Teterboro Airport

Title 14 Code of Federal Regulations (CFR) Part 150

Final Noise Exposure Map Report

May 2017

Prepared for:

The Port Authority of New York and New Jersey

4 World Trade Center | 150 Greenwich Street, 18th Floor | New York, NY 10007

By

hmmh

and

Fitzgerald & Halliday, Inc. | Planning Technology, Inc. | RS&H, Inc.

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Executive Summary

Teterboro Airport (TEB) is located in Teterboro, NJ and is designated as a "reliever" airport, working to relieve the region's commercial airports of general aviation air traffic that would otherwise increase congestion. TEB is operated by the Port Authority of New York and New Jersey (Port Authority).

The Port Authority is conducting a Title 14 Code of Federal Regulations (CFR) Part 150 Study ("Part 150 Study") at TEB to quantify noise exposure from aircraft operations and assess compatibility of land uses around the airport. This Part 150 Study assesses noise exposure resulting from an existing, baseline level of activity (2016) and a future, forecast level of activity anticipated to occur in 2021. The study is part of the broader effort to address noise levels created by aircraft operations and covers a study area that includes TEB and surrounding communities.

A Part 150 Study includes two principal elements:

1) The Noise Exposure Map (NEM) and its associated report describes the airport layout and operation, aircraft-related noise exposure, land uses in the airport environs, and the resulting noise/land use compatibility situation. Part 150 requires that NEM documentation address aircraft operations during two time periods:
   (A) the year of submission (2016) and
   (B) a forecast year that is at least five years following the year of submission (2021).
2) The Noise Compatibility Program (NCP) is a description of the actions the airport proprietor proposes to undertake to minimize existing and future noise and land use incompatibilities. The NCP is forthcoming and is the second phase of the Part 150 Study process.

History of Noise Abatement at TEB

Noise abatement at TEB began in the 1970s, with the installation of a portable noise monitor. Since the 1980s, Teterboro Airport has had a dedicated Noise Abatement Office and currently has three staff members to respond to TEB noise and environmental concerns. The Port Authority and TEB management developed the program over time, in consultation with aviation and community interests, in recognition of the close proximity of the airfield to residential and other noise-sensitive land uses.

Noise Exposure Map

The fundamental elements of a Noise Exposure Map are noise contours for existing and forecast conditions (2016 and 2021), presented over base maps depicting the airport layout, local land-use control jurisdictions, major land-use categories, discrete noise-sensitive "receptors," and other information required by Part 150. Figure 1 on page x presents the Noise Exposure Map figure for existing conditions (2016) and Figure 2 on page xi presents the Noise Exposure Map figure for the five-year forecast conditions (2021).[1] Table 1 on page viii and Table 2 on page ix show population and noise sensitive sites, respectively, within the 2016 and 2021 65 DNL contour interval.[2]

The noise contours for this study were prepared using the Integrated Noise Model (INM). The INM is an FAA-approved, industry-accepted tool for determining the cumulative effect of aircraft noise exposure around airports. The airport-specific information required by the INM includes both physical and operational data. The physical data includes airfield geometry (i.e., runway locations and utilization), the elevation of the airfield, weather, and terrain data. Operational data includes the number and types of aircraft operating at the airport and the three-dimensional flight trajectories of aircraft arriving to and departing from the airport.

Stakeholder Engagement

A key element of this Part 150 Study is broad stakeholder engagement. The process employed by the Port Authority

[1] Large-scale versions of these figures showing the Official Noise Exposure Maps, Figures 5-8 and 5-9, can be found in Attachment C to this document in the electronic version or in the back pocket of this document in print.

[2] As documented in detail in Appendix C.2, in March 2017, as part of the development of the final NEM, the HMMH Team undertook final quality assurance / quality control (QA/QC) steps, including field surveys of land uses within the NEM contours. All figures in this document that depict land uses, and all tables that present data on non-compatible land uses, also reflect refinements that resulted from that field work.

provides opportunities for all interested parties to both follow the study's progress and be directly involved when key decisions are taken. Specific engagement strategies of the NEM include:

- Establishing a Technical Advisory Committee (TAC) that held nine meetings, as of December 2016, at which the Study Team presented briefings
- Engaging with Teterboro Aircraft Noise Abatement Advisory Committee (TANAAC) on the Part 150 Process
- Consulting with agencies with jurisdiction and responsibility within the 65 DNL contour
- Affording opportunities for public review and comment during map development
- Making project-specific materials available on the Port Authority's Part 150 website
- Hosting two public workshops about the Part 150 Study process and resulting NEM
- Publishing quarterly informational newsletters

Table 1: Population within 2016 and 2021 65 DNL Contour[3,4]

Source: 2010 US Census Block Data, RS&H, HMMH, 2016

Year	Residence Type	Population within Contour Interval (DNL)			
		65-70	70-75	>75	Total
2016	Single Family	213	0	0	213
	Multi-Family	123	0	0	123
	Mobile Home	106	19	0	125
	Total	442	19	0	461
2021	Single Family	201	12	0	213
	Multi-Family	119	5	0	124
	Mobile Home	116	22	0	138
	Total	436	39	0	475
Note: Population = 2.42 people * Number of residential units					

[3] 2010 US Census Block Data. In order to estimate the number of people residing within the noise contours, existing parcel boundary land use maps were overlaid on 2010 US Census TIGER file maps that depict Census blocks – the smallest Census enumeration unit. "Populated Area" data polygons were then created by combining Census blocks with the residential land use, concentrating population and housing unit values into the residential portion of the census block where people actually live. For example, in some areas the population is concentrated along the road rather than over several square miles of open or undeveloped land.

Using Geographic Information Systems (GIS) tools, the noise contours were intersected with these "Residential/Census" data for each DNL noise contour interval. The resultant wholly or partially encompassed Residential/Census areas were then identified and the proportion of total area within the contour level was calculated to determine the estimated residential population and housing unit counts." This analysis led to an average population multiplier of 2.42 people per residential unit in the vicinity of the TEB 65 DNL contour and was used in Table 5-2 to determine the number of people within each DNL contour interval.

[4] As documented in detail in Appendix C.2, in March 2017, as part of the development of the final NEM, the HMMH Team undertook final quality assurance / quality control (QA/QC) steps, including field surveys of land uses within the NEM contours. NEM graphics and tables of non-compatible land uses presented in this document reflect the results of those surveys. For that reason, the population data presented in Table 1 differ slightly from the values presented in the public review draft of the NEM.

Table 2: Noise Sensitive Sites within 2016 and 2021 65 DNL Contour

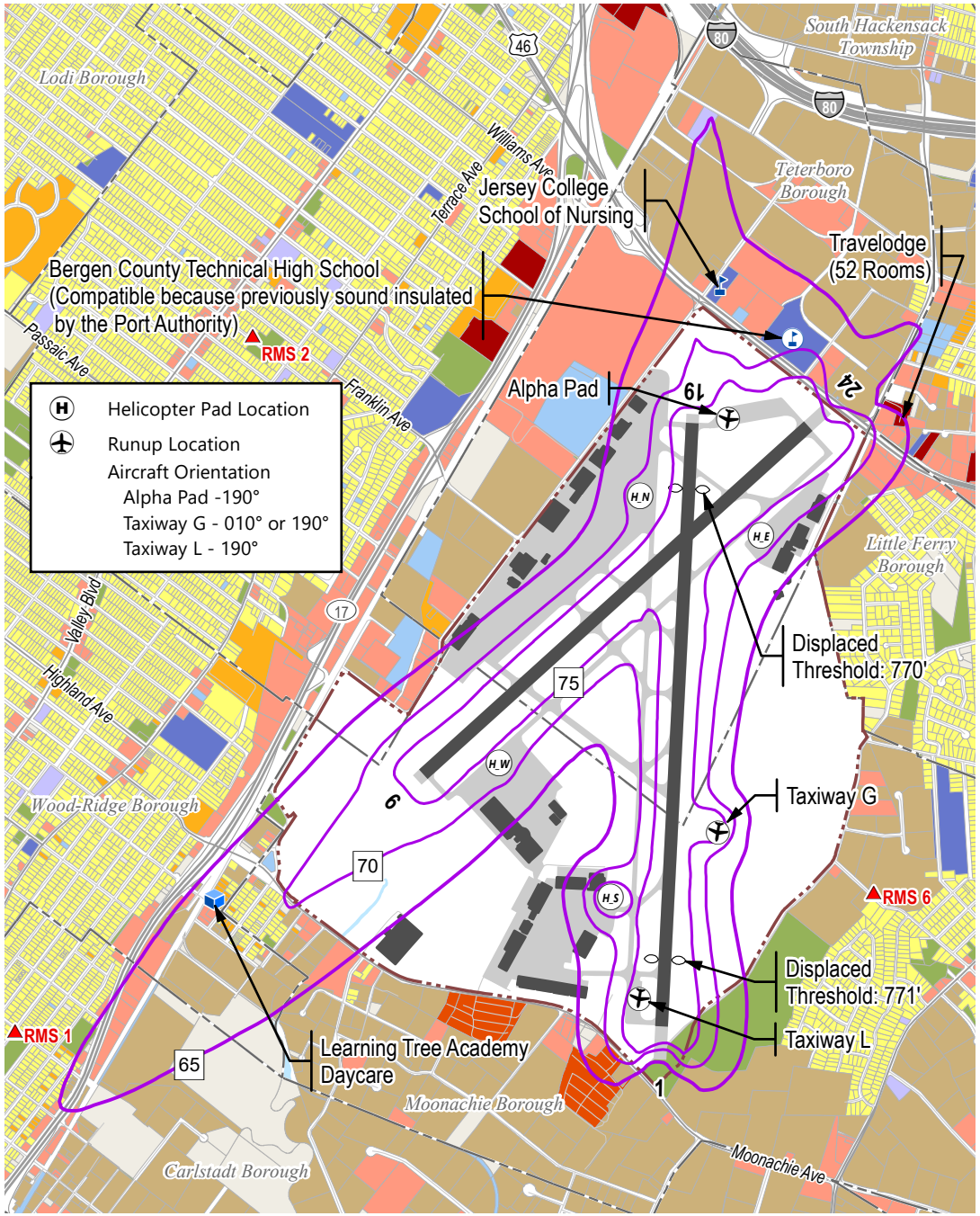
Source: RS&H, HMMH, 2016

Year	Noise Sensitive Site	Type	Address	Town
Within 2016 and 2021	Learning Tree Academy	Daycare	150 Park Place East	Wood-Ridge
	Bergen County Technical High School(Note 1)	School	504 US-46	Teterboro
	Jersey College School of Nursing(Note 2)	School	546 US-46	Teterboro
Within 2021 Only	Catalyst Agape Church(Note 3)	Place of Worship	370 North St	Teterboro

Note 1: The Bergen County Technical School has been soundproofed as a part of the School Soundproofing Program discussed in Section 2.5

Note 2: The Jersey College School of Nursing is in a former commercial structure.

Note 3: The North Jersey Vineyard Church changed to a different congregation – the Catalyst Agape Church – in the same location. The church occupies a portion of a former commercial structure.



THE PORT AUTHORITY OF NY & NJ

Teterboro Airport

Airport Noise Compatibility
Part 150 Study
2016 and 2021 Noise Exposure Maps

Figure: 1

Existing Conditions (2016) Noise Exposure Map

- 2016 DNL Contours (65-75)
- TEB Airport Boundary (Approximate)
- Runway
- RMS # Noise Monitor Locations
- Municipal Boundary
- Park / Open Space
- Water
- Highway
- Minor Roads
- Major Roads

Non-Compatible within DNL 65

- Single Family Residential
- Multi-Family Residential
- Mobile Home
- Transient Lodging (Hotel, Motel, etc..)
- School / University / Daycare
- Place of Worship

Compatible within DNL 65

- Recreational / Open Space / Cemetery
- Commercial Use
- Manufacturing and Production
- Public Use
- Vacant / Undefined

- School
- School *(Sound Insulated)*
- Daycare

Note: Entire area depicted on the figure is within Bergen County and Bergen County has jurisdictional and land use control

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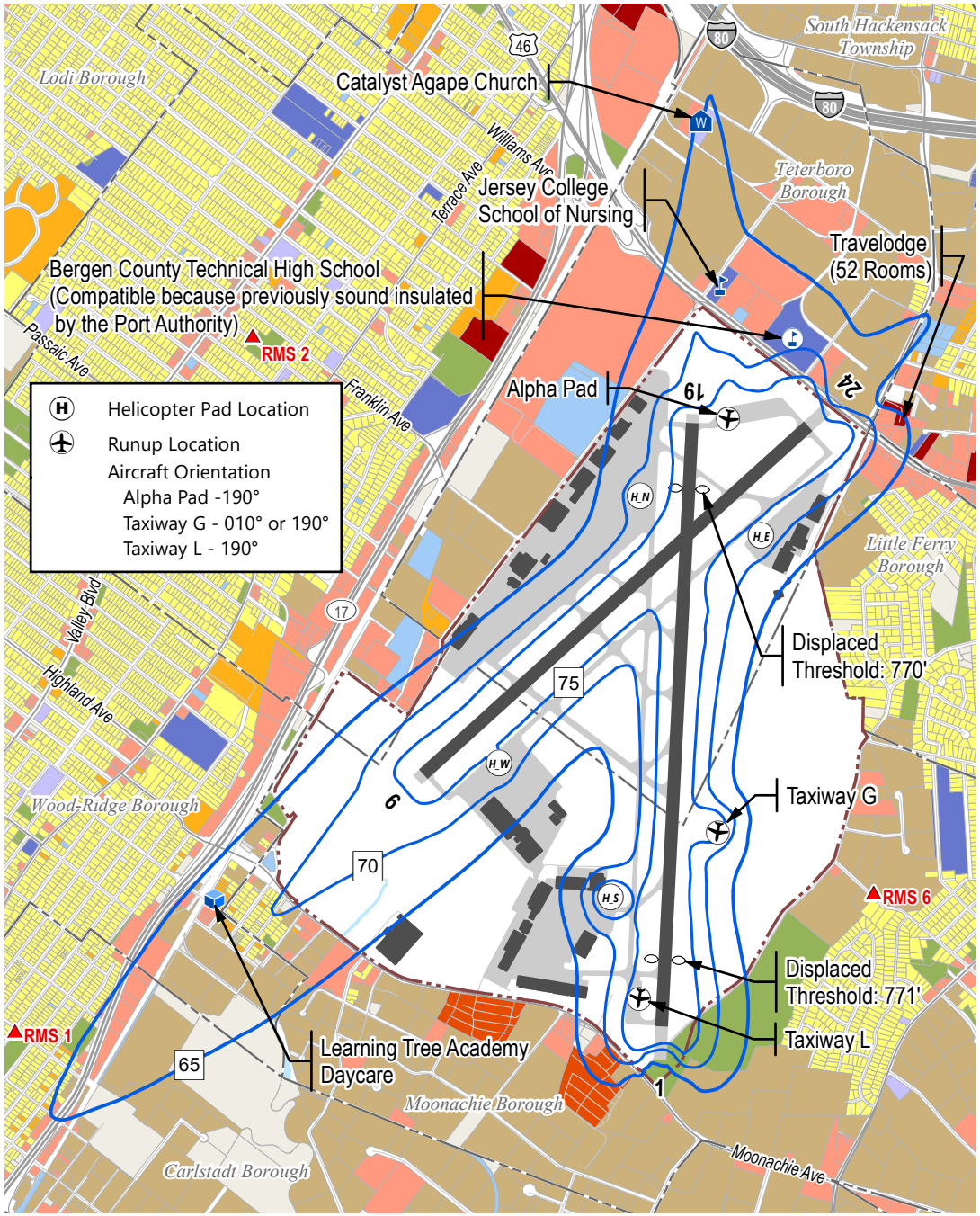
Source: The Port Authority of NY & NJ, Cornell University Geospatial Information Repository (CUGIR), NJ DEP Bureau of GIS, NYC Open Data, Environmental Systems Research Institute (ESRI)



THE PORT AUTHORITY OF NY & NJ

Teterboro Airport

Airport Noise Compatibility
Part 150 Study
2016 and 2021 Noise Exposure Maps

Figure: 2

Forecast Conditions (2021) Noise Exposure Map

- 2021 DNL Contours (65-75)
- TEB Airport Boundary (Approximate)
- Runway
- RMS # Noise Monitor Locations
- Municipal Boundary
- Park / Open Space
- Water
- Highway
- Minor Roads
- Major Roads

Non-Compatible within DNL 65

- Single Family Residential
- Multi-Family Residential
- Mobile Home
- Transient Lodging (Hotel, Motel, etc..)
- School / University / Daycare
- Place of Worship

Compatible within DNL 65

- Recreational / Open Space / Cemetery
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- School
- School *(Sound Insulated)*
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Note: Entire area depicted on the figure is within Bergen County and Bergen County has jurisdictional and land use control

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Source: The Port Authority of NY & NJ, Cornell University Geospatial Information Repository (CUGIR), NJ DEP Bureau of GIS, NYC Open Data, Environmental Systems Research Institute (ESRI)

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THE PORT AUTHORITY OF NY & NJ

May 24, 2017

Mr. Andrew Brooks
Environmental Program Manager
Federal Aviation Administration
Eastern Regional Office
1 Aviation Plaza
Jamaica, NY 11434

Subject: Noise Exposure Map (NEM) Submission pursuant to Title 14 of the Code of Federal Regulations, Part 150 for Teterboro Airport (TEB)

Dear Mr. Brooks:

The Port Authority of New York and New Jersey (PANYNJ) is pleased to submit Noise Exposure Maps (NEMs) and supporting documentation for Teterboro Airport (TEB) prepared in accordance with 14 CFR Part 150 ("Airport Noise Compatibility Planning"). As of December 31, 2016, the aircraft operations at Teterboro Airport within this document are hereby certified by the PANYNJ to be consistent with the fleet mix, forecast operational levels, and flight procedures depicted for calendar years 2016 and 2021.

In accordance with 14 CFR Part 150, Section 150.21(c), PANYNJ requests that Federal Aviation Administration (FAA) confirm receipt of these Existing (2016) and Forecast (2021) Noise Exposure Maps (NEMs) and indicate whether they are in compliance with the applicable requirements. Both the Existing (2016) and Forecast (2021) NEMs were prepared using the forecast operations reviewed and approved by the FAA.

As discussed in Chapter 6 of the document, the PANYNJ provided all interested parties adequate opportunity to submit their views, data, and comments concerning the correctness and adequacy of the draft noise exposure map and descriptions of forecast aircraft operations, consistent with Part 150, §150.21(b). The Sponsor's Certification, the formal certification required by Part 150, is provided on page xiii of the document. As requested, each document contains a CD attached to the rear cover containing electronic copies of the document.

The PANYNJ is grateful for the meaningful participation provided throughout this project by your office, the New York Airports District Office, FAA Washington D.C. headquarters, New York TRACON, and the TEB Airport Traffic Control Tower. We look forward to continuing to work with the FAA during preparation of the NCP and implementation of the NCP measures.

Please do not hesitate to contact me with any questions.

Sincerely yours,

Tom Bock
General Manager
Aviation Regulatory & Operational Support

enc.

4 World Trade Center
150 Greenwich Street, 18th Floor
New York, NY 10007

THE PORT AUTHORITY OF NY & NJ

Sponsor's Certification

The Port Authority of New York and New Jersey has completed a comprehensive Title 14 Code of Federal Regulations (CFR) Part 150 Noise Exposure Map Report for Teterboro Airport.

This is to certify the following:

1) The 2016 and 2021 Noise Exposure Maps for Teterboro Airport, and the associated documentation the Port Authority of New York and New Jersey submitted in this volume to the Federal Aviation Administration under Title 14 CFR Part 150, Subpart B, Section 150.21, are true and complete as of December 31, 2016, under penalty of 18 U.S.C. 1001.
2) Pursuant to Title 14 CFR Part 150, Subpart B, Section 150.21(b), all interested parties have been afforded adequate opportunity to submit their views, data, and comments concerning the correctness and adequacy of the draft noise exposure maps, and of the descriptions of forecast aircraft operations.
3) The "2016 Existing Condition Noise Exposure Map" (Figure 5-8 from Chapter 5, located in Attachment C to the Noise Exposure Map document) accurately represents conditions for calendar year 2016.
4) The "2021 Five-Year Forecast Condition Noise Exposure Map" (Figure 5-9 from Chapter 5, located in Attachment C to the Noise Exposure Map document) accurately represents forecast conditions for calendar year 2021 as of December 31, 2016.

