

CHAPTER TWO BASELINE CONDITIONS

This Part 150 Study Update for the T.F. Green Airport (PVD) addresses the effects of aircraft noise exposure on the neighborhoods surrounding the facility for both the existing and future conditions. This chapter sets forth the noise exposure patterns and expected number of homes, persons, and noise-sensitive public buildings that fall within various ranges of aircraft noise intensity. Appendix A sets forth the methodology and data necessary to derive noise contour patterns from a predictive computer model.

1.0 PREVIOUS AND CURRENT CONDITIONS AFFECTING NOISE EXPOSURE AND COMPATIBILITY

The airport has had an active noise abatement program for several years. In 1985 the Rhode Island Department of Transportation, airport users, jurisdictional officials, and the FAA prepared the first Part 150 Noise Compatibility Program (NCP) for T.F. Green Airport. FAA approval of the NCP was received in 1986.

In total, the 1986 study recommended 20 measures to reduce cumulative noise exposure and improve land use compatibility around the airport. Program components focused mainly on airfield improvements and restrictions on aircraft operations. In addition to these measures, preventive and corrective land use measures were also recommended to improve the compatibility of the surrounding community. The recommended actions of the 1986 study are listed below:

Noise Abatement Actions Recommended

- Fillet at intersection of Runway 5R with Runway 10/28
- Parallel taxiway serving Runway 5R
- Noise barrier parallel to Runway 5R
- Incorporation of noise barrier consideration in the design of proposed air freight buildings
- Displaced landing threshold on Runway 5L
- Restriction on scheduled air carrier nighttime operations (midnight - 6:30 a.m.)
- Maintenance run-up restrictions
- Auxiliary power unit restrictions
- Restrictions on aircraft repositioning under power
- Pre-takeoff run-up restrictions
- Voluntary reduction in the use of reverse thrust

- Prohibition of 180 degree turns on runways
- Rotational runway use program
- Noise abatement helicopter operating procedures

Land Use Planning Actions Recommended

- Voluntary land acquisition program within 75 DNL
- Sound insulation of residential structures within 65 DNL
- Sound insulation of Pilgrim High School
- Selective rezoning of residential uses between 70 and 75 DNL
- Amendment to subdivision regulations
- Amendment to building code

Most of the recommended actions from the 1986 NCP are completed or are on-going. However, there are four noise abatement measures that have either not been completed, or because of difficulty in implementation, are not in effect. These are the parallel taxiway serving Runway 5R, the noise barrier consideration for the air freight buildings, the rotational runway use program, and the noise abatement helicopter operating procedures.

The parallel taxiway serving Runway 5R has not yet been constructed. This action remains on the Airport Layout Plan (ALP) and is on the airport's five-year capital improvement plan. The noise barrier considerations for a proposed air freight building action have not been implemented because the air freight buildings were not constructed. There are no plans at this time to construct such a facility. The rotational runway use program, which was designed to equally use all runways for aircraft departures, did not operate as intended and therefore has been abandoned as an operating procedure. Pilots frequently request the longer runway (5R/23L), even when wind conditions indicate that Runway 16/34 is preferred. This makes it virtually impossible to implement a rotational runway use program at PVD. The noise abatement helicopter procedures encourage helicopter pilots to cross the airport boundary at an altitude of 1,000 feet or greater. The combination of the north airfield location of the helicopter hangars and the majority of the destinations being to the north of the airport makes complying with this policy difficult and potentially unsafe. When the helicopter operations are headed to destinations south, east, and west of the airport, they generally follow the designated procedure.

In 1993, as part of the continuing program of noise and land use management at the airport, the Part 150 Noise Exposure Maps were updated to reflect existing and forecasted conditions. However, due to an unexpected growth in operations and the difficulty in implementing the rotational runway use program, the 1993 and 1998 Noise Exposure Maps are not reflective of the current noise exposure conditions at PVD. Therefore, the Noise Exposure Maps for existing and future conditions are updated in this study to reflect the most current operating conditions.

