor to make room for additional ticket counters to accommodate either existing or new airlines. Lastly, the terminal modification project will enhance the baggage area to relieve existing congestion that sometimes lengthens the time passengers spend waiting for arriving luggage.

A departing passenger survey and a terminal observation survey were conducted in October of 2000. The survey was performed to establish baseline information on how the terminal functions are operating, and will be used in the analysis of future facility requirements later in this Master Plan. The results of these surveys are contained in Appendix A, *Survey Results*.

Terminal Curb Frontage

The upper and lower level roadways provide passenger access to the terminal curb frontage. The upper level roadway serves departing (enplaning) passengers. In front of the departures curb, the innermost lane is wider than the adjacent travel lanes to allow short-duration dwell while passengers off-load their luggage. There are four doors providing access from the enplaning curb to the ticketing lobby and ticket counters on the second floor of the terminal building.

The lower level terminal curb serves arriving (deplaning) passengers. In front of the deplaning curb, there is one lane devoted to passenger pick-up, and two through-lanes. As with the upper-level curb, the inner-lane is wider than the adjacent lanes. Similar to the enplaning curb, auto traffic demand during peak periods is focused in front of the four doors of the terminal building in front of the deplaning curb.

A "commercial vehicle" roadway and curb are also provided on the lower level. Passengers must cross the travel lanes of the lower level (arrivals) roadway in order to access the commercial curb. Taxis, buses, shuttle buses, and other commercial vehicles can be accessed from this location.

Terminal Loop Roadway

There is a terminal loop roadway that provides access to various points on and off the airport. The two-lane road encircles the hourly public parking lot, and then provides access to the Airport Connector (to I-95), as well as Post Road (Route 1), the long-term parking lot, and the Bruce Sundlun Terminal. The terminal loop roadway will be discussed in more detail in the next section.

I.5.3 Landside Facilities

The inventory of landside facilities includes parking facilities, airport area roadway access and circulation, and airport roadway and facility users (such as rental car agencies, hotel and off-airport parking operators, buses, limousines, and others). The inventory of existing ground transportation conditions includes road network geometry, traffic volume data, pedestrian movement, and transit operations. RIAC, RIDOT, and the Rhode Island Public Transit Authority (RIPTA) were all contacted and contributed valuable data and resources for the development of this landside and ground transportation inventory.

Airport Parking

Convenience of parking facilities and ease of access for air passengers are important factors for airport customer service. At T.F. Green, various short-term and long-term public and private parking facilities have been constructed to accommodate passenger demand. **Exhibit I.5-5** depicts the on-airport parking facilities that serve T.F. Green Airport.

RIAC Public Parking

The public parking supply has been increased in recent years in an attempt to keep pace with the rapid growth and popularity of travel from T.F. Green Airport. The on-airport RIAC Garage, valet garage, short-term lot, and long-term lot are all controlled by RIAC. The one exception is the privately owned and operated Red Beam Garage, located adjacent to airport property. **Table I.5-4** shows the current number of spaces and occupancy rates for the on-airport RIAC operated parking facilities.

Table I.5-4
RIAC PUBLIC PARKING FACILITIES
T.F. Green Airport

Facility	No. of Spaces	Percent Utilization	Dollar Rate
RIAC Daily Garage	1,260	100 percent	$17 per day
Short-term Hourly Lot	650	30 percent	$2 first half hour, $1 each added half hour, 5 hours-plus is $30
Long-term/Overflow	4,700	60 percent	$11 per day, $49 per week
Valet Garage	750	50 percent	$22 per day, $110 per week
Total	7,160	63 percent*	

*= Total percent utilized does not include Valet Garage.

Source: RIAC Survey October 2000.

Parking Surveys

In April 1999, during the EA for the Warwick Intermodal Train Station, a license plate survey was conducted April 1-15, 19, 23, 25, and 29 by New England Parking (NEP), the operators of the airport's parking facilities. License plates were observed from Massachusetts, Rhode Island, New Hampshire, Connecticut, and New York. This information was converted into a map showing the locations of all the license plate information on a zip code map of the region. This survey was used to define the airport service area in the New England region.