Though submittal of the document is occurring in May 2017, the operations at Teterboro Airport are hereby certified to currently be consistent with the fleet mix, forecast operational levels, and flight procedures depicted for 2016 within this document, as of December 31, 2016. Further information regarding development of the fleet mix, forecast, and procedures can be found in Chapter 4, "Development of Noise Exposure Maps," and Appendix D, "Documentation of Noise Modeling Process."

By: Huntley S. Lawrence

Title: Director, Aviation Dept., Port Authority of New York & New Jersey

Date: 5/5/2017

Airport Name: Teterboro Airport

Airport Owner/Operator: Port Authority of New York and New Jersey

Address: 4 World Trade Center, 150 Greenwich Street, 18th Floor, New York, NY 10007

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FAA Checklist

The FAA produced Advisory Circular 150/5020, "Airport Noise and Land Use Compatibility Planning", that includes a checklist for FAA's use in reviewing NEM submissions. The FAA prefers that the NEM documentation include a copy of the checklist with appropriate page numbers or other references and other notes and comments to assist in the document's review, as presented in Table 3.

Table 3: Part 150 Noise Exposure Maps Checklist

Source: FAA/APP, Washington, DC, March 1989; revised June 2005; reviewed for currency 12/2007

Part 150		
Noise Exposure Maps Checklist - Part 1		
Airport name: Teterboro Airport		Reviewer:
	Yes/No/NA	Supporting Pages/Review Comments
I. IDENTIFICATION AND SUBMISSION OF MAP DOCUMENT		
A. Is this submittal appropriately identified as one of the following, submitted under Part 150:		
1) A Noise Exposure Map only	Yes	See cover letter, cover of document, and Sponsor's Certification on page xiii.
2) a Noise Exposure Map and Noise Compatibility Program	No	
3) a revision to Noise Exposure Maps FAA has previously determined to be in compliance with Part 150?	No	
B. Is the airport name and the qualified airport operator identified?	Yes	See cover of document and Sponsor's Certification on page xiii.
C. Is there a dated cover letter from the airport operator which indicates the documents are submitted under Part 150 for appropriate FAA determinations?	Yes	The Port Authority has submitted a dated cover letter, describing this documentation as a Part 150 Noise Exposure Map submittal and requests that the Federal Aviation Administration (FAA) confirm receipt of these Existing (2016) and Forecast (2021) Noise Exposure Maps (NEMs) and indicate whether they are in compliance with the applicable requirements.
II. CONSULTATION: [150.21(b), A150.105(a)]		
A. Is there a narrative description of the consultation accomplished, including opportunities for public review and comment during map development?	Yes	See Chapter 6 and Appendix F - Technical Advisory Committee, Appendix G - Public Outreach and Appendix H - Public Comments.
B. Identification:		
1. Are the consulted parties identified?	Yes	See Chapter 1, Section 1.4 on page 1-3, Chapter 6, Section 6.1 on page 6-1 and Table 6-1 on page 6-2, and Appendix F - Technical Advisory Committee, Appendix G - Public Outreach and Appendix H - Public Comments.

Part 150		
Noise Exposure Maps Checklist - Part 1		
Airport name: Teterboro Airport		Reviewer:
	Yes/No/NA	Supporting Pages/Review Comments
2. Do they include all those required by 150.21(b) and 150.105(a)?	Yes	See Section 6.1 on page 6-1 and Table 6-1 on page 6-2.
3. Agencies in 2., above, correspond to those indicated on the NEM?		
C. Does the documentation include the airport operator's certification, and evidence to support it, that interested persons have been afforded adequate opportunity to submit their views data, and comments during map development and in accordance with 150.21(b)?	Yes	Certification language is provided on page xiii. Information on the consultation process is provided in Chapter 6 and Appendix F - Technical Advisory Committee, Appendix G - Public Outreach and Appendix H - Public Comments
D. Does the document indicate whether written comments were received during consultation and, if there were comments, that they are on file with the FAA region?	Yes	Public comments are transcribed and have been responded to in Appendix H.1, beginning on page H-3. Scanned versions of public comments are included in Appendix H.2, beginning on page H-33. Separate electronic and hard copy files of all comments will be submitted to the FAA so that they can be placed on file at the Regional office.
III. GENERAL REQUIREMENTS: (150.21)		
A. Are there two maps, each clearly labeled on the face with year (existing condition year and 5-year)?	Yes	Figure 5-8 in the back pocket of the print version of this document and in Attachment C to the electronic version presents the 2016 Map with existing conditions. Figure 5-9 in the back pocket of the print version of this document and in Attachment C to the electronic version presents the 2021 Map with 5-year conditions.
B. Map currency:		
1. Does the existing condition map year match the year on the airport operator's submittal letter?	Yes	See cover letter and Figures 5-8 and 5-9 in the back pocket of this document in print and as Attachment C to the electronic version of this document, The official submittal to the FAA will be made under a cover letter that meets Part 150 requirements.
2. Is the 5-year map based on reasonable forecasts and other planning assumptions and is it for the fifth calendar year after the year of submission?	Yes	See cover letter and certification language on page xiii.
3. If the answer to 1 and 2 above is no, has the airport operator verified in writing that data in the documentation are representative of existing conditions and 5-year forecast conditions as of the date of submission?	NA	

Part 150		
Noise Exposure Maps Checklist - Part 1		
Airport name: Teterboro Airport		Reviewer:
	Yes/No/NA	Supporting Pages/Review Comments
C. If the Noise Exposure Map and Noise Compatibility Program are submitted together:		
1. Has the airport operator indicated whether the 5-year map is based on 5-year contours without the program vs. contours if the program is implemented?	NA	
2. If the five year map is based on program implementation:	NA	
a. are the specific program measures which are reflected on the map identified?	NA	
b. does the documentation specifically describe how these measures affect land use compatibilities depicted on the map?	NA	
3. If the forecast year NEM does not model program implementation, the airport operator must either submit a revised forecast NEM showing program implementation conditions [B150.3(b), 150.35(f)] or the sponsor must demonstrate the adopted forecast year NEM with approved NCP measures would not change by plus/minus 1.5 DNL? (150.21(d))	NA	
IV. MAP SCALE, GRAPHICS, AND DATA REQUIREMENTS: [A150.101, A150.103, A150.105, 150.21(a)]		
A. Are the maps of sufficient scale to be clear and readable (they must be not be less than 1" to 2,000'), and is the scale indicated on the maps?	Yes (1" to 2,000')	See Figure 5-8 and Figure 5-9 in the back pocket of this document in print and as Attachment C to the electronic version of this document. Flight track figures at 1" to 2,000' are provided in the back pocket of this document in print as Figures 4-13 through 4-18 and as Attachment B to the electronic version of this document
B. Is the quality of the graphics such that required information is clear and readable?	Yes	GIS-based, parcel-level detail
C. Depiction of the airport and its environs.		
1. Is the following graphically depicted to scale on both the existing condition and 5-year maps:		
a. airport boundaries	Yes	All contour figures and NEMs
b. runway configurations with runway and numbers	Yes	All contour figures and NEMs
2. Does the depiction of the off-airport data include:		

Part 150		
Noise Exposure Maps Checklist - Part 1		
Airport name: Teterboro Airport		Reviewer:
	Yes/No/NA	Supporting Pages/Review Comments
a. a land use base map depicting streets and other identifiable geographic features	Yes	All contour figures and NEMs
b. area within 65 DNL (or beyond, at local discretion.)	Yes, beyond	55 and 60 DNL contours are shown for informational purposes, in Appendix E, on pages E-5 and E-6 for 2016 and 2021, respectively.
c. clear delineation of geographic boundaries and the names of all jurisdictions with planning and land use control authority within the 65 DNL (or beyond, at local discretion).	Yes	All contour figures and NEMs
D. 1. Continuous contours for at least 65 DNL, 70, and 75?	Yes	Also 55 and 60 DNL, as noted in C.2.b.
2. Has the local land use jurisdiction(s) adopted a lower local standard and if so, has the sponsor depicted this on the NEMs?	No	
3. Based on current airport and operational data for the existing condition year Noise Exposure Map, and forecast data for the 5-year Noise Exposure Map?	Yes	Chapter 4 and Appendix D present modeling inputs in detail. Section 4.2 on page 4-1 and Appendix D.2 on page D-31 document the forecasts.
E. Flight tracks for the existing condition and 5-year forecast time frames (these may be on supplemental graphics which must use the same land use base map as the existing condition and 5-year Noise Exposure Map), which are numbered to correspond to accompanying narrative?	Yes	Flight track graphics at 1"=2000' are available in the back pocket of this document as Figures 4-13 through 4-18 or as Attachment B in the electronic version. Detailed figures of flight tracks broken down by aircraft type are available in Attachment A to Appendix D, Page D-109 and Tables 14-40 in Appendix D.1, beginning on page D-15.
F. Locations of any noise monitoring sites (these may be on supplemental graphics which must use the same land use base map as the official Noise Exposure Maps)	Yes	See Figure 2-5 on page 2-9 Note that measurements were not used in modeling.
G. Non-compatible land use identification:	Yes	
1. Are non-compatible land uses within at least the 65 DNL depicted on the maps?	Yes	See Figure 1 on page x and Figure 2 on page xi in the Executive Summary, Figure 5-1 on page 5-2 and Figure 5-2 on page 5-3 in Chapter 5, and Figures 5-8 and 5-9 in the back pocket of this document in print and as Attachment C to the electronic version of this document.
2. Are noise sensitive public buildings identified?	Yes	See Figure 1 on page x and Figure 2 on page xi in the Executive Summary, Figure 5-1 on page 5-2 and Figure 5-2 on page 5-3 in Chapter 5, and Figures 5-8 and 5-9 in the back pocket of this document in print and as Attachment C to the electronic version of this document.

Part 150		
Noise Exposure Maps Checklist - Part 1		
Airport name: Teterboro Airport		Reviewer:
	Yes/No/NA	Supporting Pages/Review Comments
3. Are the non-compatible uses and noise sensitive public buildings readily identifiable and explained on the map legend?	Yes	See Figure 1 on page x and Figure 2 on page xi in the Executive Summary, Figure 5-1 on page 5-2 and Figure 5-2 on page 5-3 in Chapter 5, and Figures 5-8 and 5-9 in the back pocket of this document in print and as Attachment C to the electronic version of this document.
4. Are compatible land uses, which would normally be considered non-compatible, explained in the accompanying narrative?	Yes	See Chapter 2, Section 2.5 on page 2-7, subsection "School Soundproofing Projects," and Chapter 5, Section 5.2 on page 5-1.
V. NARRATIVE SUPPORT OF MAP DATA: [150.21(a), A150.1, A150.101, A150.103]		
A. 1. Are the technical data, including data sources, on which the Noise Exposure Maps are based, adequately described in the narrative?	Yes	See Chapter 4, Section 4.2 on page 4-1.
2. Are the underlying technical data and planning assumptions reasonable?	Yes	The Technical Advisory Committee (including FAA) carefully vetted all assumptions. See Chapter 4, Section 4.2 on page 4-1 as well as Appendix D. Also, FAA approved the forecast.
B. Calculation of Noise Contours:		
1. Is the methodology indicated?	Yes	See Chapter 4, Section 4.2 on page 4-1.
a. is it FAA approved?	Yes	Note that the "Memorandum for Continued Use of INM" is located in Appendix D.1, beginning on page D-5
b. was the same model used for both maps?	Yes	See Chapter 4, Section 4.1 on page 4-1
c. has AEE approval been obtained for use of a model other than one with previous blanket FAA approval?	NA	
2. Correct use of noise models:		
a. does the documentation indicate the airport operator adjusted or calibrated FAA-approved noise models or substituted one aircraft type for another?	Yes	FAA approved user-defined flight profiles. No other model adjustments or calibration occurred. See page D-107 of Appendix D.4 for FAA approval of user-defined flight profiles. FAA approved all aircraft substitutes, as documented in Appendix D.3 on page D-61.
b. if so, does this have written approval from AEE?	Yes	
3. If noise monitoring was used, does the narrative indicate that Part 150 guidelines were followed?	NA	Noise monitoring was not conducted for this study; however, monitored noise levels were compared with annual average DNL values from the Port Authority noise monitoring system (Section 5.3 on page 5-10).

Part 150		
Noise Exposure Maps Checklist - Part 1		
Airport name: Teterboro Airport		Reviewer:
	Yes/No/NA	Supporting Pages/Review Comments
4. For noise contours below 65 DNL, does the supporting documentation include explanation of local reasons? (Narrative explanation is desirable but not required.)	Yes	As discussed in Section 4.2 on page 4-2, the Port Authority chose to provide 55 DNL and 60 DNL contours for "informational purposes only" in Appendix E. However, the local jurisdictions have not adopted a lower standard than 65 DNL.
C. Non-compatible Land Use Information:		
1. Does the narrative give estimates of the number of people residing in each of the contours (65 DNL, 70 and 75, at a minimum) for both the existing condition and 5-year maps?	Yes	See Section 5.2 on page 5-1, and Table 5-2 on page 5-7 .
2. Does the documentation indicate whether Table 1 of Part 150 was used by the airport operator?	Yes	Table 1 of Part 150 is used in the document and is shown in Table 3-1 on page 3-2. The Port Authority further subdivided "Residential, other than mobile homes and transient lodgings," into single and multi-family.
a. If a local variation to Table 1 was used:	NA	
1) does the narrative clearly indicate which adjustments were made and the local reasons for doing so?	NA	
2) does the narrative include the airport operator's complete substitution for Table 1?	NA	
3. Does the narrative include information on self-generated or ambient noise where compatible/non-compatible land use identifications consider non-airport/aircraft sources?	NA	
4. Where normally non-compatible land uses are not depicted as such on the Noise Exposure Maps, does the narrative satisfactorily explain why, with reference to the specific geographic areas?	NA	
5. Does the narrative describe how forecasts will affect land use compatibility?	Yes	See Section 5.2 on page 5-1.
VI. MAP CERTIFICATIONS: [150.21(b), 150.21(e)]		
A. Has the operator certified in writing that interested persons have been afforded adequate opportunity to submit views, data, and comments concerning the correctness and adequacy of the draft maps and forecasts?	Yes	See certification language (page xiii).
B. Has the operator certified in writing that each map and description of consultation and opportunity for public comment are true and complete?	Yes	See certification language (page xiii) and Figures 5-8 and 5-9 in the back pocket of this document in print, and as Attachment C to the electronic version of this document.

Glossary

Acronym	Full Definition	First Reference or Definition in Document
AAD	Average Annual Day	Section 4.2, Page 4-8
ADO	[Federal Aviation Administration] Airports District Office	Section 1.4, Page 1-4
ANOMS	Airport Noise and Operations Management System	Figure 1-1 on Page 1-3
ATCT	[Federal Aviation Administration] Airport Traffic Control Tower	Section 2.1, Page 2-3
Azimuth	The azimuth of a runway refers to the magnetic compass direction of the runway. Runways are identified by numbers which indicate the nearest 10-degree increment of the runway centerline. For example, where the magnetic azimuth is 193 degrees, the runway designation would be 19.	Section 4.2, Page 4-2
CFR	Code of Federal Regulations	Chapter 1, Page 1-1
dB	Decibel	Section 1.5, Page 1-5
dBA	A-Weighted Decibel	Section 1.5, Page 1-5
DNL	Day-Night Average Sound Level	Section 1.5, Page 1-6
EA	Environmental Assessment as defined in FAA Order 1050.1F on Environmental Impacts: Policies and Procedures in implementing compliance with NEPA (National Environmental Policy Act)	Figure 1-1 on Page 1-3
EWR	Newark Liberty International Airport	Section 4.2, Page 4-8
FAA	Federal Aviation Administration	Section 1.1, Page 1-1
FBO	Fixed Base Operator	Section 2.1, Page 2-3
HIRL	High Intensity Runway Edge Lights	Section 2.1, Page 2-3
ILS	Instrument Landing System	Section 2.1, Page 2-3
INM	Integrated Noise Model	Section 4-1, Page 4-1
MALS-R	Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights	Section 2.1, Page 2-3
MSL	Mean Sea Level	Section 4.2, Page 4-2

Glossary (Continued)

Acronym	Full Definition	First Reference or Definition in Document
NCP	(Part 150) Noise Compatibility Program	Section 1.3, Page 1-2
NEM	(Part 150) Noise Exposure Map	Section 1.3, Page 1-2
NLR	Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure	Section 3.1, Page 3-3
Noise	Sound that is unwelcome because of its undesirable effects on persons (e.g., speech interference, sleep disturbance) or on entire communities (annoyance).	Section 1.5, Page 1-5
NOTAM	Notice to Airmen	Section 2.5, Page 2-10
NRHP	National Register of Historic Places	Section 3.2, Page 3-5
PAPI	Precision Approach Path Indicator	Section 2.1, Page 2-3
Part 150	14 CFR (FAR) Part 150, "Airport Noise Compatibility Planning"	Chapter 1, Page 1-1
The Port Authority	The Port Authority of New York and New Jersey	Chapter 1, Page 1-1
REILs	Runway End Identifier Lights	Section 2.1, Page 2-3
SLUCM	Standard Land Use Coding Manual	Section 3.1, Page 3-3
Sound	A physical phenomenon consisting of minute vibrations (waveforms) that travel through a medium such as air or water.	Section 1.5, Page 1-5
SZEA	A Standard State Zoning Enabling Act	Section 3.1, Page 3-4
TAC	Technical Advisory Committee	Section 1.4, Page 1-4
TAF	[FAA] Terminal Area Forecast	Section 4.2, Page 4-9
TANAAC	Teterboro Aircraft Noise Abatement Technical Advisory Committee	Section 2.1, Page 2-3
TDZ	Touchdown Zone	Section 2.1, Page 2-5
TEB	Teterboro Airport	Chapter 1, Page 1-1
Threshold	The FAA defines "threshold" as "the beginning of the part of the runway usable for landing." Some runways have "displaced" landing thresholds, and are marked to show where the pavement available for landing begins. Displaced thresholds raise the glide path of aircraft on approach. They are most often implemented to address obstruction issues, and sometimes for noise abatement purposes.	Section 4.2, Page 4-2

1. Introduction

Teterboro Airport (TEB) is located in Teterboro, NJ; it is operated by the Port Authority of New York and New Jersey (the Port Authority).

The Port Authority is conducting a Title 14 Code of Federal Regulations (CFR) Part 150 study ("Part 150 Study") at TEB to quantify noise exposure from aircraft operations and assess land use compatibility around the airport. The study is part of a broader effort to address noise levels created by aircraft operations and covers a study area that includes TEB and surrounding communities. Participation in the Part 150 program provides potential access to Federal Aviation Administration (FAA) funding for implementing FAA-approved noise compatibility program measures. Participation in this program by an airport is voluntary and the Port Authority has opted to participate in this program to document the aircraft noise exposure in the vicinity of TEB.

1.1. How to Use This Document

This document and the Part 150 Study it represents were undertaken in accordance with requirements found in 14 CFR Part 150. A checklist is provided on page xv that enumerates specific FAA requirements and the associated location of the supporting text in the document and its appendices.

This document is organized as follows:

- Chapter 1 introduces Teterboro Airport, the Part 150 Study process, and the stakeholders in this process
- Chapter 2 gives background information regarding the airport context and the history of noise abatement at TEB
- Chapter 3 describes land use compatibility and specific land uses in the TEB Part 150 Study area
- Chapter 4 describes the development of the Noise Exposure Maps, including the methodology behind the noise model and noise modeling inputs
- Chapter 5 presents the official 2016 and 2021 Noise Exposure Maps
- Chapter 6 describes stakeholder engagement efforts undertaken during the Part 150 process

History of Teterboro Airport

TEB is the oldest operating airport in the New York and New Jersey Metropolitan area, beginning operations in 1919. The U.S. Army Air Force (now the U.S. Air Force) operated the airport during WWII. The Port Authority purchased TEB in 1949 and entered into an agreement to have Pan Am World Airways operate the airport in 1970. In 2000, the Port Authority resumed full responsibility for TEB.