2.0 EXISTING BASELINE NOISE CONTOURS (EXISTING NOISE EXPOSURE MAP)

The operating conditions set forth by the history of noise abatement at T.F. Green are reflected in the noise exposure patterns for the 1998 condition. A compilation of data representative of the average annual day of operations was necessary to develop the noise contours. This data included the number of arrival and departure operations by individual aircraft types serving T.F. Green during both day and night periods, the distribution of aircraft among the four separate runway ends available at the airport, and the distribution of aircraft along the flight paths leading to or from each runway (see Appendix A, *Methodology*, for details of each operational input). Operations used to define existing noise exposure patterns for the baseline period occurred between January 1, 1997 and December 31, 1997. These levels of operation are generally consistent with the level of operations at the end of 1998.

The data are used as inputs to the FAA's Integrated Noise Model (INM), Version 5.2a, computer model for the calculation of noise in the airport environs. **Exhibit 2-1** reflects the average annual noise exposure pattern for the existing baseline period. Contours are presented at levels of 65, 70, and 75 decibels of DNL -- levels considered by FAR Part 150 to be significant for noise-sensitive land uses such as residences, churches, and schools. **Table 2-1** provides a comparison of the areas within the existing 1998 and 2003 baseline noise exposure patterns.

The noise contours do not represent the noise levels present on any specific day, but, rather, represent the energy-average of all 365 days of operation during the year. The noise contour pattern extends from the airport along each runway end, reflective of the flight tracks used by all aircraft. The relative distance of the contours from the airport along each route is a function of the frequency of use of each runway for total arrivals and departures, as well as its use at night, and the type of aircraft assigned to it.

The shape of the noise contours is primarily a function of runway utilization at PVD. The contours extend farther and are wider off of Runway 5R/23L than Runway 16/34. This is a result of Runway 5R/23L being the preferred runway for most commercial jet flights due to its length (7,166 feet). Roughly 80 percent of commercial jet departures and 75 percent of commercial jet arrivals occurred on Runway 5R/23L during the baseline period. General aviation flight distribution is more dependent upon wind and weather conditions. Approximately 92 percent of the general aviation flights were distributed equally among Runways 5R/23L and 34.

To the northeast of the airport, the noise contours reflect usage by aircraft arriving from the north and aircraft departing to the north. The 65 DNL noise contour extends approximately 1.7 miles beyond the end of the runway, passing over areas of open space and residential areas of Warwick. Average noise exposure has increased in the northeast by as much as 3 decibels since publication of the 1993 Noise Exposure Map.

Southwest of the airport, the noise contours reflect usage by aircraft arriving from the south and departing to the south. The 65 DNL noise contour extends approximately 1.9 miles beyond the end of the runway, passing over mostly residential areas of Warwick. The 70 DNL noise contour remains mostly on airport-owned property or properties made compatible through the airport's on-going sound insulation program. Average noise exposure has increased to the southwest by as much as 2 decibels since publication of the 1993 Noise Exposure Map.

**Table 2-1
AREAS WITHIN NOISE EXPOSURE CONTOURS (IN SQUARE MILES)
T.F. Green Airport**

Contour Range	Actual 1998 Baseline	Projected 2003 Baseline
65-70 DNL	2.29	1.59
70-75 DNL	0.92	0.58
75 + DNL	<u>0.68</u>	<u>0.53</u>
65 + DNL	3.89	2.70

Source: Landrum & Brown, 1998.

Southeast of the airport, the noise contours have decreased in size by roughly one to two decibels since the 1993 Noise Exposure Map was published. The reduction in noise exposure to the southeast is the result of the different runway utilization assumed when creating the 1993 NEM. The previous study assumed a higher percentage of operations would use Runway 16/34 due to the rotational runway use program. As discussed previously, the rotational runway use program did not guide the runway use at T.F. Green Airport during the baseline period. The 65 DNL noise contour extends to Sandy Lane over areas of open space and residential areas that have been made compatible through the airport's on-going sound insulation program. The 70 DNL noise contour extends to the southwest over residential units that have mostly been made compatible through the airport's on-going sound insulation program.