Privately-Owned Public Parking

Off-airport privately owned public parking facilities are located along Post Road (Route 1). These facilities include the Red Beam Garage, Thrifty, Pre-Flight, and Airport Valet. **Table I.5-5** shows the total number of spaces and occupancy rates for each of these facilities.

Table 1.5-5
PRIVATELY-OWNED, PUBLIC PARKING FACILITIES*
T.F. Green Airport

Facility	No. of Spaces	Percent Utilization	Parking Rate
Red Beam Garage	1,500	60 percent	$17 per day
Thrifty (Off Site)	1,100	90 percent	$12.95 per day, $49.95 per week
Pre-Flight (Off Site)	650	30 percent	$5 per day/$23 per week
Airport Valet (Off Site)	600	80 percent	$13 per day, $45 per week
Total	3,850	65 percent	

Source: RIAC Survey October 2000

In November 2000, a similar survey was completed to determine the changes in service area that had taken place primarily in Massachusetts and Connecticut. A three-day survey of license plates was taken at all long-term parking facilities at 9:00 p.m. until completion each night. The results of this survey indicate that 60 percent of the traffic is from Massachusetts. **Exhibit I.5-6** depicts a map created similar to the above survey to show license plate origins in Massachusetts. Communities with the highest usage of T.F. Green on-airport parking were Boston, Worcester, Franklin, and Barnstable. The highest percentage of airport users in the April 1999 survey, completed by NEP, was from these cities but also included the Taunton/Attleboro region and Plymouth. It is important to note that the 1999 study included nearly a month's data and therefore more detailed information is available than for the 2000 study.

In March 2001, a parking occupancy survey was conducted to revise previous long-term off site parking occupancy data at the following off-airport parking facilities: Airport Valet, Thrifty, Pre-Flight, Alamo, and the Senator Street Lot. The results of the survey indicate that these facilities are generally at 80 percent occupancy. This is higher than the 65 percent observed in the October 2000 survey completed by RIAC.

In April of 2001, NEP conducted another parking survey. A 30-day survey of license plates was taken at the long-term lot, the short-term hourly lot, and the valet garage. Over 16,000 vehicles were surveyed from over 900 zip codes. Approximately 26 percent of the vehicles were from Rhode Island, 60 percent from Massachusetts, eight percent from Connecticut, and the remainder were from other states.

Airport Access and Circulation

An inventory of existing ground access and circulation in the airport vicinity was undertaken as part of the Master Plan. The study area extends north from the Main Avenue (Route 113)/Post Road (Route 1) intersection, to the Post Road (Route 1) and Airport Road intersection. Airport Road is included from Post Road (Route 1), east to the Hade Court/Etta Street intersection, northeast of the airport. All major signalized

intersections along these corridors have been counted to develop baseline traffic volumes for the overall study. Post Road (Route 1) and the Airport Connector provide roadway access to the airport from I-95. **Exhibit I.5-7** shows the extent of the study area.

Major Roads

Airport Connector is the major four-lane limited access highway that connects I-95 with T.F. Green Airport. Two travel lanes and a paved shoulder are provided in each direction. Two major interchanges are provided for access to the local street network before the connection into the airport terminal – Jefferson Boulevard and Post Road (Route 1). Although full access is provided to and from Post Road (Route 1) and the Airport Connector, access at Jefferson Boulevard is limited to westbound on-ramps and eastbound off-ramps. Traffic volume on the Airport Connector is the highest in the airport study area with a daily volume of 52,237 in 2000.

Post Road (Route 1) is the primary four lane north-south arterial roadway directly west of the airport terminal. A center two-way left-turn lane exists on the section adjacent to the airport. Access from Post Road (Route 1) to I-95 is provided via the Airport Connector. Several major intersections located along Post Road (Route 1) directly impact airport traffic. Airport Road, Coronado Road, the Airport Connector, the Airport's south entrance, and Main Avenue (Route 113) are major intersections for traffic entering and exiting the airport. The average daily traffic (ADT) on Post Road (Route 1), between Coronado Road/Airport Exit and the Airport Connector was 31,481 in 2000.