TEB is the busiest general aviation jet airport in the U.S. and supports more than 14,900 jobs and $2.3 billion in annual sales activity. See Figure 1-5 on page 1-7 for more information on TEB.

1.2. History of Noise Abatement at TEB

The Port Authority has a long history of noise abatement at TEB, which predates the FAA's Part 150 Program. The Port Authority has chosen to participate in the Part 150 program as a continuation of its long history of addressing the noise levels created by aircraft operations at TEB.

Noise abatement at TEB began in the 1970s, with the installation of a portable noise monitor. Since the 1980s, Teterboro Airport has had a dedicated Noise Abatement Office and currently has three staff members to respond to TEB noise and environmental concerns. The Port Authority and TEB management developed the program over time, in consultation with aviation and community interests, in recognition of the close proximity of the airfield to residential and other noise-sensitive land uses.[5] Chapter 2 of this report includes more specifics on the existing noise abatement rules at TEB.

1.3. Part 150 Process

FAA's emphasis on the relationship between aircraft noise and land use compatibility planning started with the passage of the Aviation Safety and Noise Abatement Act of 1979. This act gives the FAA the authority to issue regulations on noise compatibility planning and provides a means for Federal funding for projects that would improve the noise environment around an airport.

These regulations are codified in Part 150 "Airport Noise Compatibility Planning."[6] Part 150 regulations set forth standards for airport operators to use when documenting noise exposure around airports and for establishing programs to minimize noise-related land use incompatibilities. Participation in this program by an airport is voluntary and the Port Authority has opted to participate in this program to document the aircraft noise exposure in the vicinity of TEB. A Part 150 Study includes two principal elements:

1) A Noise Exposure Map (NEM) for a base year and future, forecast conditions,
2) A Noise Compatibility Program (NCP).

Acceptance of an NEM by the FAA is a pre-requisite to their subsequent approval of measures proposed in a NCP. See Figure 1-1 on page 1-3 for an overview of the Part 150 process.

Noise Exposure Map

The Noise Exposure Map (NEM) document describes the airport layout and operation, aircraft-related noise exposure, land uses in the airport environs and the resulting noise and land-use compatibility situation. Part 150 requires that NEM documentation address aircraft operations during two time periods: (1) a base year and (2) a forecast year that is at least five years following the year of submission (the "forecast conditions"). The year of submission for this study is 2016. Chapter 5 presents an existing conditions NEM for that year, and a 2021 five-year forecast conditions NEM. The Port Authority has conducted additional analyses and has provided the 55 DNL and 60 DNL contours for informational purposes only, which can be found in Appendix E, beginning on page E-5.[7]

[5] PANYNJ. (2016). Noise Office. Retrieved March 28, 2016, from PANYNJ: http://www.panynj.gov/airports/noise-office.html

[6] 14 CFR (FAR) Part 150, "Airport Noise Compatibility Planning".
http://www.ecfr.gov/cgi-bin/text-idx?SID=f8e6df268e3dad2edb848f61b9a0fb51&mc=true&node=pt14.3.150&rgn=div5#se14.3.150_11

[7] Based on public requests, the Port Authority is providing contours down to 55 DNL "for informational purposes only" as described in Section 6.5 of the Study Protocol in Appendix G, on page G-20. However, the local jurisdictions have not adopted a lower standard than 65 DNL.

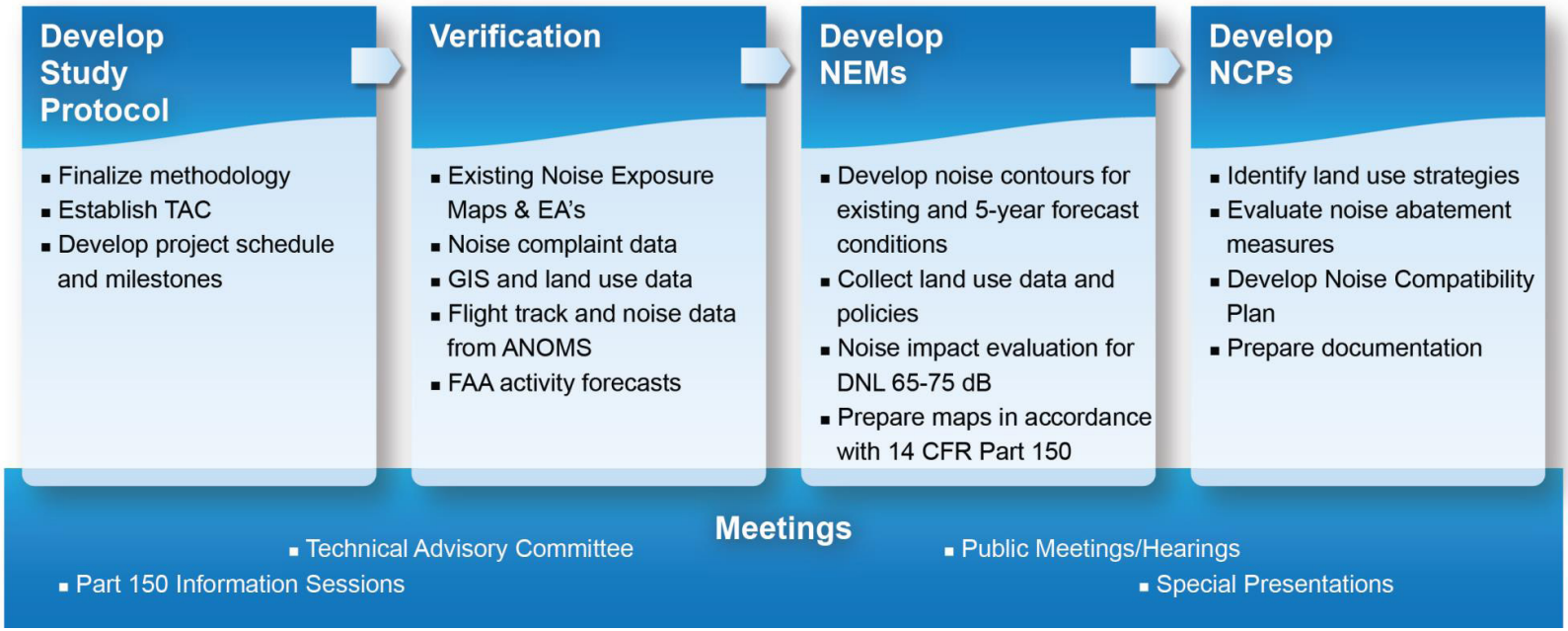


Figure 1-1: Overview of the Part 150 Process:
Source: HMMH, 2015

Noise Compatibility Program

The Noise Compatibility Program (NCP) is a description of the actions the airport proprietor proposes to undertake to minimize existing and future noise and land use incompatibilities. The NCP is forthcoming, and is the second phase of the Part 150 Study process. The NCP documentation will describe:

- The development of the program
- Each measure the Port Authority considered
- The reasons the proprietor elected to include or exclude particular measures
- The entities responsible for implementing each measure
- Implementation and funding mechanisms
- The predicted effectiveness of both individual measures and of the overall program

Roles and Responsibilities

Several groups are involved in the preparation of TEB's Part 150 Study. Primary groups included: The Port Authority, its staff and consultant team; a TEB Part 150 Study Technical Advisory Committee (TAC) chartered to advise the Port Authority throughout the process; the FAA, and members of the general public. For more information, see Figure 1-2 on page 1-4 and Chapter 6.

1.4. Stakeholder Engagement

The Port Authority is conducting the Part 150 Study in a transparent fashion, including engaging a variety of stakeholders in a manner that exceeds Part 150 consultation requirements, as discussed below.

The process employed by the Port Authority provides opportunities for all interested parties to both follow the study's progress

and be involved when key decisions are taken. Specific engagement strategies of the NEM, which exceed Part 150 requirements, were designed to ensure that all interested parties are given ample opportunity to review and comment on all aspects of the Part 150 study. These include:

- Establishing a Technical Advisory Committee (TAC) which held nine meetings as of December 2016 at which the Study Team presented briefings
- Engaging with Teterboro Aircraft Noise Abatement Advisory Committee (TANAAC) on the Part 150 Process
- Consulting with agencies with jurisdiction and responsibility within the 65 DNL contour
- Affording opportunities for public review and comment during map development
- Making project-specific materials available on the Port Authority's Part 150 website
- Hosting two public workshops about the Part 150 Study process and resulting NEM
- Publishing quarterly informational newsletters

Chapter 6 and Appendices F, G, and H document the public consultation process required under Part 150 in greater detail.

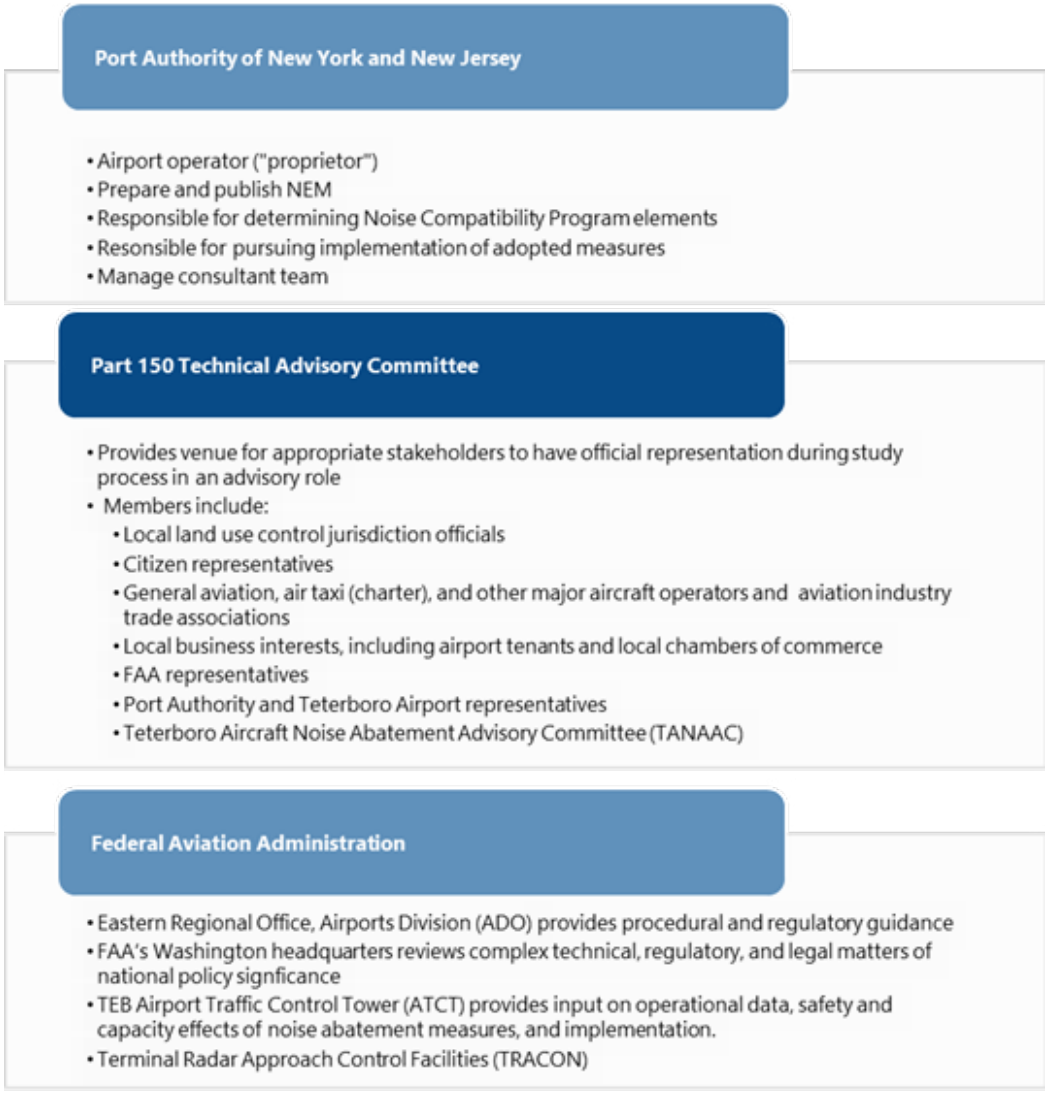


Figure 1-2: Roles and Responsibilities in the Part 150 Process
Source: HMMH, 2016

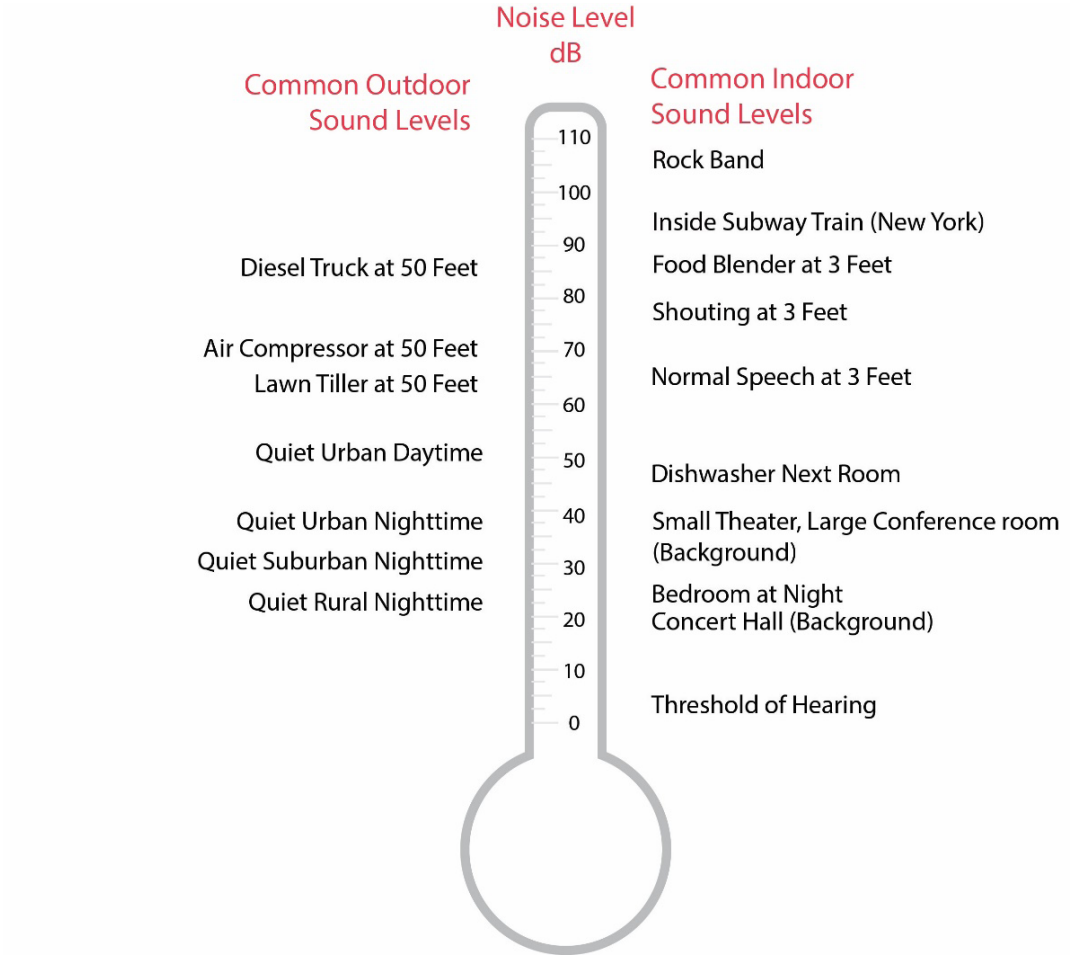


Figure 1-3: Common Environmental Sound Levels, in dBA
Source: HMMH, 2016

1.5. Noise Terminology

Information presented in this NEM document relies upon a reader's understanding of the characteristics of noise (unwanted sound), the effects noise has on persons and communities, and the metrics or descriptors most commonly used to quantify noise.

The properties, measurement, and presentation of noise involve specialized terminology that can be difficult to understand. Where possible, the Part 150 Study uses graphics and everyday comparisons to communicate noise-related quantities and effects in reasonably simple terms. Figure 1-3 shows common environmental A-weighted sound levels in dB (See Appendix A for more information on noise metrics).

Introduction to Noise Terminology

Sound is a physical phenomenon consisting of minute vibrations (waveforms) that travel through a medium such as air or water.

Noise is sound that is unwelcome because of its undesirable effects on persons (e.g., speech interference, sleep disturbance) or on entire communities (annoyance).

Noise Metrics

Noise metrics may be thought of as measures of noise 'dose'. There are two main types, describing (1) single noise events (single-event noise metrics) and (2) total noise experienced over longer time periods (cumulative noise metrics). Single-event metrics are indicators of the intrusiveness, loudness, or noisiness of individual aircraft noises. Cumulative metrics used to measure long-term noise are indicators of community annoyance. Unless otherwise noted, all noise metrics presented in Part 150 documentation are reported in terms of the A-weighted decibel or dB.

Day Night Average Sound Level (DNL)

Annoyance is greater when an intrusive sound occurs at night. As is implied in its name, the ***Day-Night Average Sound Level*** (DNL) represents the noise energy present during a daily period. However, for purposes of Part 150, it normally is calculated through use of aircraft operations data from a longer period, such as a year, in order to smooth out fluctuations occurring in day-to-day operations. The DNL reported in Part 150 documentation is often referred to as the annual-average DNL.

The Day-Night Average Sound Level (DNL)[8] represents noise as it occurs over a 24-hour period, with the assumption that noise events occurring at night (10 p.m. to 7 a.m.) are 10 dB louder than actual. This 10 dB weighting is applied to account for greater sensitivity to nighttime noise, and the fact that events at night are often perceived to be more intrusive than daytime (see Figure 1-4).

An alternative way of describing this adjustment is that each event occurring during the nighttime period calculated is as if it were equivalent to ten daytime events.

For more information regarding noise and noise metrics, please see Appendix A.