Northwest of the airport, the noise contours are similar to those of the 1993 published NEM. The noise contours extend approximately 1.25 miles beyond the end of the runway to just beyond I-95. Most of the land uses in this area are compatible with aircraft operations. A small number of residential uses are also located here. The 70 DNL noise contour extends over commercial and industrial uses which are both compatible.

The actual 1998 baseline noise exposure has increased from the 1998-projected Noise Exposure Map prepared in 1993. The increase in size is due to a larger than expected increase in operations in the commercial jet category and to a higher than expected utilization of Stage 2 aircraft. The difference in the shape of the noise contours is a direct reflection of the runway utilization at the airport. The previous study assumed a relatively equal distribution of flights among all runways. In reality, Runway 5R/23L was used more heavily for the commercial jet flights due to its length.

3.0 2003 BASELINE NOISE CONTOURS

The baseline noise exposure contours projected for 2003 are presented in **Exhibit 2-2**. These projected contours assume growth as forecasted by RIAC, supplemented by specific information provided to this study by the airline operators, with no change in the current method of operation. The projected 2003 contour is smaller than the 1998 contour, owing to a 32 percent

increase in operations, moderated by the completion of a transition of aircraft from one of mixed FAR Part 36, Stage 2 and Stage 3 aircraft to one composed entirely of Stage 3 aircraft. Table 2-1 provides a comparison of the areas within the existing (1998) and 2003 noise exposure patterns.

Because the forecast increase of operations is offset by the conversion of all aircraft weighing more than 75,000 pounds to Stage 3 noise levels by 2000, the baseline contours for 2003 are smaller than the existing baseline in all directions from the airport. By 2003, the 70 and 75 DNL noise contours fall entirely over airport-owned or noise-sensitive property made compatible through the airport's on-going sound insulation programs.

Only at the ends and the sides of the 65 DNL noise contour to the northeast and the southwest of the airport does the 2003 baseline noise exposure extend beyond the current boundaries of the sound insulation program.

4.0 BASELINE NOISE CONTOUR INCOMPATIBILITIES

Identifying and evaluating all land uses within the airport environs is necessary to quantify residential and other noise-sensitive land uses impacted by aircraft noise. The FAA has created land use compatibility guidelines relating types of land use to airport sound levels. These guidelines are defined in 14 CFR Part 150, *Land Use Compatibility with Yearly Day-Night Average Sound Levels*. The compatibility table is reproduced in Appendix A, *Methodology*, of this document (see Table A-23). These guidelines show the compatibility parameters for residential, public (schools, churches, nursing homes, hospitals), commercial, manufacturing and production, and recreational land uses. All land uses exposed to noise levels below 65 DNL noise contour are generally considered compatible with airport operations.

Summaries of the residential population, housing units, and noise-sensitive facilities affected by noise levels exceeding 65 DNL noise contour for existing (1998) and 2003 baseline noise contours are provided in **Table 2-2**. The information is aggregated by DNL noise level (65, 70, and 75) and includes incompatibility numbers for the contours "with" and "without" the number of homes and facilities that are eligible for participation in the airport's current noise mitigation program. For the purpose of future planning, structures included in the airport's mitigation program based on the 1993 Noise Exposure Map will be considered to be compatible with aircraft noise.

The number of residential units within the 65 DNL noise contour will decrease from 3,323 in 1998 to 1,986 in 2003. Of the 3,323 residential units located within the existing (1998) baseline noise contours, 892 are currently eligible for mitigation. By 2003, the total number of residential units within the baseline 65 DNL noise contour decreases to 1,986 and approximately 835 of those units will have been mitigated under the airport's current mitigation program. The remaining 1,151 units are not covered by current program measures.