Airport Road is the main east-west arterial road north of and adjacent to airport property. This four-lane road provides access from Warwick Avenue (Hoxsie Four Corners), a north-south arterial that intersects with Post Road (Route 1) three miles north of the airport, as well as Route 117 two miles south of the airport. Land use along Airport Road is a mixture of airport and commercial use. To the east of the airport, there are residential and scattered commercial uses along Airport Road. Airport Road has two lanes in each direction with additional turn lanes at major intersections. The ADT on this road was 36,071 in 2000.

Jefferson Boulevard, a major north-south arterial road to the west of Post Road (Route 1) and the Amtrak line, is located within the airport study area. Jefferson Boulevard extends from Post Road (Route 1) about two miles south of the airport to Route 37 to the north of the airport. The land use along this road is primarily industrial with limited residential. This four-lane arterial has two lanes in each direction with additional turn lanes at intersections. A partial interchange provides access to the Airport Connector westbound and from the Airport Connector eastbound. There are no off-ramps or on-ramps from Jefferson Boulevard to the Airport Connector eastbound. The ADT was 17,600 in 2000.

RIDOT is committed to constructing improvements on Jefferson Boulevard within the next few years to accommodate traffic volumes projected with operation of the planned Warwick Intermodal Train Station. The two intersections at the Airport Connector on- and off-ramps will be signalized as part of the train station project. Jefferson Boulevard at Coronado Road will potentially have improvements through the construction of northbound and southbound left-turn lanes to separate turning movements.

Main Avenue (Route 113) is a major four-lane east-west arterial roadway, which crosses the approach of Runway 5R, at the southern end of the study area. The Post Road (Route 1) interchange is signalized at both on- and off-ramps. The road has two lanes in each direction with additional turn lanes at intersections. The land use along Main Avenue (Route 113) is primarily airport property and residential land use. The ADT volume on this road was 30,742 in 2000. RIDOT is scheduled to reconstruct the Main Avenue (Route 113) and Post Road (Route 1) interchange to improve traffic flow and safety in the area. According to RIDOT Road Design, the Main Avenue (Route 113)/Post Road (Route 1)/Greenwood Avenue Bridge project will begin construction in May 2001. This bridge replacement project will include new traffic signals at the on- and off-ramps, geometric improvements to improve sight distance, new island design, and landscaping.

The Greenwood Avenue Bridge project will be completed in two construction phases. Phase 1 will complete 50 percent of the work by November 15, 2002. Phase 2 will finish all other work by October 15, 2003. There is a six-month period after these contracts for landscaping completion by May 15, 2004.

Route 37 is a major four-lane limited access highway that extends west from the terminus at the Post Road (Route 1) interchange, past I-95, to I-295. The interchange on Post Road (Route 1) is located a half-mile north of the airport terminal. The Route 37 interchange and highway links are outside the airport study area, but described here because of its connection to I-95, which provides one available ground access route for airport traffic destined for areas north of the airport. Complete turning movements are provided at both the I-95 and Post Road (Route 1) interchanges on Route 37.

Traffic Count Data

New traffic count data was collected in the airport study area in November of 2000, prior to the holiday season. Historic traffic count data was also collected for airport locations for the last three years. Data was collected from RIAC, RIDOT, and city of Warwick. RIAC provided pertinent airport-related traffic count studies completed in recent years. RIDOT provided a list of 24-hour count locations, and turning movement counts around the airport. The city of Warwick provided transportation-related studies completed in the airport area during the last three years including traffic impact studies completed for some retail developments in the area. **Exhibit I.5-8** shows the volumes in bar graph format for comparison.

RIDOT conducted counts around the airport to support the Master Plan and their annual count program. RIDOT counts were conducted on the Airport Connector ramps into and out of the airport, the Airport Connector ramps at Post Road (Route 1), and at the Route 37 on- and off-ramps at Post Road (Route 1). These counts have not been factored to adjust for seasonal variations throughout the year.

Major Intersections and Traffic Control

Airport vehicle traffic affects intersections within the airport study area. These intersections move traffic into and out of the airport study area. **Exhibit I.5-9** indicates the location of the intersections in relation to the airport terminal and planned train station.

Signalized Intersections

Post Road (Route 1) at Airport Road: This intersection is a three-approach intersection with the westbound Airport Road approach having three lanes: a double left-turn lane and one right-turn lane. The northbound Post Road (Route 1) approach is two through lanes and one right-turn lane. The southbound approach is two through lanes, and a double left-turn lane. The intersection has a high peak hour traffic volume created by large retail businesses, Post Road (Route 1) through traffic, and airport business-related traffic.