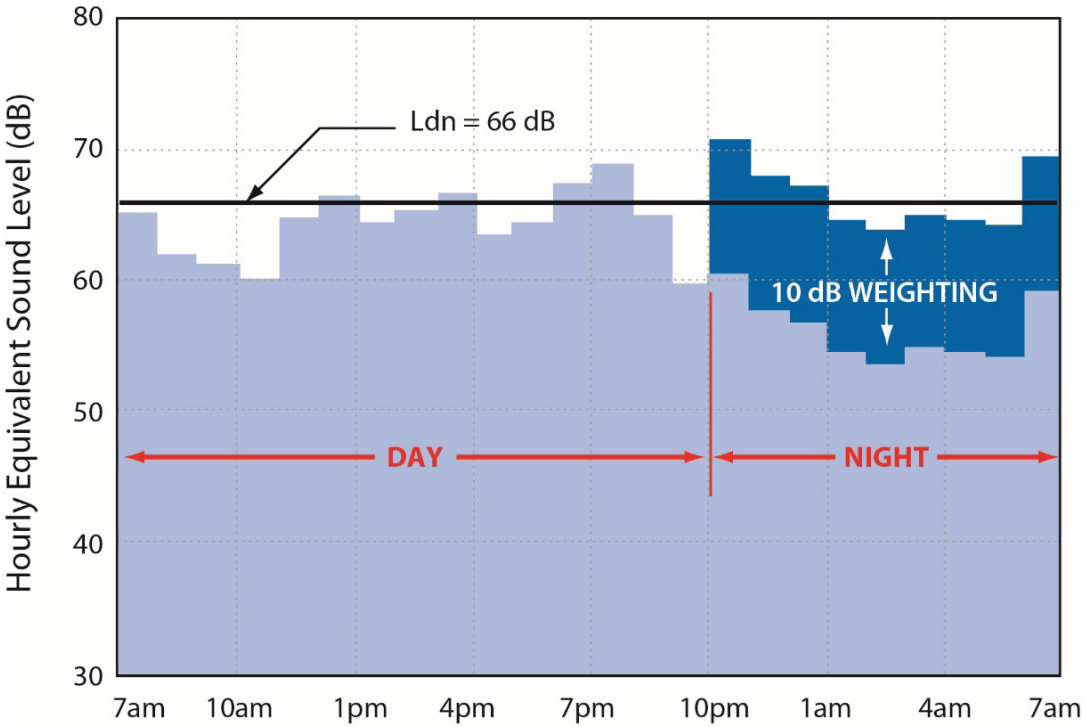
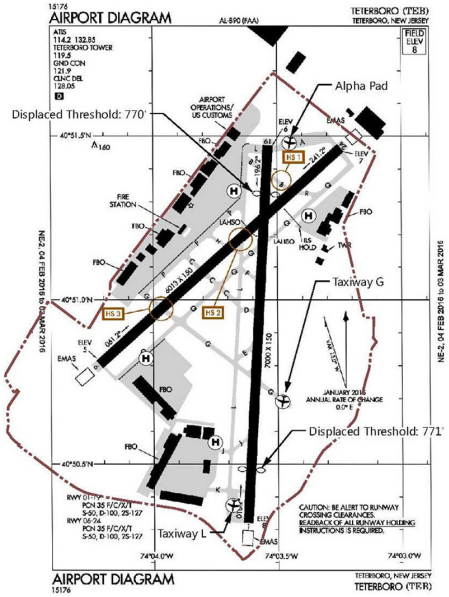


Figure 1-4: Example of a Day-Night Average Sound Level Calculation
Source: HMMH, 2016

[8] For the regulatory definition of DNL see 14CFR Part 150 §150.7 Definitions. http://www.ecfr.gov/cgi-bin/text-idx?SID=f8e6df268e3dad2edb848f61b9a0fb51&mc=true&node=pt14.3.150&rgn=div5

TETERBORO AIRPORT

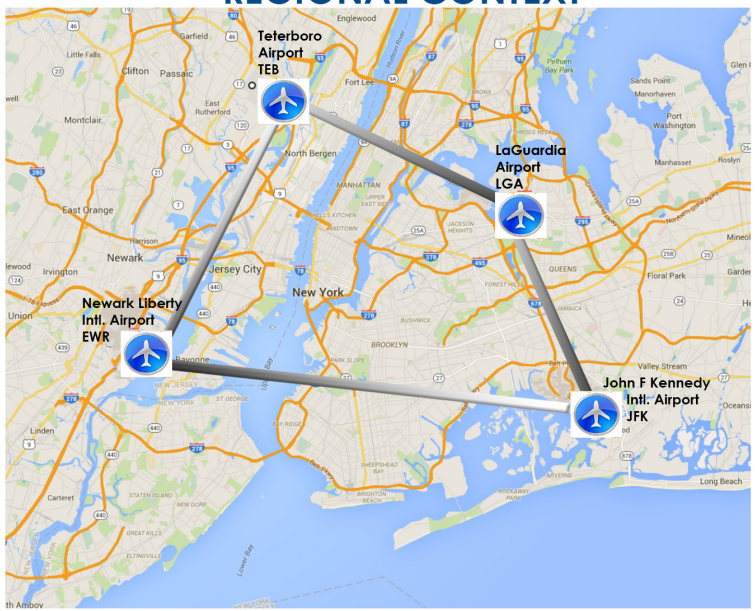
827 acres of land
15 acres undeveloped land
$380 million in upgrades
3 new hangars:
two 40,000 sq ft and one 30,000 sq ft



RUNWAY LAYOUT

Two intersecting runways
Runway 6-24 is 6,013 ft long, 150 ft wide
Runway 1-19 (N/S) is 7,000 ft long and 150 ft wide
Approximately 4.2 miles of taxiways

REGIONAL CONTEXT



ECONOMY

14,900 jobs
$868 million in annual wages
$2.3 billion annual sales

AIRFIELD AND LANDSIDE FACILITIES

23 hangars
570,000 sq ft
Tenant locations total 252,000 sq ft

Figure 1-5: TEB Facts and Figures
Source: HMMH 2016, PANYNJ 2015

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2. Background

Located 12 miles from midtown Manhattan, Teterboro Airport (TEB) is classified by the FAA as a general aviation reliever airport. Reliever airports do not offer scheduled airline service but are nonetheless important to an integrated, nationwide air transportation system network and are consequently eligible for grant funding for infrastructure capital improvements. Reliever airports are designated by the FAA for two primary functions: (1) relieving congestion at larger, commercial airports serving air carriers in a metropolitan region and (2) providing general aviation aircraft access to the overall community.[9] Although general aviation operations occur at the Port Authority's nearby commercial air carrier airports, TEB and other reliever airports remove the bulk of smaller and slower aircraft from the regional air traffic thereby relieving congestion allowing general aviation operators access to airports that are closer to their ultimate origin or destination points.

2.1. Airport History and Context[10]

TEB is the oldest operating airport in the New York City metropolitan region. Walter C. Teter acquired the property in 1917. The first flight at the airport took place in 1919.

During World War I, North American Aviation operated a manufacturing plant on the site. After the war, the airport served as a base of operation for Anthony Fokker, the Dutch aircraft designer. Throughout World War II, the U.S. Army Air Force operated the airport. The Port Authority purchased the airport on April 1, 1949, from Fred L. Wehran, a private owner. The Port Authority leased the airport to Pan Am World Services in 1970. Johnson Controls assumed the lease in 1989 when it acquired Pan Am World Services. On December 1, 2000 the Port Authority resumed full responsibility for operation of the airport.

Contribution to Economy

Today, TEB continues to play a vital role in regional aviation interests. The airport supports more than 14,900 jobs, which results in $868 million in annual wages, and generates nearly $2.3 billion in annual sales activity, as of 2015. The Port Authority has invested more than $380 million to upgrade the airport's facilities and open new areas of service to the aviation community.

Primary improvements throughout the airport include two new 40,000-square-foot hangars, a 30,000-square-foot hangar, a modernized terminal building, and paved parking for aircraft. Plans are underway to better meet the needs of newer, more efficient, (and generally quieter) aircraft, through improvements to existing aeronautical areas and development land within the airport boundary.

Size and Location

TEB covers 827 acres. It lies within the municipalities of Teterboro, Hasbrouck Heights, Little Ferry, Moonachie, and Wood-Ridge in Bergen County, N.J., with its northern border on U.S. Highway 46 and its southern border on Moonachie Avenue (See Figure 2-1 on page 2-2).

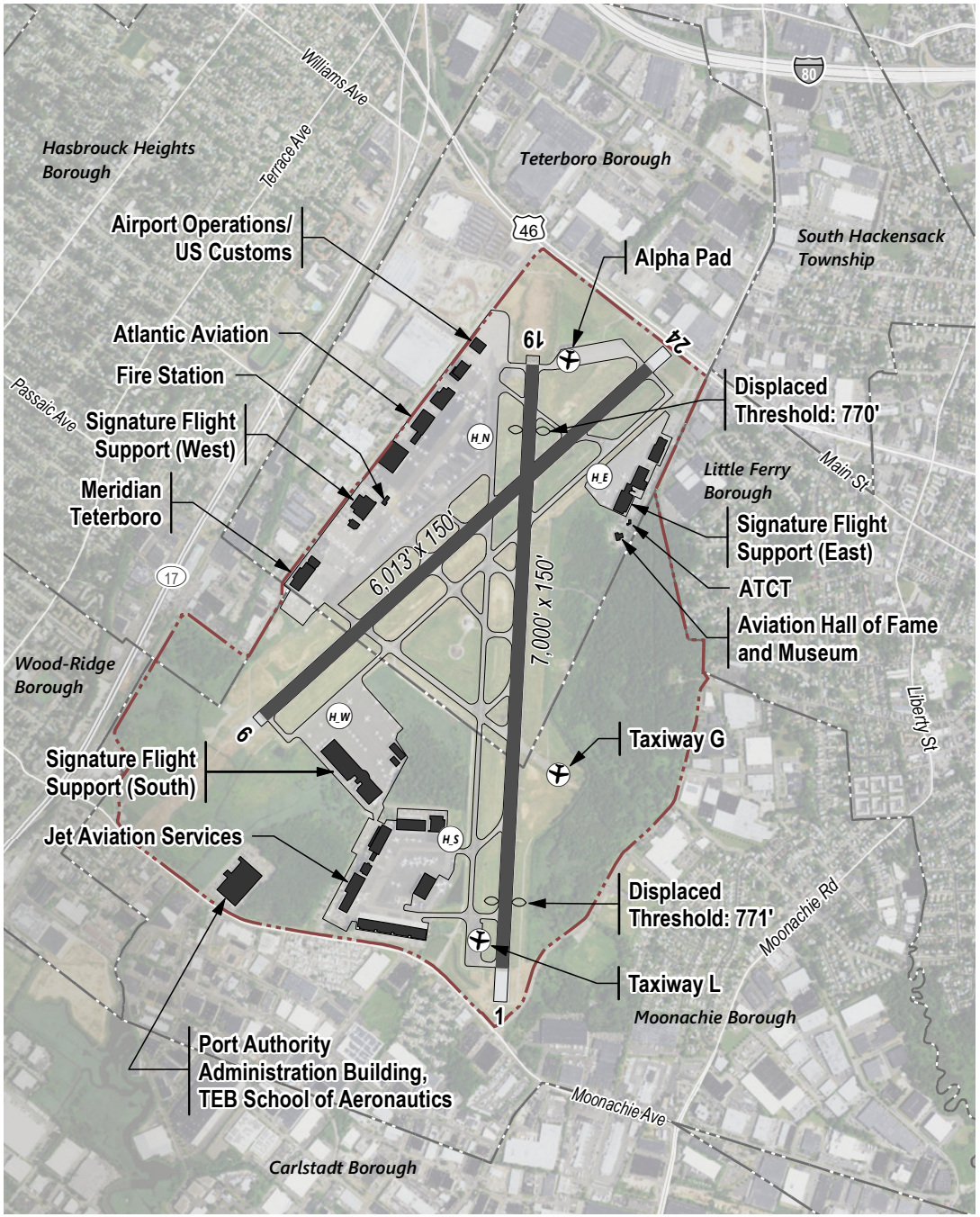
Airfield and Landside Facilities

Figure 2-1 on page 2-2 depicts TEB's major airfield and landside facilities.

TEB has two intersecting runways – Runway 6-24 and Runway 1-19. Runway 6-24 (NE/SW) is 6,013 feet long and 150 feet wide, and is equipped with High Intensity Runway Edge Lights (HIRL). The Runway 6 approach has an Instrument Landing System (ILS) and a Medium Intensity Approach Lighting System with Runway End Identifier Lights (MALS-R).

[9] Title 49 /https://www.gpo.gov/fdsys/pkg/USCODE-2011-title49/pdf/USCODE-2011-title49-subtitleVII-partB-chap471-subchapI-sec47102.pdf

[10] PANYNJ, 2015 http://www.panynj.gov/airports/pdf-traffic/ATR_2015.pdf Much of the information in this section can be found in the Port Authority's AirportTraffic Report.



THE PORT AUTHORITY OF NY & NJ

Teterboro Airport

Airport Noise Compatibility
Part 150 Study
2016 and 2021 Noise Exposure Maps

Figure: 2-1

Major Airfield and Landside Facilities

- TEB Airport Boundary (Approximate)
- Runway
- Buildings
- Helicopter Pad Location
- Runup Location
  Aircraft Orientation
  - Alpha Pad -190°
  - Taxiway G - 010° or 190°
  - Taxiway L - 190°
- Municipal Boundary

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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community; New Jersey Geographic Information Network (NJGIN)

The Runway 24 approach is equipped with a Precision Approach Path Indicator (PAPI) and Runway End Identifier Lights (REILs). Runway 6-24 underwent a complete rehabilitation in 2010, during which centerline lights were added to the runway and Touchdown Zone (TDZ) lights were added to Runway 6. An Engineered Materials Arresting System (EMAS) is installed at each runway end.

Runway 1-19 (North/South) is 7,000 feet long and 150 feet wide, and is equipped with HIRL and REILs. The Runway 19 approach is equipped with a PAPI and the Runway 1 approach is equipped with a Visual Approach Slope Indicator (VASI). With this, the Runway 19 approach has an ILS.

Runway 1-19 was overlaid and grooved in the summer of 2000. This included the installation of centerline lights and TDZ lights for Runway 19. In 2011, Runway 1-19 was rehabilitated; this included work to relocate nearby Redneck Avenue to create a Runway Safety Area.

Approximately 4.2 miles of taxiways exist at the airport. Most are 60 feet wide, and many are equipped with centerline lights and edge lighting.

The 23 aircraft storage hangars at TEB have a total area of approximately 572,000 square feet. An office building with an area of approximately 134,400 square feet includes the Airport Management Office. Additional office and shop space leased by fixed-base operators and other tenants total about 252,000 square feet. Aircraft rescue, firefighting, and maintenance facilities are located at the airport.

The FAA constructed an Airport Traffic Control Tower (ATCT), on the east side of the airport in 1975. The ATCT is open and staffed 24 hours a day. A new tower is under design, with a final completion date pending. These facilities allow TEB to operate as a reliever airport, serving aircraft weighing up to 100,000 pounds, enabling it to operate as the premier general aviation airport on the east coast of the U.S.

Teterboro Airport Noise Abatement Program History

TEB's noise abatement program was initiated in 1970, when a portable noise monitor was used to obtain samples of aircraft noise levels. In 1977, a noise monitoring system was installed that included permanent noise monitors connected to a central computer. Regular enhancements to the monitoring system over the years have included software upgrades, integration of flight tracking, and complaint handling. The current Airport Noise and Operations Management System (ANOMS) is considered state-of-the-art.

The Teterboro Aircraft Noise Abatement Advisory Committee (TANAAC) held its first meeting in early 1987. The purpose of this meeting was to introduce Pan Am World Airways (the airport operator at that time) and the Port Authority of New York and New Jersey (the airport owner) and to explain their roles and responsibilities in reducing noise in the local communities. Additional discussion of TANAAC and the TEB noise abatement program is provided later in this chapter.

Airport Users

TEB has a diverse group of airport tenants that includes fixed base operators, charter and aircraft leasing, cargo, public service operations, and customs to support a wide range of general aviation (and occasional military) users.

Fixed-Based Operators – TEB is served by four fixed-based operators (FBOs) that provide a range of services for private, general aviation aircraft. FBOs are airport service centers responsible for aircraft services such as passenger handling, aircraft fueling, parking, maintenance, charters, rentals, flight training, and de-icing. FBOs also provide ground handling services like towing and baggage handling, and other services such as car rentals, hotel reservations, and pilot lounges.

Charter/Aircraft Leasing – Companies can charter an aircraft either to supplement their own aircraft or to travel if they do not own an airplane.

Cargo – Couriers and small package cargo shippers operate at TEB.

Public Service – TEB serves as the primary receiving point for hearts and other human organs used for life-saving transplant operations performed at medical centers throughout the region.

International Travel – Customs clearance services are available at the airport.

Airport Activity Trends

Figure 2-2 depicts historic and forecast operations at TEB. As the figure indicates, aircraft operations grew in the 1990s and declined in the 2000s to a low of 137,890 in 2009, and then began increasing again reaching over 165,000 in 2015.

Section 4.2 provides full detail on the FAA-approved Part 150 forecasts for this study, including their development and results.

2.2. Ongoing Stakeholder Outreach

The Port Authority and TEB management take their roles as community leaders very seriously. This includes everything from investing in the infrastructure that keeps the region moving to investing in the people and places that make it all work. The Port Authority and TEB management work closely with communities and elected officials throughout the region on a variety of community-based initiatives, and also with aviation interest groups on industry-based initiatives. The primary ongoing venue for continuous noise-related stakeholder consultation at TEB is the TANAAC.

Teterboro Aircraft Noise Abatement Advisory Committee

As mentioned previously, the Teterboro Aircraft Noise Abatement Advisory Committee (TANAAC) was established at its first meeting held on February 26, 1987.

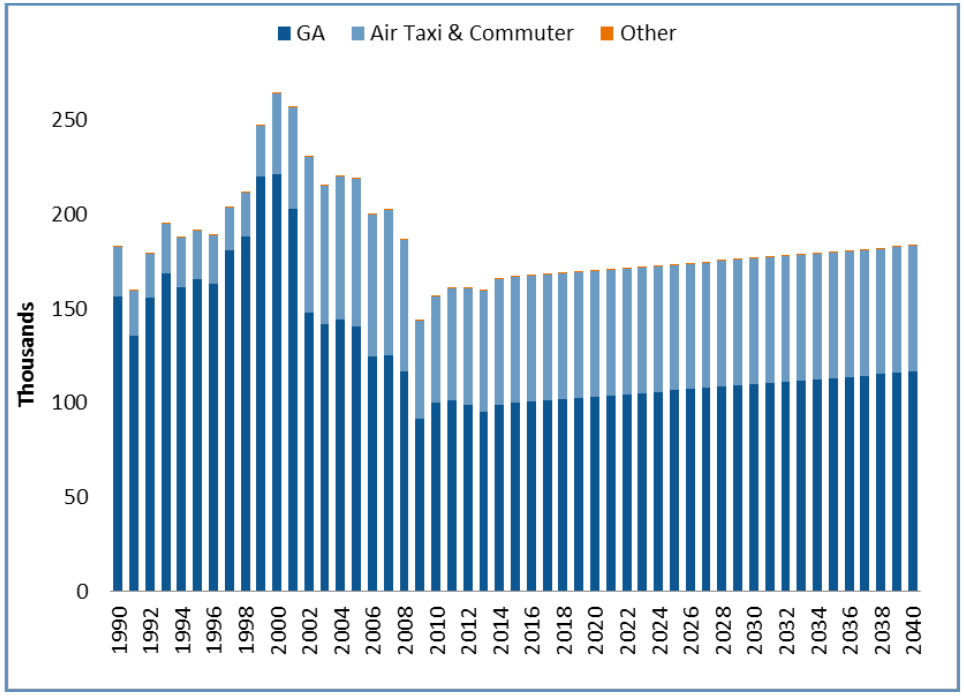
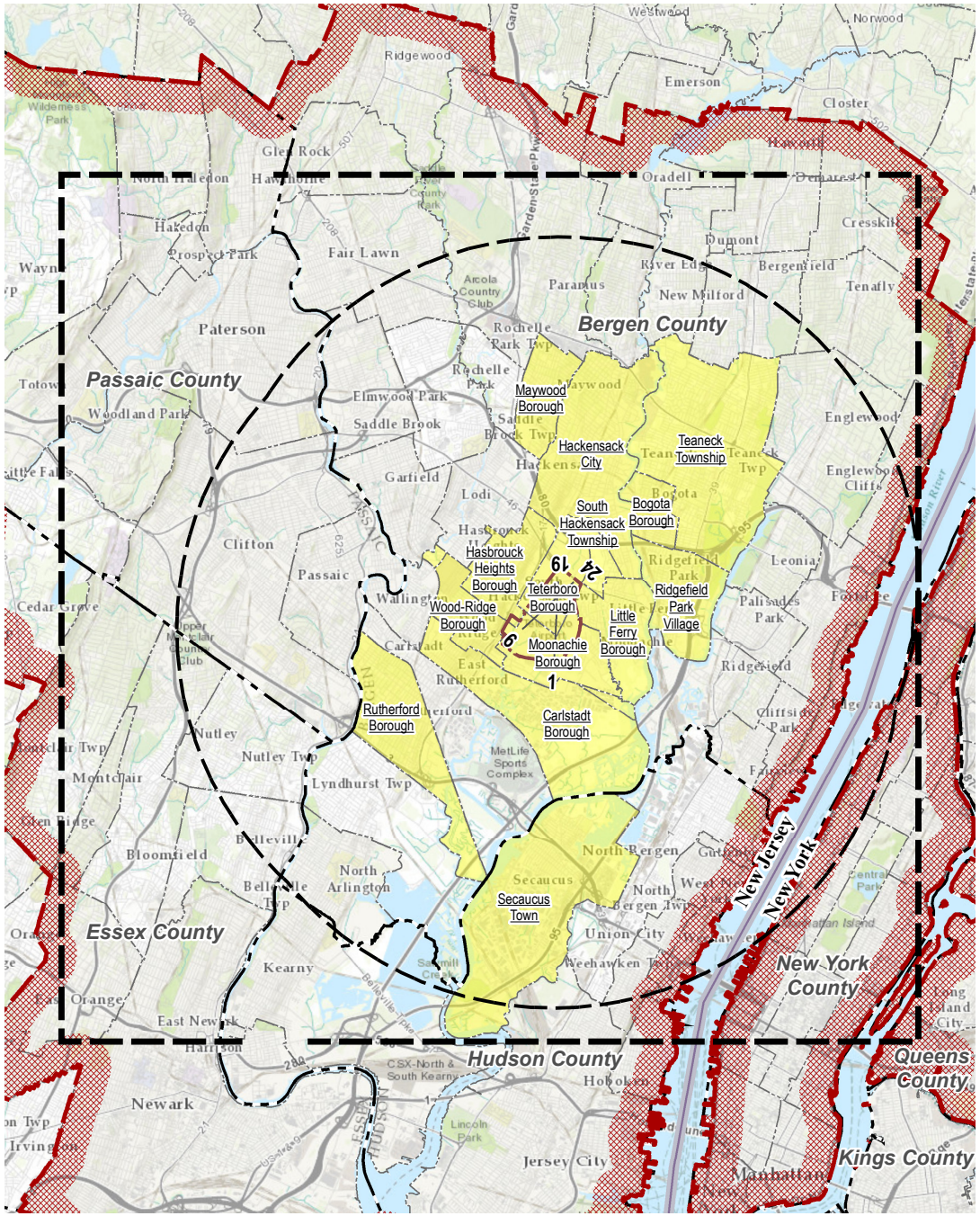


Figure 2-2: Historic and Forecast Teterboro Aircraft Operations
Sources: 1990-2015 historic operations from 2015 FAA Terminal Area Forecast, published January 2015. 2015-2040 forecast operations from "TEB Aircraft Fleet Mix and Annual Aircraft Operations Forecast, 2014-2033," Port Authority of New York and New Jersey, January 20, 2016.