There are 111 residences and a population of 236, within the 70 and 75 DNL, of the existing baseline (1998) noise contours which have not been offered mitigation under the airport's current mitigation program. There are no residences (or population) in the 70 or 75 DNL noise contours of the future, 2003 baseline noise contours that have not been offered mitigation.

**Table 2-2
BASELINE HOUSING, POPULATION, AND
NOISE-SENSITIVE FACILITY INCOMPATIBILITIES
T.F. Green Airport**

Condition	HOUSING UNITS											
	TOTAL (All Residential Units)				Residential Units in Present Mitigation Program				Unmitigated Residential Units			
	65-70 DNL	70-75 DNL	75+ DNL	TOTAL	65-70 DNL	70-75 DNL	75+ DNL	TOTAL	65-70 DNL	70-75 DNL	75+ DNL	TOTAL
Baseline 1998	2,735	601	6	3,342	405	490	6	901	2,330	111	0	2,441
Baseline 2003	1,898	88	0	1,986	747	88	0	835	1,151	0	0	1,151

Condition	POPULATION											
	TOTAL Population				Population in Present Mitigation Program				Unmitigated Population			
	65-70 DNL	70-75 DNL	75+ DNL	TOTAL	65-70 DNL	70-75 DNL	75+ DNL	TOTAL	65-70 DNL	70-75 DNL	75+ DNL	TOTAL
Baseline 1998	7,091	1,568	16	8,675	1,050	1,332	16	2,398	6,041	236	0	6,277
Baseline 2003	4,932	216	0	5,148	2,018	216	0	2,234	2,914	0	0	2,938

Notes: Noise contours were generated using the Integrated FAA's Noise Model, Version 5.2a computer model. Housing counts are based on 1990 aerial photography, supplemented by field verification. Population numbers are approximate based on the housing counts multiplied by the 1990 census block housing to population ratio. Baseline conditions assume the continuation of the existing operating procedures without modification.

Source: Landrum & Brown, 1998
Reference: 97BS01 and 03BS01.

The total population exposed to the baseline 65 DNL noise contour and higher noise levels is forecast to decrease from 8,625 in 1998 to 5,148 in 2003, while total aircraft operations are forecast to increase by 32 percent. This increase is offset by the completion of a transition of aircraft from one of mixed FAR Part 36, Stage 2 and Stage 3 aircraft to one composed entirely of Stage 3 aircraft.

Approximately 2,376 of the residents located within the existing (1998) baseline 65 DNL noise contour are eligible to participate in the airport's current mitigation programs. The remaining population residing within the contours, but not within current Part 150 mitigation program boundaries, are defined as "unmitigated population." A comparison of the unmitigated population for existing (1998) and 2003 baseline noise contours shows a decrease in population impacts for this five-year period. Currently, the unmitigated population within the 65 DNL noise contour is 6,249. By 2003, the unmitigated population decreases to 2,914, based on existing residential levels. This represents a 53 percent decrease in the number of people within the 65 DNL noise contour living in residences that have not received noise mitigation treatment.

Additionally, there are four noise sensitive-facilities, two churches, and two schools, located within the existing (1998) baseline 65-70 DNL noise contour. The two churches are The Kingdom Hall of Jehovah's Witnesses at 544 Long Street and the Spring Green Memorial Church at 1350 Warwick Avenue. The two schools are Pilgrim High School at 111 Pilgrim Parkway and John Wickes Elementary at 50 Child Lane. Both schools have received sound insulation under the airport's current mitigation program, and for the purpose of future planning will not be considered incompatible with aircraft noise. The only noise-sensitive facility located in the 2003 baseline noise contour is The Kingdom Hall of Jehovah's Witness at 544 Long Street. There are no hospitals, nursing homes, or libraries located in either the existing (1998) or the 2003 noise contour.