Post Road (Route 1) at Coronado Road and the Airport Exit: This intersection is a four-approach intersection with the westbound approach being a one way airport exit. The northbound Post Road (Route 1) approach is three lanes: two through lanes and one left-turn lane. The southbound approach is two lanes: one through lane and one right-turn lane. The eastbound Coronado Road approach includes two lanes: a left and a right-turn lane. The westbound approach from the airport contains three lanes: one left-turn lane, one through lane, and one channeled right-turn lane. Pedestrian actuation buttons are located at the crosswalks on Post Road (Route 1) at the northbound approach and Coronado Road at the eastbound approach.

Post Road (Route 1) at Airport Connector Ramps: This intersection is interconnected to control movements at three intersections: Airport Connector off-ramp, Airport Connector on-ramp, and the Airport Entrance at Donald Avenue, which is 100 feet to the south of the Airport Connector off-ramp. The Airport Connector off-ramp splits at Post Road (Route 1) into two left-turn lanes and one right-turn lane. The Airport Connector on-ramp has a separated southbound right-turn acceleration lane and a northbound left-turn lane from Post Road (Route 1). The Airport Entrance is separated by traffic islands for northbound and southbound entry lanes.

Post Road (Route 1) at Airport Entrance and Donald Avenue: This is a three-approach intersection interconnected with the Post Road (Route 1) and Airport Connector ramp intersections. Post Road (Route 1) northbound has two through lanes and one right-turn lane into the airport; Post Road (Route 1) southbound has two through lanes and one left-turn lane in the airport. Donald Avenue forms the eastbound approach with one shared lane for left and right turns. There is no westbound flow from the one way airport entrance.

Jefferson Boulevard at Coronado Road/Kilvert Street: This is a four-approach intersection with Jefferson Boulevard being the north-south major arterial road. The northbound approach has two lanes: a through/left-turn lane, and a through/right-turn lane. It also has a channeled right-turn slot close to the intersection. The southbound approach has the same geometry, but no right-turn slot. The westbound Coronado Road approach forms two unmarked lanes that operate as a left/through lane, and a through/right-turn lane. The eastbound Kilvert Street approach has the same geometry. There are no crosswalks or pedestrian buttons at the approaches.

Airport Road at Delivery Entrance: This is a three-approach intersection with Airport Road being the major east-west arterial road. There are two lanes in each direction on Airport Road. The Delivery Drive provides the only means of access for airport terminal deliveries, the airport's fuel farm facilities, and existing Hertz, Avis, and Budget rental car facilities (both inside and outside of the RIAC parking garage. Land use to the north of Airport Road at the intersection is commercial development.

Airport Road at Hade Court at Etta Street: This four-approach intersection has two lanes in each direction on Airport Road. Hade Court forms the northbound approach and Etta Street the southbound approach in a single-lane configuration with loop detectors on all approaches. Right turns are restricted from 4:00 p.m. to 6:00 p.m. daily for eastbound traffic. Pedestrian actuation buttons are located on Hade Court to cross Airport Road. Land use on Hade Court and on Etta Street is single-family residential homes.

Airport Road at Commerce Drive: This three-approach intersection on Airport Road serves the privately owned Airport Industrial Park to the north. There are three Airport Road lanes eastbound: one left-turn lane, and two through lanes. There are two lanes westbound: one through/right-turn lane, and one through lane. The southbound approach from Commerce Drive has separate left and right-turn lanes.

Airport Road at Airfield Maintenance Facility: This intersection is actuated for airport maintenance operations only. The airport maintenance facility, located north of Airport Road, actuates the signal when access is needed between the maintenance facility and runway/airport areas across the street on the main airport property. This occurs during deliveries, snow removal, and other pertinent activities requiring maintenance. During time-critical snow removal operations, this intersection severely constrains airport maintenance operations. Airport Road in this area has two lanes in each direction and high traffic volumes. These traffic volumes require that this traffic signal be maintained for safe access of airport personnel to the AOAs.