Its main purpose is to maintain meaningful ongoing dialogue between the airport community and the residential communities surrounding TEB, and to oversee noise abatement, while insuring the safe and efficient operation of the airport. TANAAC is comprised of the airport operator, federal, state, and local elected officials, FAA representatives, airport users, and representatives of 14 municipalities surrounding the airport (See Figure 2-3 on page 2-5). The committee holds four quarterly meetings a year. There is one vote per member with the exception of the Airport Manager, who votes only in the case of a tie. The general public may attend to observe the proceedings.



THE PORT AUTHORITY OF NY & NJ

Teterboro Airport

Airport Noise Compatibility
Part 150 Study
2016 and 2021 Noise Exposure Maps

Figure: 2-3

TEB Study Area

- TEB Airport Boundary (Approximate)
- TEB Study Area
- Runway
- Extent of Municipal Boundaries within TEB Study Area
- Runway Buffer - 30,000 feet
- TANAAC Member Towns
- State Boundary
- County Boundary
- Municipal Boundary
- Park / Open Space
- Water
- Highway
- Major Roads
- Minor Roads

Note: The purpose of this figure is limited to depicting the area within which land use and flight operations data will be collected, and does not relate in any way to definition of noise exposure, land use compatibility, or eligibility for noise mitigation. Consistent with FAA guidelines in 14 CFR Part 150, land use compatibility will be assessed only within the existing and five-year forecast conditions 65 decibel (dB) Day-Night Average Sound Level (DNL) contours, when prepared and accepted by the FAA.

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2.3. Part 150 Study Area

Figure 2-3 on page 2-5 depicts the Study Area[11] that the Port Authority developed for the TEB Part 150 in consultation with the FAA, to meet both Part 150 regulatory minimum requirements and project-specific needs. The Study Area identifies the outer limit of the overall scope of data collection, analyses, and outreach. Pursuant to Part 150, detailed, parcel-level land use data collection and analysis was conducted within the 65 DNL contours.

Part 150 requires that the Study Area include flight tracks out to at least 30,000 feet (i.e., approximately six statute miles) from the end of each runway. This resulted in a 30,000-foot perimeter around the runways, from which the Study Area was extended in three directions:

- To the south, to encompass all of Secaucus Town
- To the north, to encompass areas under the proposed Runway 19 charted visual procedure
- To the west, where prior noise contours prepared for the Port Authority indicate departure "hold downs" may extend the noise contours.

11 FAA Op cit.

Part 150 requires formal Noise Exposure Map submissions to depict tracks out to at least 30,000 feet at a scale of at least 1" to 2,000'. FAA guidelines permit airports to present the flight tracks covering this scope and scale on separate, unbound figures at this scale accompanying the Noise Exposure Map document.

Table 2-1: Complaint Statistics - Sum of 2014 and 2015 Complaints, by Aircraft Type Identified by Complainant
Source: PANYNJ 2015

Complaint Statistic	Jets	Propeller	Helicopter	Unspecified
Number of complaints within the study area	1,345	36	76	1,683
Total complaints	1,393	37	78	1,704
Percent of complaints within the study area	97%	97%	97%	99%

Figure 2-3 on page 2-5 presents geographic information considered in the development of the Study Area:

- The Part 150 requirement for a 30,000 foot perimeter around both runways.[12] On the figure this line looks like a slightly elongated circle around the airport.
- The jurisdictional boundaries of the 14 municipalities that make up TANAAC.
- An estimated area based on previously prepared noise contours for TEB to accommodate DNL noise exposure contours from 75 to 55 dB.[13]

2.4. Noise Complaints

The Port Authority provides two primary means of filing an aircraft noise complaint: (1) by completing and submitting the form on the Port Authority's website or (2) by leaving a voicemail on the airport noise complaint hotline. Noise complaints are recorded and processed with the help of the Port Authority's PlaneNoise® complaint management system. Each noise complaint received is compiled in a database, verified for accuracy, analyzed, and mapped for reporting. Noise complaint reports are provided to the FAA on a recurring basis to notify them of areas of noise concerns. See Table 2-1 for complaint statistics.

Appendix B presents figures depicting the geographic distribution of noise complaints the Port Authority received in 2014 and 2015 regarding day (7 a.m. – 10 p.m.) and night (10 p.m. – 7 a.m.) operations in four aircraft categories: (1) jets, (2) propeller aircraft, (3) helicopters, and (4) unspecified aircraft types.

12 FAA Op cit.

Sec. A150.103(b)(1) states:

(b) Except as provided in paragraph (c) of this section, the following information must be obtained for input to the calculation of noise exposure contours:

(1) A map of the airport and its environs at an adequately detailed scale (not less than 1 inch to 2,000 feet) indicating runway length, alignments, landing thresholds, takeoff start-of-roll points, airport boundary, and flight tracks out to at least 30,000 feet from the end of each runway.

13 These contours are not shown, because they were prepared for internal deliberative purposes only and were never formally adopted.

2.5. Noise Abatement Measures

TEB has a nationally recognized noise abatement program. The Port Authority and TEB management developed the program over time, in consultation with aviation and community interests, in recognition of the close proximity of the airfield to residential and other noise-sensitive land uses. The noise abatement measures are described in the "TEB Quiet Flying Program Flight Crew Handbook."[14]

Note on Special Conditions that Apply to Mandatory Noise Abatement Measures

The TEB noise abatement program includes both voluntary and mandatory measures. The mandatory noise rules at Teterboro include Maximum Noise Levels allowable for aircraft departures and the ability to ban aircraft from operation at Teterboro if three violations of the noise rules occur during a two-year period. It should be noted that the Port Authority adopted the mandatory measures prior to the passage of the federal Airport Noise and Capacity Act of 1990 ("ANCA"). The mandatory noise rules at TEB are "grandfathered" by ANCA as they were in effect at the time the Act was passed.

Provisions in ANCA impose severe limits on an airport proprietor's ability to adopt new mandatory noise rules, such as the ones that exist at TEB. As a result, FAA approval must be obtained before an airport proprietor may adopt new noise-based restrictions affecting jet operations. The NCP phase of the Part 150 project will discuss the FAA process of use restrictions creation and adoption.

Restrictions that have been created at other airports after the adoption of ANCA applied to civilian jet aircraft that the federal government banned from operating in the U.S. starting on January 1, 2016 (except under extraordinary exceptions).[15] More detail on federal regulations related to airport noise is provided on the FAA website.[16]

School Soundproofing Projects

The Port Authority has long taken an active role in the communities it serves. In 1983, the Port Authority first made a commitment to ensure that students in schools close to its airports always have a quiet learning environment. That commitment continues today with the soundproofing work the Port Authority has done over the years in 77 schools around its airports, totaling over $400 million in improvements. Of these 77 schools, five schools are in the area surrounding TEB and soundproofing was completed at the last of these in 2012. A total of over $38 million USD has been invested in soundproofing these schools which serve over 2,000 students in the area surrounding TEB. The soundproofing program includes:

- Acoustic windows, insulation, ventilation and air conditioning
- Specifications that meet federal procurement guidelines
- Sponsorship and administration of federal requirements by the Port Authority
- Reimbursement of schools by the Port Authority for consultants and contractors
- Opportunities for local contractors
- Support of DBE goals approved annually by FAA

The soundproofing project is contingent upon federal funding. Specifically, 80 percent of the funding was provided by the FAA and the remaining 20 percent by the Port Authority. For TEB specifically, the Port Authority had identified six schools eligible for treatment near the airport. These six schools are:

- Bergen County Technical High School
- Jackson Avenue School
- Memorial School

[14] This is published at https://www.panynj.gov/airports/pdf/TEB-Flight-Crew-Handbook.pdf.

[15] The FAA has established aircraft noise criteria in 14 CFR Part 36, "Noise Standards: Aircraft Type and Airworthiness Certification." For transport category "large" aircraft (with maximum takeoff weights of 12,500 pounds or more) and all turbojet-powered aircraft, Part 36 identifies four "stages" of aircraft with respect to their relative noisiness: Stage 1 aircraft have never been shown to meet any noise standards, Stage 2 aircraft meet original noise limits set in 1969, Stage 3 aircraft meet more stringent limits established in 1977, and Stage 4 aircraft meet the most stringent limits established in 2005. Between the late 1980s and January 1, 2016, the FAA adopted regulations that phased out all civil Stage 1 and 2 jet operations nationwide (with extremely limited case-by-case exceptions for aircraft maintenance, modification, retirement, and emergency purposes). The critical implication for this study is that no Stage 1 or 2 jet operations are projected to occur at TEB in 2016 or 2021.

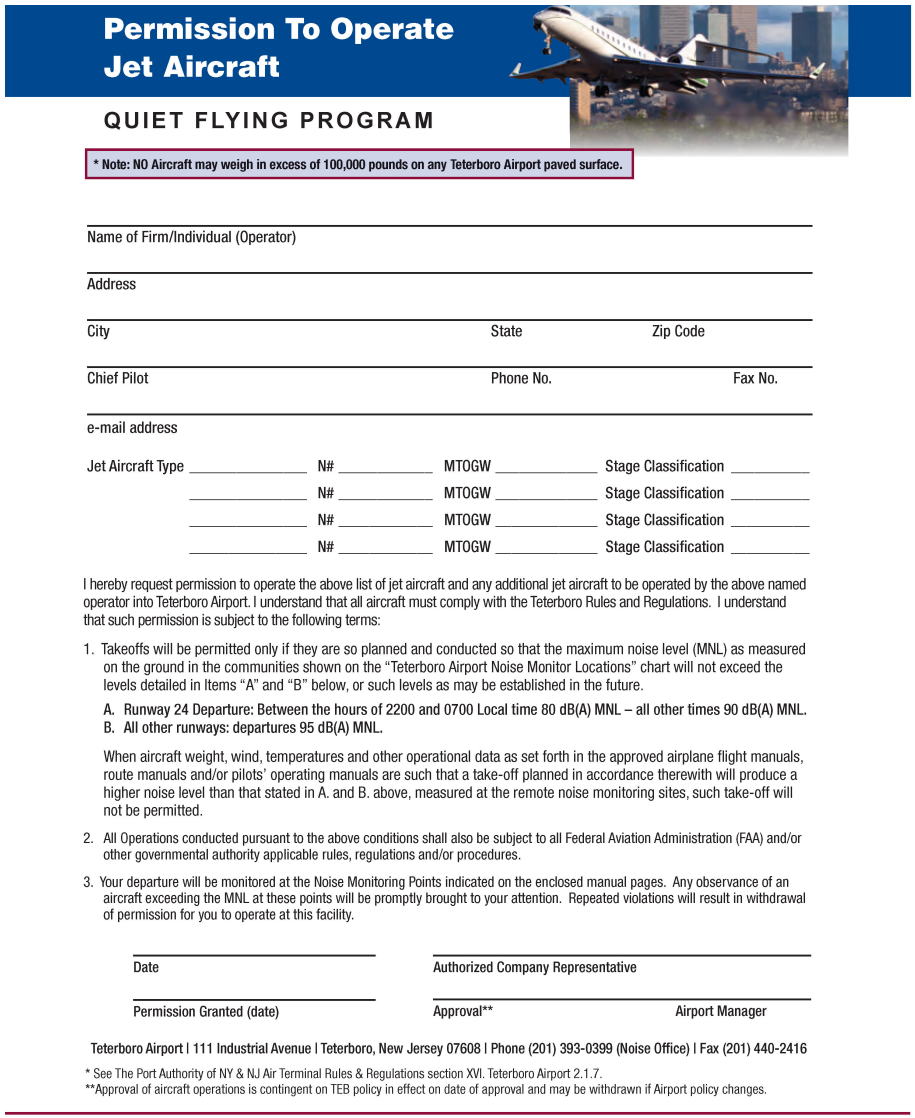
[16] This can be found at http://www.faa.gov/airports/environmental/airport_noise/.

- St. Francis School
- Becton High School
- Sylvan School

Sound insulation treatment was completed on the first five schools. One school that was identified for funding (the Sylvan School) declined the construction grant because it ceased being used a school. All other schools that were offered soundproofing received funding. One of these schools in Teterboro, NJ; the Bergen County Technical High School has been determined to be inside the 65 DNL contour in this Part 150 Study. As a result, this school is considered a compatible land use as noise inside the classrooms has been significantly reduced by the modifications provided.

Mandatory Requirement for Approval to Operate Jet Aircraft

No jet-powered aircraft may operate at TEB without prior approval of the Airport Manager. Operators of jet aircraft new to the airport or with a changed owner/ operator must submit a "Permission to Operate" form to the Airport Manager, shown in Figure 2-4. The form requires the operator to acknowledge awareness of and commitment to compliance with the TEB "Quiet Flying Program."



Permission To Operate Jet Aircraft

QUIET FLYING PROGRAM

*** Note: NO Aircraft may weigh in excess of 100,000 pounds on any Teterboro Airport paved surface.**

Name of Firm/Individual (Operator)

Address

City State Zip Code

Chief Pilot Phone No. Fax No.

e-mail address

Jet Aircraft Type _____ N# _____ MTOGW _____ Stage Classification _____
_____ N# _____ MTOGW _____ Stage Classification _____
_____ N# _____ MTOGW _____ Stage Classification _____
_____ N# _____ MTOGW _____ Stage Classification _____

I hereby request permission to operate the above list of jet aircraft and any additional jet aircraft to be operated by the above named operator into Teterboro Airport. I understand that all aircraft must comply with the Teterboro Rules and Regulations. I understand that such permission is subject to the following terms:

1. Takeoffs will be permitted only if they are so planned and conducted so that the maximum noise level (MNL) as measured on the ground in the communities shown on the "Teterboro Airport Noise Monitor Locations" chart will not exceed the levels detailed in Items "A" and "B" below, or such levels as may be established in the future.
   A. Runway 24 Departure: Between the hours of 2200 and 0700 Local time 80 dB(A) MNL – all other times 90 dB(A) MNL.
   B. All other runways: departures 95 dB(A) MNL.

   When aircraft weight, wind, temperatures and other operational data as set forth in the approved airplane flight manuals, route manuals and/or pilots' operating manuals are such that a take-off planned in accordance therewith will produce a higher noise level than that stated in A. and B. above, measured at the remote noise monitoring sites, such take-off will not be permitted.
2. All Operations conducted pursuant to the above conditions shall also be subject to all Federal Aviation Administration (FAA) and/or other governmental authority applicable rules, regulations and/or procedures.
3. Your departure will be monitored at the Noise Monitoring Points indicated on the enclosed manual pages. Any observance of an aircraft exceeding the MNL at these points will be promptly brought to your attention. Repeated violations will result in withdrawal of permission for you to operate at this facility.

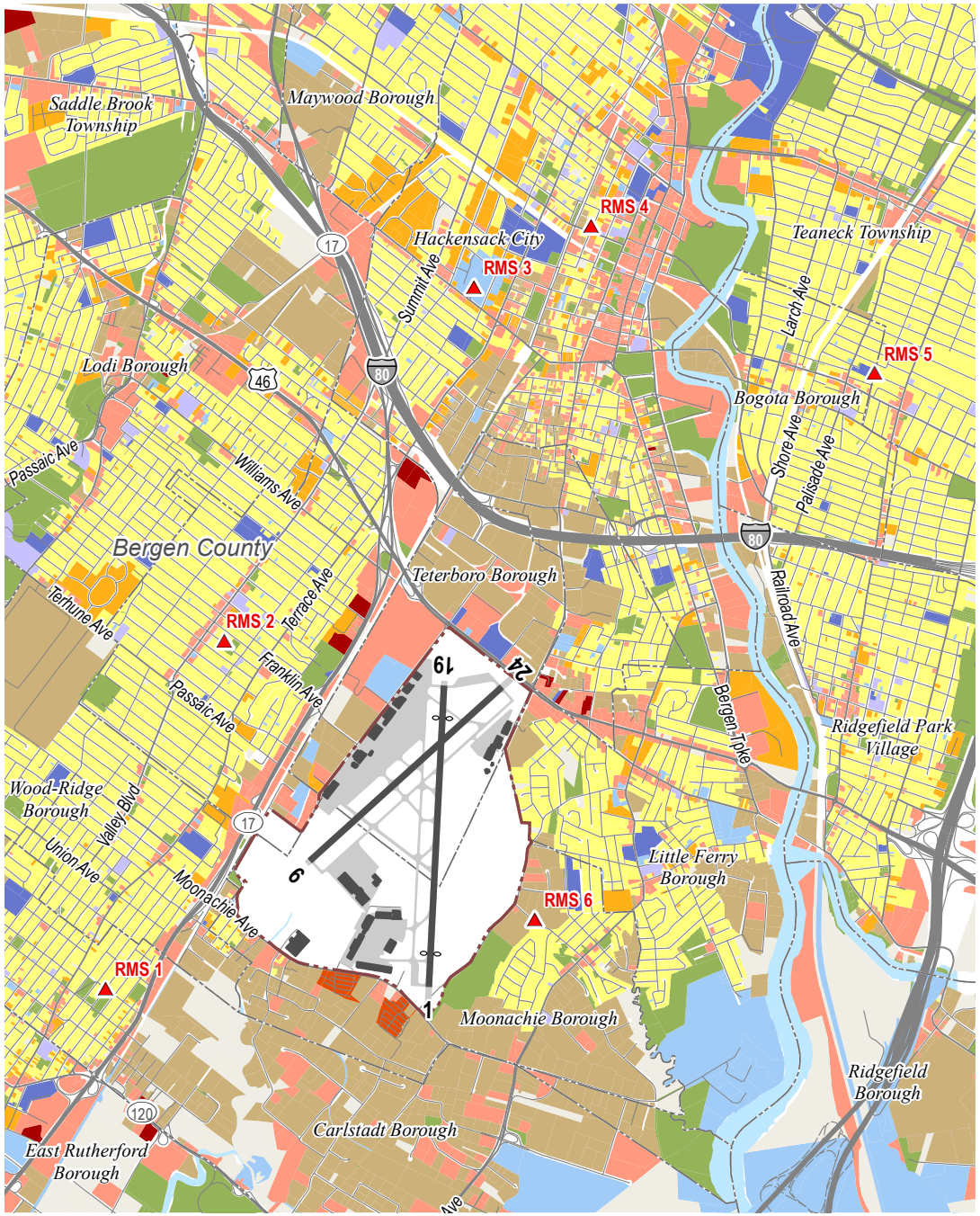
Date Authorized Company Representative

Permission Granted (date) Approval** Airport Manager

Teterboro Airport | 111 Industrial Avenue | Teterboro, New Jersey 07608 | Phone (201) 393-0399 (Noise Office) | Fax (201) 440-2416

* See The Port Authority of NY & NJ Air Terminal Rules & Regulations section XVI. Teterboro Airport 2.1.7.
**Approval of aircraft operations is contingent on TEB policy in effect on date of approval and may be withdrawn if Airport policy changes.

Figure 2-4: Permission to Operate Form for TEB Fly Quiet Program
Source: "TEB Quiet Flying Program Flight Crew Handbook" https://www.panynj.gov/airports/pdf/TEB-Flight-Crew-Handbook.pdf.



THE PORT AUTHORITY OF NY & NJ

Teterboro Airport

Airport Noise Compatibility
Part 150 Study
2016 and 2021 Noise Exposure Maps

Figure 2-5

Permanent Noise Monitoring Locations

- TEB Airport Boundary (Approximate)
- Runway
- RMS # Noise Monitor Locations
- Municipal Boundary
- Park / Open Space
- Water
- Highway
- Minor Roads
- Major Roads

Non-Compatible within DNL 65

- Single Family Residential
- Multi-Family Residential
- Mobile Home
- Transient Lodging (Hotel, Motel, etc..)
- School / University / Daycare
- Place of Worship

Compatible within DNL 65

- Recreational / Open Space / Cemetery
- Commercial Use
- Manufacturing and Production
- Public Use
- Vacant / Undefined

Note: Entire area depicted on the figure is within Bergen County and Bergen County has jurisdictional and land use control

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Source: The Port Authority of NY & NJ, Cornell University Geospatial Information Repository (CUGIR), NJ DEP Bureau of GIS, NYC Open Data, Environmental Systems Research Institute (ESRI)

Mandatory Maximum Noise Levels

The Port Authority uses A-weighted decibel (dBA) measurements to enforce formal "Maximum Noise Level" (MNL) limits that apply to takeoffs and vary according to runway end and time of day, as follow:

- 80 dBA departure limit on Runway 24 from 10 p.m. to 7 a.m. local time
- 90 dBA departure limit on Runway 24 from 7 a.m. to 10 p.m. local time
- 95 dBA departure limit on Runways 01, 19 and 06 at all times
- 95 dBA departure limit for helicopters at all times

The Port Authority has installed noise monitors at six locations around TEB to track compliance, as shown in Figure 2-5 on page 2-9.

Violations

Aircraft that exceed these limits are issued a noise violation. Aircraft that have received three noise violations in a two-year span are not permitted to operate at TEB. Notifications of noise violations are sent to the operator via registered mail. Failure by the operator to receive notification shall not be cause for dismissal of the violation. A record of First Violation and Second Violation is kept for two years from the date of the violation. On the second anniversary, the record of that violation is expunged.

Exemptions

Operators may conduct up to two flight tests, or "Noise Plots," on any one aircraft at TEB. These tests may be conducted for the purpose of evaluating noise abatement procedures. Permission for such tests will not be granted if there is a record of a Second Violation for the aircraft involved.

If Runway 19 is officially closed by NOTAM, the applicable MNL for Runway 24 is 95 dBA.

If the crosswind component existing at the time of departure on Runway 19 exceeds the maximum allowable cross-wind component for the aircraft being used, the MNL for Runway 24 is 95 dBA. Exemptions may be granted by the Airport Manager, in cases where, due to unforeseen circumstances, noise abatement procedures were not used by the pilot in order to assure safety of flight.

Appeals

Operators may appeal the assessment of a noise violation. There is a well-defined protocol for appeals which can be found in the TEB Quiet Flying Program Flight Crew Handbook.

Aircraft/Engine Maintenance Run-ups

The Port Authority has established mandatory aircraft run-up regulations as follow:

- Turbine engine aircraft (including jets) run-ups are prohibited on ramp areas.
- Prior to conducting a maintenance run-up, including piston powered aircraft run-ups on ramp areas, the operator must contact Airport Operations to request a run-up.
- All maintenance run-ups are conducted between the hours of 8 a.m. and 8 p.m., Monday through Saturday, or between the hours of 12 p.m. and 6:00 p.m. on Sundays.

Voluntary Measures

Voluntary IFR and VFR Approach and Landing Procedures

Pilots are requested to comply with the voluntary IFR and VFR approach and landing procedures laid out in detail in the TEB Flight Crew Handbook in order to reduce noise.

Voluntary Restraint from Overnight Flights

Operators are requested to voluntarily restrain from operating any aircraft type between the hours of 11 p.m. and 6 a.m. Operators that do not abide by this voluntary restraint receive letters reminding them that the program is in place, notifying them of their failure to meet program requirements, and reminding them that only essential flights should be conducted during the restraint period.

Ban on Stage 1 Jet Operations and Voluntary Restraint of Stage 2 Jet Operations

On May 1, 2002, the Port Authority adopted a ban on operations of jet aircraft certificated as "Stage 1" under 14 C.F.R. Part 36, "Noise Standards: Aircraft Type and Airworthiness Certification."

From that date through 2015, operators also were requested to voluntarily restrain from conducting operations of jet aircraft certificated as "Stage 2." However, both of these measures became moot January 1, 2016 when the federal government banned Stage 2 operations nationwide (with very limited exemptions for emergencies and other exceptional situations).[17]

Voluntary Preferential Runway Use

Between 10 p.m. and 7 a.m. local time, all aircraft over 12,500 pounds, jet aircraft and those aircraft with high noise levels should request Runway 01 for landing when airport traffic is landing to the north and Runway 19 for departures when airport traffic is departing to the south.

Voluntary Restraint in Use of Reverse Thrust

To minimize noise, operators are requested to avoid reverse thrust at power settings other than idle, except when necessary for operational safety.

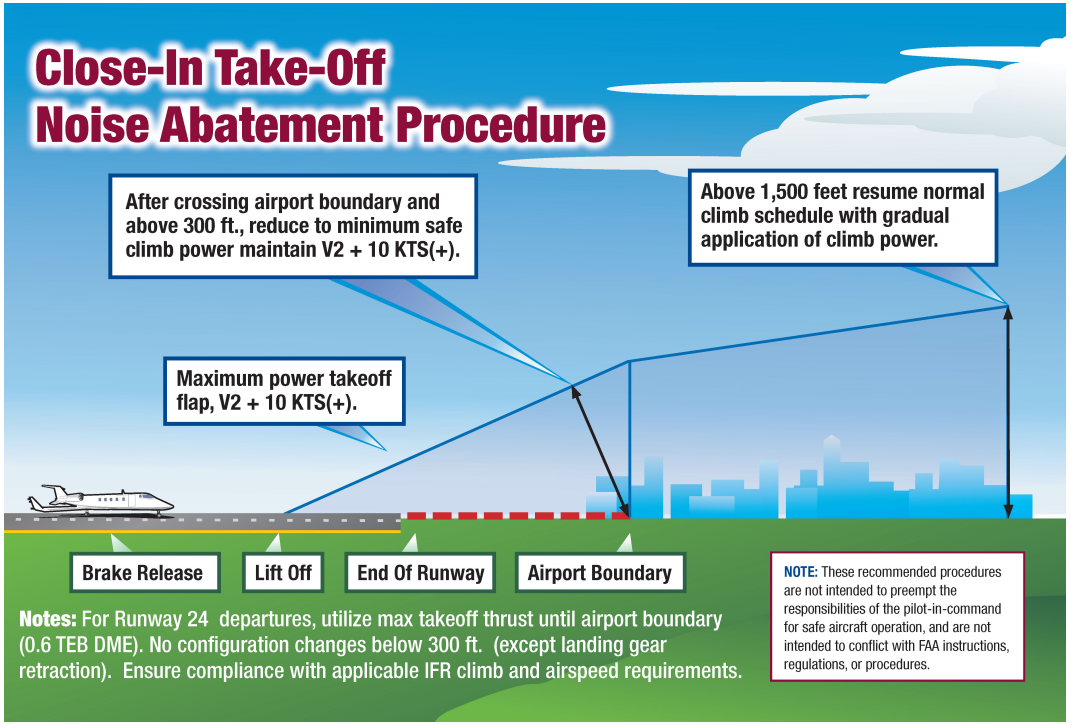

Figure 2-6: Voluntary Close-in Noise Abatement Take-Off Procedure
Source: "TEB Quiet Flying Program Flight Crew Handbook" https://www.panynj.gov/airports/pdf/TEB-Flight-Crew-Handbook.pdf.

Voluntary Use of Close-in Take-off Noise Abatement Procedure.

Figure 2-6 provides a visual representation of this procedure.

Voluntary Helicopter Routes

The Port Authority requests that helicopter operators voluntarily follow the helicopter routes depicted in Figure 2-7 on page 2-12. These routes are extracted from the FAA's VFR Helicopter Route Charts, available at: http://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/vfr/.

[17] Pursuant to laws passed by the U.S. Congress, the FAA establishes civil aircraft noise certification standards (set forth in 14 CFR Part 36, "Noise Standards: Aircraft Type and Airworthiness Certification") and dates for the phase out of older, noisier aircraft operations (set forth under 14 CFR Part 91, Subpart I, "Operating Noise Limits"). As of January 1, 2016, the Part 91 regulation banned - with very limited exceptions - all operations nationwide in the two noisiest categories of jets; i.e., Part 36 Stage 1 and 2).

THE PORT AUTHORITY OF NY & NJ

Teterboro Airport

Airport Noise Compatibility
Part 150 Study
2016 and 2021 Noise Exposure Maps

Figure: 2-7

Teterboro Terminal Area
Helicopter Routes within the Study Area

- TEB Airport Boundary (Approximate)
- TEB Study Area
- Runway
- Helicopter Route
- State Boundary
- County Boundary
- Municipal Boundary
- Park / Open Space
- Water
- Highway
- Major Roads
- Minor Roads

Note: TEB Helicopter Routes are advisory only.

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0 15,000 30,000 Ft

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community Cornell University Geospatial Information Repository (CUGIR), NJ DEP Bureau of GIS, NYC Open Data, FAA, "New York Helicopter Route Chart," Effective April 28, 2016

3. Land Use

Title 14 CFR Part 150 requires the review of land uses located in the airport environs to understand the relationship between those land uses and the noise exposure associated with arriving and departing aircraft. This includes delineation of land uses within the 65 DNL and higher contours on the NEMs and identification of noise sensitive uses that may be non-compatible with that level of noise exposure. Identification of a noise sensitive use within the 65 DNL contour does not necessarily mean that the use is either considered non-compatible or that it is eligible for mitigation. Rather, identification merely indicates that the use is generally considered non-compatible, but requires further investigation. Factors that influence compatibility and/or eligibility may include but not be limited to previous sound reduction treatments, current interior noise levels, structure condition, ambient and self-generated noise levels, whether a given use is considered temporary or permanent, and the time-frame within which a given structure was constructed.[18] These factors will be more thoroughly evaluated during the NCP and subsequent implementation phase.[19]

This chapter outlines the land use data collection process, land use compatibility and noise sensitive uses, and the land use regulatory environment.

3.1. Land Use Compatibility

The objective of airport noise compatibility planning is to promote the compatible growth and development of airports with their surrounding communities. Part 150 requires the review of existing land uses surrounding an airport to understand impacts associated with aircraft activity at the airport. A key element of the Noise Exposure Map (NEM) process is the development of detailed land use and zoning maps, including a thorough review of residential and other non-compatible land uses in areas exposed to high levels of airport noise.

The FAA has published land-use compatibility guidelines, as set forth in Part 150, Appendix A, Table 1, which is reproduced in Table 3-1 on page 3-2 of this document. As the table indicates, the FAA considers all land uses to be compatible with aircraft-related DNL levels below 65 dB, including residential, hotels, retirement homes, intermediate care facilities, hospitals, nursing homes, schools, preschools, and libraries. These categories will be referenced throughout the Part 150 process.

Land use compatibility and noise impacts were evaluated based on the land use information surrounding TEB. This chapter provides an overview of municipal jurisdictions with authority to regulate land use in the vicinity of TEB, a description of recommended land uses that are deemed generally compatible under Part 150, Appendix A, and an overview of existing land uses and zoning classifications in the vicinity of the airport.

[18] On March 27, 1998, FAA issued a policy on 14 CFR Part 150 airport noise compatibility programs that limits approval of remedial mitigation measures, e.g., soundproofing, property acquisitions, and relocation, etc., to land uses that were in place as of October 1, 1998 unless an airport can demonstrate that DNL contours were not published prior to that date. New non-compatible uses resulting from airport expansion may be eligible for consideration.

[19] Determination of eligibility would be made when the TEB Noise Compatibility Program has been approved, program protocols have been established and the implementation phase has been initiated.

Table 3-1: Part 150 Airport Noise / Land Use Compatibility Guidelines
Source: Part 150, Appendix A, Table 1

Land Use	Yearly Day-Night Average Sound Level, DNL, in Decibels (Key and notes on following page)					
	<65	65-70	70-75	75-80	80-85	>85
Residential Use						
Residential other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N
Mobile home park	Y	N	N	N	N	N
Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
Public Use						
Schools	Y	N(1)	N(1)	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Governmental services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
Commercial Use						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail--building materials, hardware and farm equipment	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade--general	Y	Y	Y(2)	Y(3)	Y(4)	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	Y	25	30	N	N
Manufacturing and Production						
Manufacturing general	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
Recreational						
Outdoor sports arenas and spectator sports	Y	Y(5)	Y(5)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts and camps	Y	Y	Y	N	N	N
Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N

Key to Table 3-1

SLUCM: Standard Land Use Coding Manual.

Y(Yes): Land use and related structures compatible without restrictions.

N(No): Land use and related structures are not compatible and should be prohibited.

NLR: Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.

25, 30, or 35: Land use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dBA must be incorporated into design and construction of structure.

Notes for Table 3-1

The designations contained in this table do not constitute a Federal determination that any use of land covered by the program is acceptable or unacceptable under Federal, State, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise compatible land uses.

1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dBA and 30 dBA should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR of 20 dBA, thus, the reduction requirements are often started as 5, 10, or 15 dBA over standard construction and normally assume mechanical ventilation and closed windows year round. However, the use of NLR criteria will not eliminate outdoor noise problems.
2) Measures to achieve NLR of 25 dBA must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
3) Measures to achieve NLR of 30 dBA must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
4) Measures to achieve NLR of 35 dBA must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
5) Land use compatible provided special sound reinforcement systems are installed.
6) Residential buildings require an NLR of 25.
7) Residential buildings require an NLR of 30
8) Residential buildings not permitted

Study Area

The Port Authority established a Study Area for the TEB Part 150 Study to meet minimum regulatory requirements of Part 150, as well as specific project needs as explained in Section 2.3 on page 2-6 and depicted on Figure 2-3 on page 2-5.

Land Use Data Collection Area

A land use data collection area for TEB was identified to allow for a detailed review and collection of land use data. The Land use data collection area included municipalities with the potential to be located within TEB's 2016 and 2021 65 DNL or higher noise contours.

Local Municipality Coordination

Pursuant to New Jersey's Zoning Act of 1928,[20] local governments have the authority to, among other things, establish zoning regulations and prepare and adopt master plans. The New Jersey Municipal Land Use Law (N.J.S.A. 40:55D-1 et seq.), enacted in 1976, defines the powers and responsibilities of municipalities, and specifically provided that municipalities have primary authority over land use decisions within their jurisdiction. The following municipalities within the TEB land use data collection area were consulted to document existing land uses, identify future planned land uses, and discuss applicable land use controls and/or policies:

[20] Modeled after the Standard State Zoning Enabling Act (SZEA)

Standard State Zoning Enabling Act

In the U.S., the basic foundation for planning and zoning tools intended to influence how land is used, was laid by two standard state enabling acts published by the U.S. Department of Commerce in the 1920s. Enabling legislation is a mechanism by which a state delegates its inherent police power authority to local governments (counties and municipalities), including the power to plan and zone.

The Standard State Zoning Enabling Act (SZEA), was developed by an advisory committee on zoning appointed by Secretary of Commerce (and later President) Herbert Hoover in 1921. After several revisions, the Government Printing Office published the first printed edition in May 1924 and a revised edition in 1926.

The SZEA had nine sections. It included a grant of power, a provision that the legislative body could divide the local government's territory into districts, a statement of purpose for the zoning regulations, and procedures for establishing and amending the zoning regulations. A legislative body was required to establish a zoning commission to advise on the initial development of zoning regulations.

- Borough of Carlstadt;
- Borough of East Rutherford;
- City of Hackensack;
- Borough of Hasbrouck Heights;
- Borough of Moonachie;
- Township of South Hackensack;
- Borough of Teterboro; and
- Borough of Wood-Ridge.

All of these municipalities are located within Bergen County, which was also consulted to obtain county-level land use data. Additionally, TEB is located in the New Jersey Meadowlands District, maintained by the New Jersey Sports & Exposition Authority (NJSEA), which provides additional land use planning and zoning for portions of the Borough of Carlstadt, Borough of East Rutherford, Borough of Little Ferry, Borough of Moonachie, Township of South Hackensack, and Borough of Teterboro in the TEB vicinity. The NJSEA also was consulted as a part of this study.

3.2. Land Use

Land Uses within the Land Use Data Collection Area

The TEB airfield boundaries are located in the Boroughs of Teterboro, Moonachie, and Hasbrouck Heights in Bergen County, New Jersey. TEB is bordered by the Boroughs of Moonachie and Little Ferry to the east, the Boroughs of Carlstadt and East Rutherford to the south, the Boroughs of Hasbrouck Heights and Wood-Ridge to the west, and the City of Hackensack and Township of South Hackensack to the north.

Land within the land use data collection area is heavily developed. Land use to the east and west of the Airport is predominantly single-family residential while land use to the north and south is predominantly manufacturing and production with some commercial use. There are two mobile home parks immediately to the south of the Airport. All of the residential areas have parks or open space, cemeteries, transient lodging, and public uses (e.g., churches, schools, hospitals, nursing homes, etc.) intermixed. No mixed commercial and residential uses were identified within the 65 DNL contour. For the small area of mixed commercial and residential uses located outside of the 65 DNL contour (primarily in Hasbrouck Heights), the more noise-sensitive land use was depicted on the graphic.[21] Figure 3-1 on page 3-7 shows existing land use categories for the TEB Land Use Data Collection Area.

Appendix C.1, beginning on page C-3, describes the land use data process, and the land uses, zoning, and noise sensitive sites within the Land Use Data Collection Area.

Land Use Data Collection and Verification

Appendix C.2, beginning on page C-31, documents final quality assurance/quality control (QA/QC) steps that the HMMH Team undertook in March 2017, as part of the development of the final NEM, which included additional field surveys of land uses within the NEM contours. Figures in this document that depict land uses, and tables that present data on non-compatible land uses, reflect refinements that resulted from that field work.

As noted in Appendix C.2, the March 2017 field surveys led to minor land use revisions, including reclassification of land use designations of only 21 parcels within the 2016 and 2021 65 DNL contours. For the 2016 contours, 20 of these parcels are within the 65-70 DNL interval and one is within the 70-75 DNL interval. For the 2021 contours, 19 of the parcels are within the 65-70 DNL interval and two are within the 70-75 DNL interval.

The most common changes were reclassification of parcels from single family to multifamily. A few parcels were reclassified from multifamily to single family, or from residential to non-residential. The overall results were slight increases in the total population within the 65 DNL contours, from 401 to 461 in 2016 and from 433 to 475 in 2021.

One parcel changed from commercial to school/university use (the Jersey College School of Nursing, as shown on all NEM figures; e.g., Figure 5-1 on page 5-2, Figure 5-2 on page 5-3, and Figure 5-3 on page 5-4, and the large scale versions presented as Figure 5-8 and 5-9 in back pockets of print versions of this document

[21] For example; if the building is commercial on the first floor with a single family residential unit on the second floor, the single family land use category is used since it refers to a more sensitive land use as shown in Table 3-1.

and in Attachment C to electronic versions of this document.