Airport Road at Pedestrian Signal (Army National Guard): This is a push button pedestrian actuated signal that is only activated for pedestrian use. This signal allows pedestrians to cross Airport Road from the Army National Guard to access airside operations including airport hangars, general aviation aircraft parking, and other airport operations. Although the pedestrian button is not frequently actuated for crossing on Airport Road, the signal does provide for safe crossing conditions that would not exist without a traffic signal on this high volume road.

Terminal Loop Roadway/Short- and Long-Term Parking/Terminal Loop Roadway On/Off-Ramps: This is a three-approach intersection within the airport terminal area that controls circulation from the Airport Connector, airport south entrance and long-term parking traffic, and the terminal loop roadway. The single-lane northbound Airport Connector approach splits at the signal to the inner curb (arrivals area), commercial lane (bus drop-off/pickup), and the hourly parking lot. The westbound approach from long-term parking has two lanes, a left-turn lane to the Airport Connector, and a right-turn lane to the arrivals curb, hourly lot, and commercial lane. The eastbound approach from the terminal loop roadway has three lanes: a left-turn lane to hourly parking, to a commercial lane, and to an arrivals curb; a through lane to long-term parking and return to the departures level, and a right-turn lane to the Airport Connector.

Stop Control Intersections (Unsignalized)

Jefferson Boulevard at Airport Connector: This intersection is a half diamond partial interchange configuration. An off-ramp and on-ramp connect at Jefferson Boulevard to form the partial interchange. The eastbound off-ramp splits to form a left and right-turn lane. The westbound on-ramp access has a right-turn acceleration lane from southbound Jefferson Boulevard and a northbound left-turn/through lane on Jefferson Boulevard. The land use in the area is commercial and industrial. As part of the RIDOT Warwick Intermodal Train Station project, these two intersections would be signalized to improve traffic flow.

Proposed Road Network and Infrastructure by Others

Several roadway improvements are planned by agencies other than RIAC. Roadway mitigation plans and other transportation and intermodal improvements associated with RIDOT's Warwick Intermodal Train Station include the following:

- Locating the railroad station away from the busy Post Road (Route 1) corridor to the Jefferson Boulevard corridor that has more roadway capacity
- An automatic people mover (APM) connection from the airport terminal
- The electrified train shuttle between Warwick and downtown Providence
- Installation of traffic signals at key locations
- Construction of added turn lanes at select key intersections

The road network in the airport vicinity will undergo improvements in the future. Major improvements committed to in the Federal Highway Administration (FHWA)/RIDOT EA will be the installation of traffic signals on Jefferson Boulevard at the Airport Connector off-/on-ramp and geometric improvements to Jefferson Boulevard at Coronado Road. Both of these projects are part of the Warwick Intermodal Train Station development. A traffic signal may also be installed at the new train station driveway to manage exiting traffic onto Jefferson Boulevard.

Other intermodal improvements include a proposed electrified train shuttle service from Warwick Intermodal Station to downtown Providence that will shuttle passengers to and from Providence. This may reduce the need for separate single vehicle trips from the airport to Providence. The shuttle would operate on a dedicated track east of the mainline tracks.

Multi-modal Circulation

Vehicle Circulation

Airport terminal ground traffic circulation has several access and egress points from the Airport Connector and Post Road (Route 1). The primary access/egress point is through the Airport Connector that ends inside the airport terminal at a signalized intersection.

The Airport Connector eastbound provides access to the long-term parking lot, to the upper departures level, and to the lower arrivals level. Garage parking is accessed via both upper and lower levels. Access to the short-term parking lot and Budget, Avis, and Hertz (in the RIAC parking garage) is provided via the lower level. A commercial lane separated from the inner arrivals curb/lanes provides for drop-off/pickup by airport shuttle buses to the long-term parking lot, hotel courtesy vans, and intercity buses.

The terminal loop roadway provides access to the airport exit at Post Road (Route 1) and Coronado Road. The terminal loop roadway then circles the short-term parking lot to a signalized intersection which provides access northbound to the short-term parking lot and bus lane/commercial lane pick up drop-off area. It also splits northbound back to the lower level front of the terminal. It continues eastbound to the long-term parking surface lot, and southbound onto the Airport Connector towards I-95. No access is provided from the terminal loop road to the upper arrivals level; rather, vehicles must proceed through the signalized intersection southbound to gain access to the upper level departure curb.