Noise Sensitive Sites

Noise sensitive sites are those land uses considered non-compatible within the 65 DNL contour due to adverse effects of high levels of aircraft noise, like residences, schools, hospitals, nursing homes, religious facilities, and libraries.[22] Noise sensitive sites within the TEB Land use data collection area were identified by review of a variety of sources including information at the Bergen County Planning and Engineering Department, municipality master plans, consultation meetings with municipalities, and available online mapping sources. Part 150 requires properties eligible for inclusion in the National Register of Historic Places (NRHP) to be identified and mapped along with these land uses. The following noise sensitive sites have been identified for the TEB Land use data collection area:

- Churches and places of worship;
- Schools, K-12 and colleges/universities;
- Hospitals; and
- Historic properties.

No outdoor music shells or amphitheaters are within the 65 DNL Contour. Four parks are within the 65 DNL Contour for 2016 and 2021; however, all are considered to be compatible land uses (see Table 3-1 on page 3-2).

Historic properties identified for this study are those that are included the National Register of Historic Places and Bergen County and those that have been previously determined[23] to be eligible for listing in the National Register of Historic Places.

The locations of noise sensitive sites within the Land Use Data Collection Area are shown in Figure 3-1 on page 3-7.[24] A more detailed discussion of methods used to identify noise-sensitive sites and historic resources is provided in Appendix C.1 beginning on page C-3. As indicated in the introduction to this chapter, inclusion of these properties within the 65 DNL contour does not necessarily mean that a land use is either considered non-compatible or that it is eligible for mitigation. Inclusion merely indicates that the land use is generally considered non-compatible with noise levels greater than or equal to 65 DNL, but requires further investigation during the NCP and subsequent implementation phase.

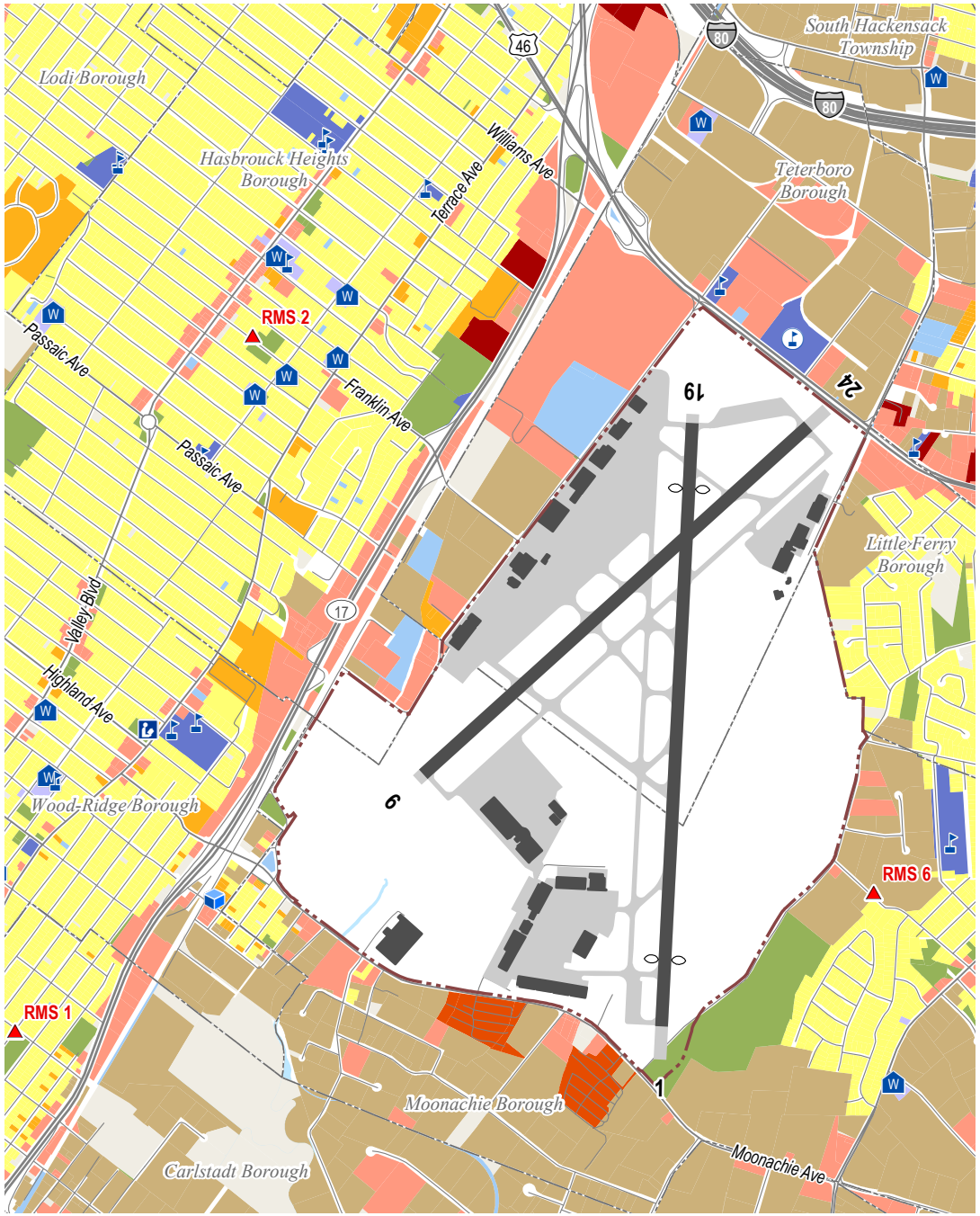
Land Use Control Regulations

Zoning and subdivision regulations are in effect for the entire Study Area. Existing zoning information (at the parcel level) was readily available for municipalities within Bergen County, Essex County, Hudson County, and New York County portions of the Study Area. To the north and south of the airport, zoning designations are primarily industrial with some commercial. To the east and west of the airport, adjacent residential land uses predominate. A discussion of zoning designations by municipality is provided in Appendix C.1 beginning on page C-12.

[22] These noise sensitive categories are defined in Part 150, Appendix A, Table 1 and are shown in Table 3-1

[23] Nominations for listing historic properties come from State Historic Preservation Officers, from Federal Preservation Officers for properties owned or controlled by the United States Government, and from Tribal Historic Preservation Officers for properties on Tribal lands. A professional review board in each state considers each property proposed for listing and makes a recommendation on its eligibility.

[24] The official land use base map is located in Attachment A of this document in electronic form and in the back pocket of this document in print as Figure 3-2. This figure is at 1"=2000' scale.



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Airport Noise Compatibility
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Figure 3-1

Existing Land Use

- TEB Airport Boundary (Approximate)
- Runway
- RMS # Noise Monitor Locations
- Municipal Boundary
- Park / Open Space
- Water
- Highway
- Minor Roads
- Major Roads

Non-Compatible within DNL 65

- Single Family Residential
- Multi-Family Residential
- Mobile Home
- Transient Lodging (Hotel, Motel, etc..)
- School / University / Daycare
- Place of Worship

Compatible within DNL 65

- Recreational / Open Space / Cemetery
- Commercial Use
- Manufacturing and Production
- Public Use
- Vacant / Undefined

- School
- School *(Sound Insulated)*
- Place of Worship
- Library
- Hospital
- Daycare

Note: Entire area depicted on the figure is within Bergen County and Bergen County has jurisdictional and land use control

N

0 2,000 4,000 Ft

Source: The Port Authority of NY & NJ, Cornell University Geospatial Information Repository (CUGIR), NJ DEP Bureau of GIS, NYC Open Data, Environmental Systems Research Institute (ESRI)

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4. Development of Noise Exposure Maps

Development of Noise Exposure Maps requires detailed noise predictions and comprehensive land use data. This chapter discusses the noise modeling methodology used to develop noise contours that, when overlaid on underlying land uses presented in Chapter 3, form the basis of the Noise Exposure Map.

4.1. Overview of the Integrated Noise Model (INM)

Consistent with Part 150 requirements, the noise contours for this study were prepared using the most recent release of the FAA's INM that was available at outset of the study, "Version 7.0d."[25]

The INM was developed by the FAA for modeling noise from aircraft operations occurring in the immediate vicinity of an airport.[26] The INM is the FAA-approved tool for determining the cumulative effect of aircraft noise exposure around airports. Statutory requirements for INM use are defined in Part 150, Airport Noise Compatibility Planning.

The airport-specific information required by the INM includes both physical and operational data. The physical data includes airfield geometry (i.e., runway locations and utilization) the altitude of the airfield, weather, and terrain data. Operational data includes the number and types of aircraft operating at the airport and the three-dimensional flight trajectories of aircraft arriving to and departing from the airport.

Information on each of these modeling variables is provided in Section 4.2.

To create noise contours, the INM first computes noise levels at finite points, using the physical and operational parameters described above for each aircraft operation modeled. The noise levels for all of the operations are then summed to calculate the noise level for the desired metric, such as DNL. In addition to computing noise levels at the individual computer-defined points, the INM renders contours by connecting grid points having equal values, at user-specified intervals and levels.[27]

The modeling software also creates noise level and other reports such as operations summaries or other input data, depending on the parameters chosen by the user.

4.2. Noise Modeling Inputs

The noise modeling inputs for forecast 2016 and 2021 operations include:

- Physical description of the airport layout
- Meteorological and terrain data
- Runway use and utilization rates
- Flight track geometry and utilization rates
- Forecast and aircraft flight and run-up operations
- Aircraft noise and performance characteristics

Study Area

Figure 2-3 on page 2-5 depicts the Study Area that the Port Authority developed for the TEB Part 150 in consultation with the FAA, to meet both Part 150 regulatory minimum requirements and project-specific needs. The Study Area identifies the outer limit of the overall scope of data collection, analyses, and outreach. With this, population counts and analysis are limited to the 65 dB and higher DNL contour. [28]

[25] The Port Authority received written approval from FAA to use the INM Version 7.0d, based on the fact that significant work toward development of noise model inputs had already been completed prior to the release of Aviation Environmental Design Tool (AEDT). The FAA approval letter can be found in Appendix D.1 on page D-5

[26] The methods and calculations that the INM uses when predicting aircraft noise exposure conform to internationally accepted scientific standards, specifically those published by Society of Automotive Engineers (SAE) in its Aerospace Information Report (AIR) Number 1845 Procedure for Calculation of Airplane Noise in the Vicinity of Airports which can be found here: http://standards.sae.org/air1845/

[27] 14 CFR Sec. A150.1(b) states: "This appendix provides for the use of the FAA's Integrated Noise Model (INM) or an FAA approved equivalent, for developing standardized noise exposure maps and predicting noise impacts."

[28] Based on public requests, the Port Authority is

Airport Layout

Figure 2-1 on page 2-2 depicts the airport diagram, along with annotations added that show:

- The approximate airport property line
- Displaced landing threshold distances
- Locations of designated aircraft engine 'run-up' locations
- Four informal helipad locations
- There are no defined helipads at TEB. For the purposes of this study, helipad locations were determined based off of helicopter radar track data as well as the helicopter advisory routes as published in the FAA's "New York Helicopter Route Chart," effective April 28, 2016.
  - North helipad – on the ramp on the west side of the airport, northwest of the runway intersection (labelled "H_N" on Figure 2-1 on page 2-2)
  - East helipad – on the ramp on the east side of the airport, east of the runway intersection (labelled "H_E" on Figure 2-1 on page 2-2)
  - South helipad – on the ramp on the south side of the airport (labelled "H_S" on Figure 2-1 on page 2-2)
  - West helipad – on the ramp on the southwest side of the airport (labelled "H_W" on Figure 2-1 on page 2-2)

Runway Layout

Information regarding the existing (2016) airfield layout at TEB was obtained from the Port Authority and existing (2016) runway lengths, azimuths, and threshold locations were incorporated into the existing conditions (2016 NEM).

The Port Authority confirmed that there are no planned changes to the runway layout that would affect modeling inputs within the five-year forecast timeframe. Therefore, no change to the 2016 runway details was required for the future conditions (2021 NEM). See Appendix D.1 on page D-3, which summarizes existing and future airfield conditions at TEB. The following data were used to define the existing conditions and future conditions runways in INM:

- Runway end coordinates (latitude/longitude)
- Runway end elevation (Mean Sea Level or MSL, feet)
- Runway width (feet)
- Distance of any displaced arrival or take-off thresholds (feet)
- Glide Slope (degrees)
- Threshold crossing height (feet)

Meteorological and Terrain Data

In addition to airport-specific physical and operational data, the INM also requires data on two kinds of local conditions influencing aircraft operations and sound propagation: annual average day meteorological conditions and terrain.

Meteorological Data

The INM uses annual-average-day meteorological data to adjust aircraft performance and sound propagation. Data in the following three required categories were obtained from the National Climatic Data Center for calendar year 2014:

- Temperature: 54.6°F
- Pressure: 30.02 inches mercury (Hg)
- Relative humidity: 59.4%
- Headwind Speed: 8 knots[29]

Terrain Data

The INM uses terrain data to adjust the aircraft-to-ground path length, to take into account locations where terrain variation relative to the airfield makes the ground closer to or farther from the aircraft relative to flat-earth conditions. Terrain data were obtained from the United States Geological Survey National Elevation Dataset.

Runway Utilization

Aircraft arriving to a runway have a different noise signature compared to those departing from a runway. It is for this reason that runway use is an important factor in determining the noise exposure around an airport. Runway utilization data from the official 2014 TEB Operations database was used in the model.[30]

Runway and Helipad Utilization Rates

Fixed-Wing Runway Utilization Rates

Figure 4-1 summarizes fixed-wing runway

providing contours down to 55 DNL "for informational purposes only" as described in Section 6.5 of the Study Protocol in Appendix G, on page G-20. However, the local jurisdictions have not adopted a lower standard than 65 DNL.

[29] The standard headwind in the INM is 8 knots and was not modified

[30] There are no conditions projected to change from 2014 to the end of 2021 that would affect runway use. Therefore, 2014 runway utilization rates are not expected to change over the entire forecast period and the 2014 utilization was used for both 2016 and 2021.

utilization rates that were developed from the TEB Compuland System, which is a computer database used at TEB to record arrivals and departures of aircraft based on airport operations personnel observations and is the official airport operations record.

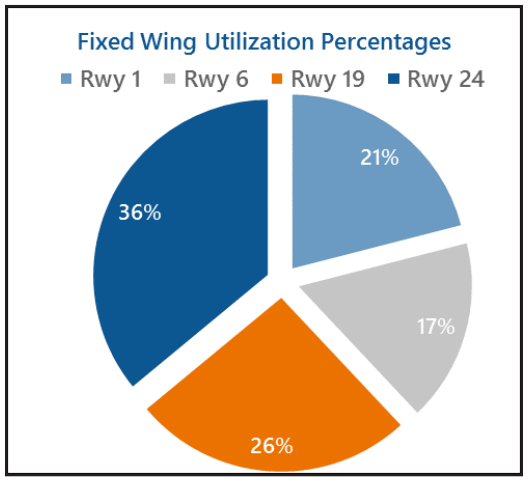

Figure 4-1: 2016 and 2021 Fixed-Wing Utilization Rates
Source: HMMH, 2016

The rates are presented for all aircraft at each runway i.e., Runway 1, Runway 6, Runway 24 and Runway 19. Each aircraft type has utilization rates that are within one to two percentage points of the overall averages shown in Figure 4-1.

Usage rates for aircraft types will vary slightly due to several factors such as, the time of day they are in use, runway length requirements and their location on the airfield.

For further detail regarding aircraft type, day and night, and arrivals and departures reference to runway utilization percentages, see Table 10 in Appendix D.1, page D-14.

Helipad Utilization Rates

Figure 4-2 summarizes the helipad utilization rates used in the model.

Like the runway utilization rates, these rates were developed from the TEB Compuland database. For further detail on day versus night and arrival versus departure runway utilization percentages, see Table 11 in Appendix D.1, page D-15.

Flight Track Development

Table 4-1 summarizes the modeled flight tracks by aircraft category and operation (arrival/departure). The large number of modeled aircraft flight tracks (1,255) is due to the complex fleet mix, airspace and the destination/origin of the flights at TEB.

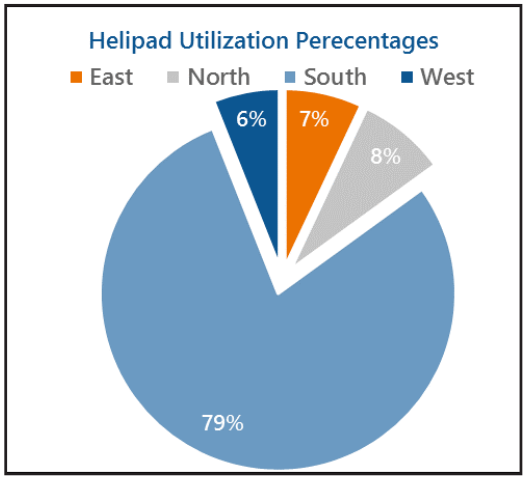

Figure 4-2: 2016 and 2021 Helipad Utilization Rates
Source: HMMH, 2016

These modeled flight tracks were developed using a standard method which entailed analyzing 12 months of radar data from ANOMS and splitting the flight tracks into similar and manageable groups.

Table 4-1: Numbers of Modeled Flight Tracks by Category
Source: HMMH, 2016

Aircraft Category	Arrival tracks	Departure Tracks	Total Tracks
Jet	215	259	474
Non-Jet	247	310	557
Helicopter	113	81	194
Total	575	650	1,225

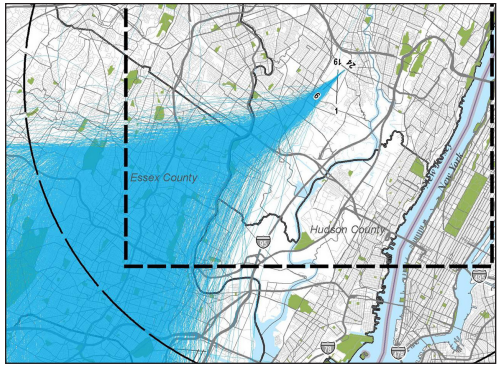

Figure 4-3: Runway 24 Southbound Jet Departures
Source: HMMH, 2016

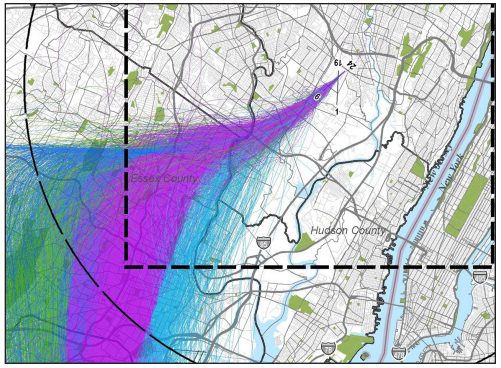

Figure 4-4: Runway 24 Southbound Jet Departures with similar geometry
Source: HMMH, 2016

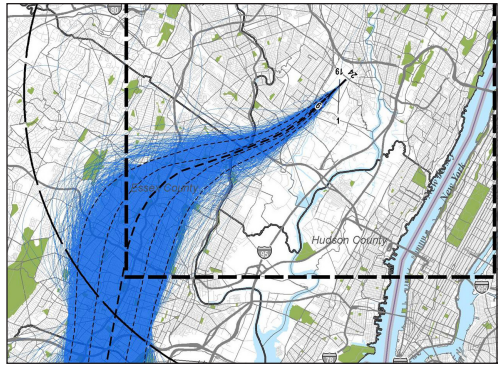

Figure 4-5: Example of Back-bone and Subtracks for Runway 24 Southbound Jets
Source: HMMH, 2016

From here, model tracks were developed for each geometrically similar group. For example, radar data from Runway 24 jet departures with a southbound destination were split into four geometrically similar groups and three 'backbone' tracks were developed (see Figure 4-3 through Figure 4-5). Each of these backbone tracks was then assigned two 'dispersion' sub tracks on either side of the backbone, for a total of five tracks (one backbone and four dispersion) for each geometrically similar group.