Pedestrian Circulation

The primary location of airport terminal pedestrian traffic is at the terminal arrival level (lower) and departure level (upper) doors at the front of the terminal. There are two lower level crosswalks with stop signs and flashing red lights at the main terminal entrance/exit. These crosswalks connect over to the bus drop-off/pickup area and short-term parking lot. Vehicle traffic in front of the terminal must yield to pedestrian traffic at these two crosswalks.

The following figure illustrates one of the two lower level crosswalks in front of the main terminal. Passengers arrive and depart via the long-term parking lot, short-term parking lot, van and car drop-offs, and parking garages.

Lower Level Terminal Crosswalk

The long-term parking lot is located to the south of the terminal and provides shuttle bus service for passengers to and from the terminal. The short-term parking lot is located directly across from the terminal building. This lot provides for short-term visitors to meet or stay with passengers prior to their departure and to pick up arriving passengers.

Overnight parking is located in the RIAC garage, Red Beam garage, and the long-term parking lot. These passengers have a five-minute walk to the terminal from the garages and ten-minutes from the long-term lot, or they can use the airport shuttle bus from long-term parking.

Sidewalks are provided to the parking garages, long-term parking facilities, and to Post Road (Route 1) businesses. All sidewalks are in good condition and provide widths from 10 to 12 feet. These sidewalks do not conflict with the main vehicular traffic, and provide for safe pedestrian circulation around the terminal complex. Sidewalks are not provided around the terminal loop roadway.

Rental Car Operations

Nine rental car companies operate at the T.F. Green Airport. Hertz, Budget, and Avis operate 160 ready spaces inside the main RIAC parking garage and the remaining companies operate along Post Road (Route 1). Hertz, Budget, and Avis currently comprise 50 percent of the market share. Alamo, Thrifty, Dollar, Enterprise, National, and Payless provide patrons with shuttle bus service to their satellite facilities.

A major component of the planned Warwick Intermodal Train Station would be the consolidation of all rental car facilities for the airport into the proposed train station-parking garage. All on-airport and off-airport rental car facilities would be relocated into the Warwick Intermodal Train Station garage. This consolidation of rental car facilities would help reduce traffic volumes on Post Road (Route 1) which are attributable to shuttle van operations, movement of rental cars for fueling, washing, maintenance, storage, and pick up by customers. Use of the APM would eliminate the need for rental car shuttle buses. Fueling, washing, and vehicle storage would also be conducted at the consolidated facility. Access to and from I-95 would be via Jefferson Boulevard, an underutilized arterial roadway, to the Airport Connector. As previously indicated, signal improvements would increase the level of service at key Jefferson Boulevard intersections.

Other Airport Ground Transportation Opportunities

Transit Operations

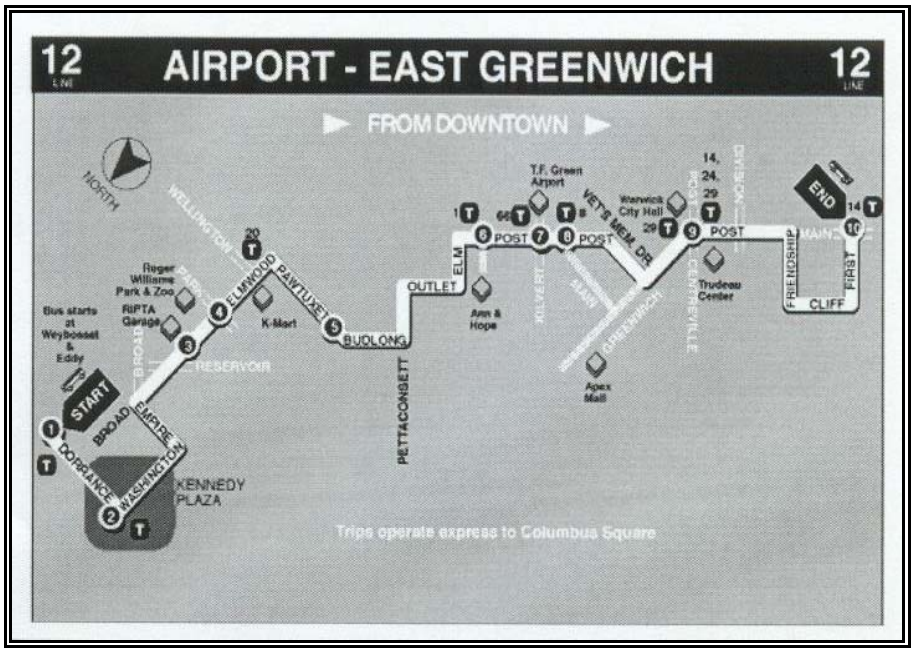
Intermodal connections exist at the airport to downtown Providence and Boston via bus service. The terminal loop roadway splits at the internal signalized intersection to a commercial vehicle lane that accommodates RIPTA bus service, Bonanza intercity bus, rental car shuttle bus, limousines, and taxis. The figure on the next page depicts the commercial vehicle lane on the lower roadway level of the main terminal.

RIPTA Scheduled Bus Service

RIPTA operates two bus routes to T.F. Green Airport on the hour from Kennedy Plaza in downtown Providence. These bus routes are known as the Airport/East Greenwich line (Route 12) and Providence/University of Rhode Island (URI) line (Route 66). The routes are described below.

Transit - Intermodal Drop-off/Pickup

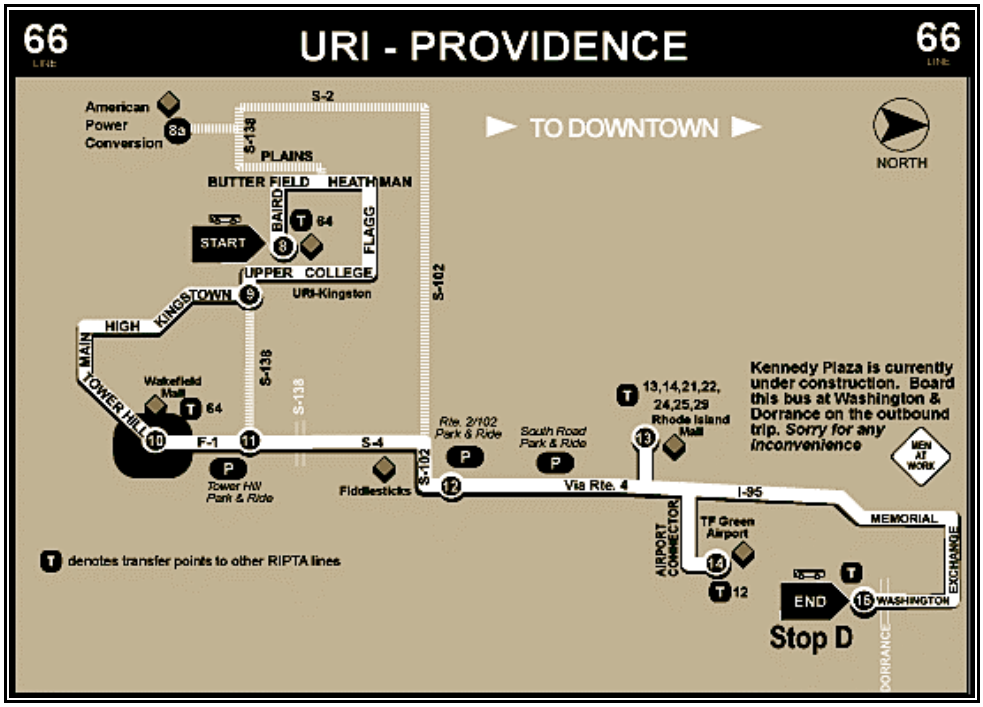
Route 12 - Providence to East Greenwich: T.F. Green Airport is the fourth of nine stops inbound from East Greenwich and the sixth stop outbound from Providence. The inbound trip on weekdays takes between 18 and 21 minutes to complete. During the week, 20 inbound and outbound trips are completed. On Saturdays the trip is between 15 and 21 minutes. The outbound trip on weekdays and Saturday takes approximately 37 minutes to complete from the stop at Weybosset and Eddy to the airport. On Saturday, 14 inbound trips and 12 outbound trips are scheduled. No Sunday or holiday service is scheduled.



RIPTA Bus Route 12

Route 66 - Providence to URI: T.F. Green Airport is the seventh of eight stops inbound from American Power Conversion and URI and the first stop outbound from downtown Providence. The inbound route stops at the airport four times daily during the week (9:05 a.m., 10:45 a.m., 12:15 p.m., and 6:40 p.m.) with an average travel time of 58 minutes from URI.

On Saturdays, Sundays and holidays four scheduled inbound trips stop at the airport with an average travel time of 55 minutes. Outbound service from Providence includes five stops at the airport daily during the week (10:35 a.m., 12:30 p.m., 2:00 p.m., 6:25 p.m., and 8:00 p.m.). On Saturdays, Sundays, and holidays four outbound trips are scheduled from Providence to the airport. The travel time from Providence to the airport is 15 minutes. Fares throughout Rhode Island are $1.50 (one-way).



RIPTA Bus Route 66

Bonanza

Bonanza Bus Lines is owned by Coach USA but is still operating under Bonanza. Over 99 percent of Bonanza service at the airport is scheduled service; some trips are generated by airlines for diversion of flights to other airports. Service is provided from the airport to locations throughout New England and New York via its Providence bus station at Exit 25 on I-95.

Bonanza leases two curbfront spaces on the departures level (upper) at the airport terminal. Dwell time at the curb is five minutes in the AM peak (before 9:00 a.m.), 20 minutes midday (between 9:00 a.m. and 2:20 p.m.), 30 minutes in the PM peak (3:00 p.m. to 8:00 p.m.), and 20 minutes in the evenings (after 8:00 p.m.).

Departures are hourly (currently 7:50 a.m., hourly from 9:00 a.m. to 9:00 p.m., and 10:30 p.m.) on No. 2045, with service between the airport and South Station, Boston with stops at Kennedy Plaza, the bus station at Exit 25 on I-95 in Providence, and Foxboro MA. Bonanza has 15 trips from the airport to South Station (with stops in Providence) and 17 trips from South Station (with stops in Providence) to the airport daily. No. 2045 is the only Bonanza route with service to T.F. Green Airport. Connections to other Bonanza routes are made via the Providence bus station or at Boston's South Station. South Station is the dominant destination for T.F. Green Airport passengers. Bonanza typically carries 100 passengers per day to and from the airport, with a peak of 300 passengers during the holidays. Southwest Airlines has generated much of the ridership, although other carriers are served as well. Service to Providence is discouraged; people wanting to go to downtown Providence are encouraged to either take a cab/van or the RIPTA bus. Fare to Providence is $10 (one-way).

Cozy Transportation Service

Cozy Transportation Service offers hourly fixed-route shuttle service between Newport hotels and T.F. Green Airport according to their Vice President, Peter Miller. A maximum of 33 trips are scheduled daily to and from Newport, 365 days per year (the schedule varies in off-peak months, due to the high percentage of tourism-based trips). Service is provided on the hour from the far north end of the commercial lane on the arrivals level to the Newport Gateway Center, hotels (Viking, Marriott, Newport Harbor Hotel, Hyatt), and various locations within the Navy base. Fare is $15 one-way and service is very seasonal. Approximately 60 to 70 percent are tourists and 10 percent are Navy personnel on the government rate.

Cozy has nine 15-passenger vans. Although they operate a range of transportation options out of the Newport office at 129 Connell Highway (24-hour taxi service, Towncars & Cadillac's, van charter service, unmarked sedans, private tours, rental cars, courier services, transport and coordinating), only fixed-route shuttle service is provided at the airport.

Airport Taxi

Airport Taxi operates 31 cabs under its four-year contract with RIAC. Service is provided from the commercial curb lane at the terminal. The contract enables one cab to wait at curbside with up to 35 taxicab staging spaces at the cargo area, south of the terminal. Although service is provided anywhere from the airport, service going into the airport is limited to Warwick for Airport Taxi. Taxis average 200 trips from the airport per week. In 2000, 2.2 million miles were tracked. According to industry standards for an origin and destination airport, an average of 1.25 passengers per cab trip may be expected.