All modeled flight tracks are provided at a 1" equals 2000' scale as Figures 4-13 through 4-18, which are provided in a folded format in the back pocket of the printed version of this document and as an attachment to the electronic version.[31] With this, flight tracks are broken down by aircraft type for better visibility in Attachment A to Appendix D, beginning on page D-109. Figure 4-3, Figure 4-4, and Figure 4-5 represent the process of creating backbone and dispersion tracks from a subset of radar data. Figure 4-6 and Figure 4-6 on the following pages represent a sample of departure and arrival operations for jets at TEB.

Flight Track Utilization

Utilization rates for each of these modeled tracks can be found in Appendix D.1, Tables 14 through 40, beginning on page D-15. These tables show the level of detail used in the model development, with some tracks having as little as 0.1 percent of jet operations per runway assignment. The relative ratio of flight track usage was preserved according to those ratios in the 12-month radar dataset from ANOMS.

Arrival and Departure Figures

The following pages and Figure 4-6 and Figure 4-6 demonstrate a few examples of the methodology discussed above regarding the development of flight tracks. These are meant to be a sample group and an illustrative example of flight track development . The full set of noise modeling flight tracks are presented at a reduced scale on 42 flight track figures presented in Attachment A of Appendix D.[32]

[31] These can be found in the back pocket of this document in the print version and as an attachment to the electronic version.

[32] These begin on page D-109 of Appendix D in the print version, and exist as a separate attachment to the document electronically.

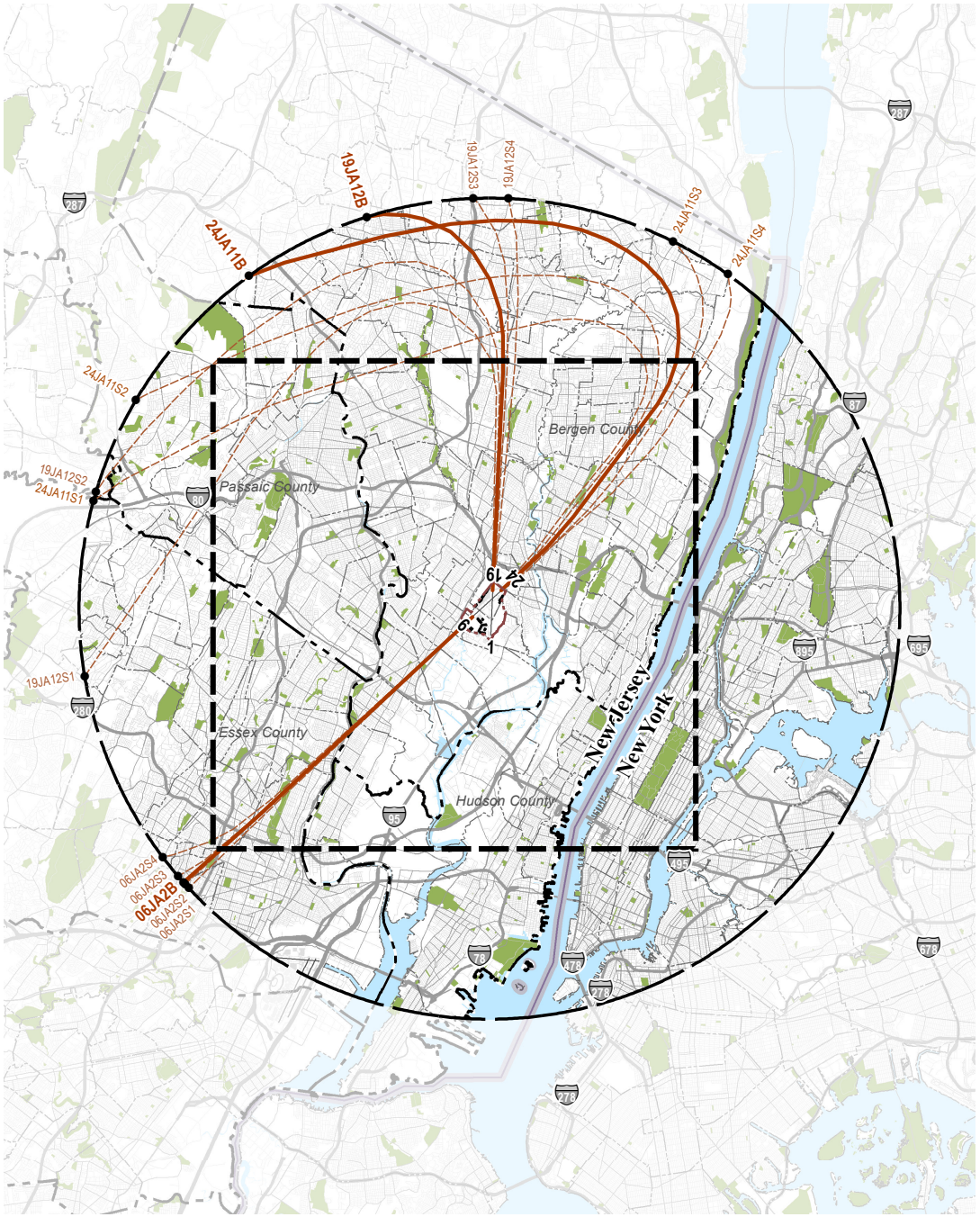

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Figure: 4-6

Sample of Jet Arrival Noise Modeling Flight Tracks

- Model Backbone Track (Arrival)
- Model Track (Arrival)

19JA2B
- Unique Model Track ID
- Operation Type (A: Arrival, D:Departure)
- Engine Type (J:Jet, P:Piston, T:Turboprop, H: Helicopter)
- Runway ID

- TEB Airport Boundary (Approximate)
- TEB Study Area
- Model Track Boundary
- Runway
- State Boundary
- Municipal Boundary
- County Boundary
- Park / Open Space
- Water
- Highway
- Minor Roads
- Major Roads

Note: Appendix D presents the complete set of modeling tracks for all combinations of aircraft and operation types.

N

0 4 8 Nautical Miles

Source: The Port Authority of NY & NJ, Cornell University Geospatial Information Repository (CUGIR), NJ DEP Bureau of GIS, NYC Open Data, Environmental Systems Research Institute (ESRI)

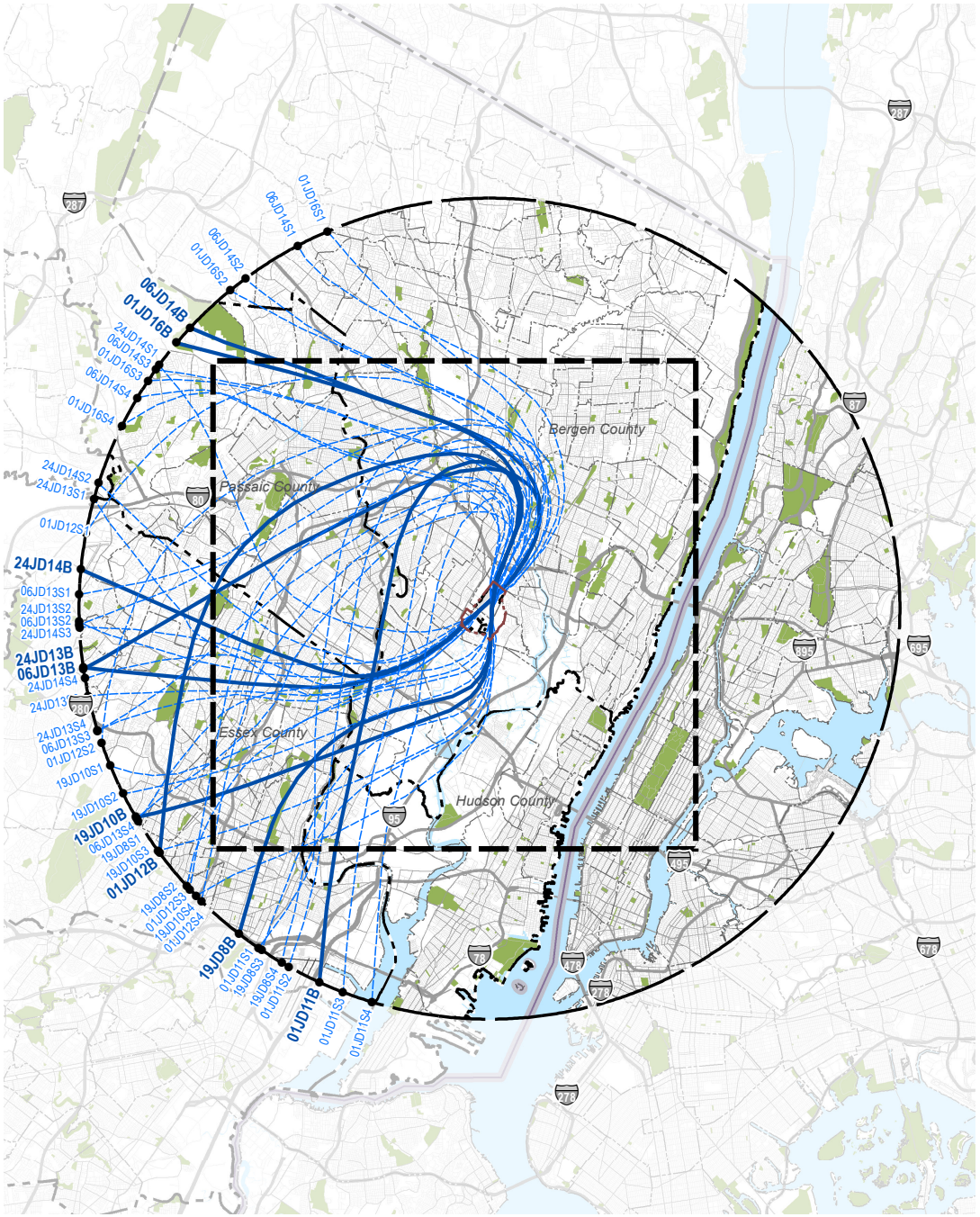

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Figure: 4-7

Sample of Jet Departure Noise Modeling Flight Tracks

- Model Backbone Track (Departure)
- Model Track (Departure)

19JD2B
- Unique Model Track ID
- Operation Type (A: Arrival, D:Departure)
- Engine Type (J:Jet, P:Piston, T:Turboprop, H: Helicopter)
- Runway ID

- TEB Airport Boundary (Approximate)
- TEB Study Area
- Model Track Boundary
- Runway
- State Boundary
- Municipal Boundary
- County Boundary
- Park / Open Space
- Water
- Highway
- Minor Roads
- Major Roads

Note: Appendix D presents the complete set of modeling tracks for all combinations of aircraft and operation types.

N

0 4 8 Nautical Miles

Source: The Port Authority of NY & NJ, Cornell University Geospatial Information Repository (CUGIR), NJ DEP Bureau of GIS, NYC Open Data, Environmental Systems Research Institute (ESRI)

Aircraft Noise and Performance Characteristics

FAA approval is required for the use of non-standard aircraft noise and performance modeling in four areas:

- INM aircraft types for modeling types that are not available in the INM as standard aircraft types and for which the FAA has not identified pre-approved substitutes
- User-defined aircraft for which no standard INM aircraft would be an appropriate substitute
- Approval of user-defined flight profiles, to address non-standard air traffic control procedures affecting departure or approach profiles
- Approval of user-defined flight profiles to address non-standard departure weight

Approvals for these items are found in Appendix D. Specifically, the aircraft substitution approval can be found on page D-61 of Appendix D.3 and the user-defined flight profiles approval can be found on page D-107 of Appendix D.4.

User-Defined Profiles

Based on a review of flight track data from ANOMS, it was determined that some aircraft arriving to and departing from TEB commonly fly procedures that are not adequately represented by the standard profiles provided in the INM, and that "user-defined profiles" would be the most appropriate means of modeling actual flight operations

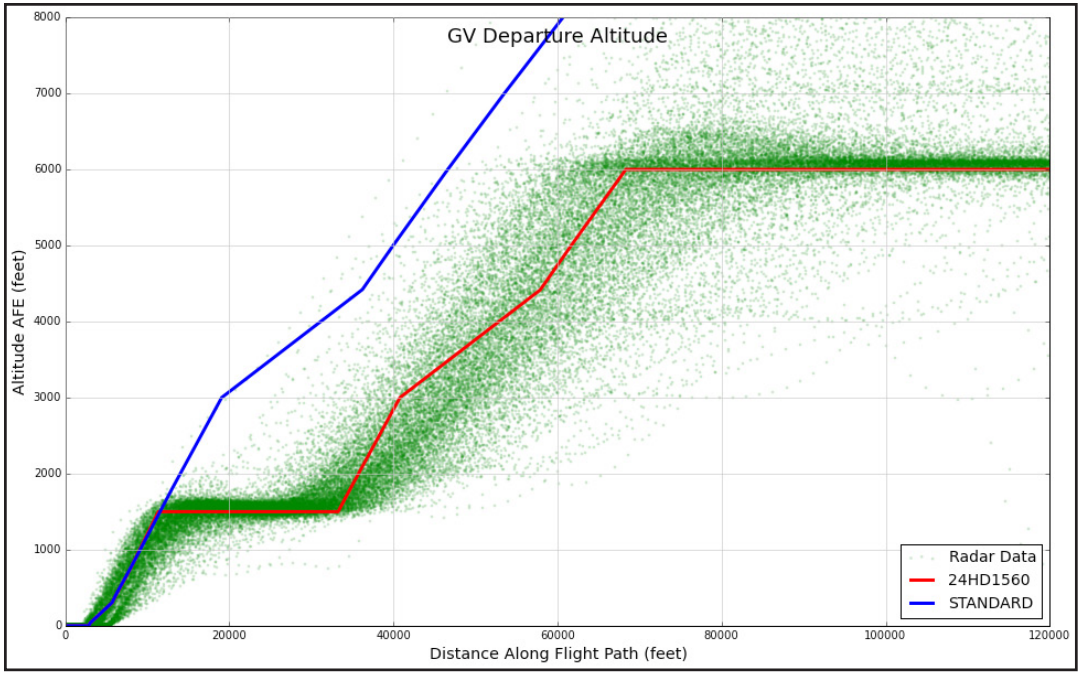

Figure 4-8: GV Departure Profiles
Source: HMMH, 2016

In order to use these types of profiles in the INM, the FAA must review and approve the user-defined procedures. Appendix D.4 contains the submission to FAA and the approval.

Due to the diverse nature of operations at TEB, user-defined profiles were created for the 17 INM aircraft types representing the top 90% of operations (which include at least one representative type from each modeling group), as shown in Appendix D.4, beginning on page D-63. Two types of user-defined profiles were developed. The first represent arrivals and departures with extended level segments in the flight profile and the second a heavier weight Gulfstream V (GV) jet departure profile to represent long haul GV flights and newer model business jet aircraft which are heavier than the GV. Figure 4-8 displays GV radar departures from Runway 24 along with the INM standard profile and the user-defined profile.

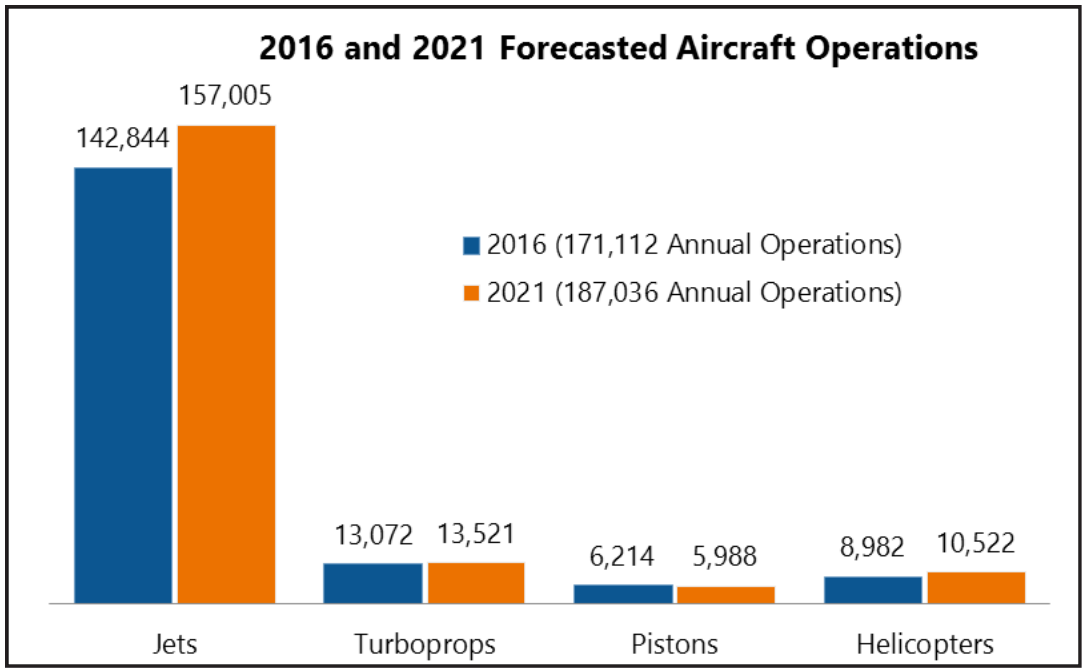

Figure 4-9: 2016 and 2021 Forecasted Aircraft Operations
Source: PANYNJ 2016, RS&H 2016

Forecast

Aircraft Operations

Consistent with FAA guidance,[33] the Port Authority submitted a memorandum to the FAA on February 18, 2016 requesting approval of forecasts of TEB operations for 2016 and 2021. This approval can be found in Appendix D, page D-49.

Figure 4-9 depicts the 2016 and 2021 forecasted aircraft operations.

For aircraft noise exposure calculations using the DNL metric, aircraft operations associated with the annual average day (AAD) are used in the INM. The number of annual operations by each INM aircraft type is divided by 365 to arrive at the AAD by INM aircraft type.

This representation of airport activity does not reflect any particular day, but gives an accurate picture of the character of operations throughout the year. Use of the AAD is required by the FAA in Part 150 studies.[34]

Forecast Process

The Port Authority, the Study Team, and the FAA collaborated in the development of a "Study Protocol for Newark/Liberty International (EWR) and Teterboro (TEB) Airports Part 150 Studies" (November 2015). Section 5 of that document sets forth the "Aviation Activity Forecast Protocol" (See Appendix G.1, page G-15). The Port Authority and the Study Team followed that protocol in preparing the TEB Part 150 forecasts.

The Port Authority prepared the primary forecasts, including detail on annual arrival and departure operations by aircraft type for day (7 am - 10 pm) and night (10 pm - 7 am) time periods used in calculating DNL.

The Part 150 Study Team developed "derivative" forecasts addressing supplemental detail required for the noise model input, including identifying stage lengths for departure operations,[35]

[33] FAA "Guidance on Review and Approval of Aviation Forecasts," June 2008, accessed on February 2, 2016 at https://www.faa.gov/airports/planning_capacity/media/approval_local_forecasts_2008.pdf.

[34] 14 CFR Sec. A150.103 (b)(2) states: "Airport activity levels and operational data which will indicate, on an annual average-daily-basis, the number of aircraft, by type of aircraft, which utilize each flight track, in both the standard daytime (0700-2200 hours local) and nighttime (2200-0700 hours local) periods for both landings and takeoffs."

[35] It should be noted that the INM database does not include standard modeling inputs for varied departure stage lengths for most general aviation aircraft models.

and distributing the small number of "unallocated" operations[36] in the Port Authority forecast.

For more detail about the Forecast process, please see Appendix D.2, page D-31.

Consistency with FAA's Terminal Area Forecast

FAA requires that airport sponsors' locally generated forecasts be consistent with the FAA's Terminal Area Forecast (TAF) for the airport. Specific FAA guidance for approval of forecasts states: "For all classes of airports, forecasts for total enplanements, based aircraft, and total operations are considered consistent with the TAF if they meet the following criterion: forecasts differ by less than 10 percent in the 5-year forecast period, and by less than 15 percent in the 10-year forecast period."[37]

Section 5.1 of the "Study Protocol for Newark/Liberty International (EWR) and Teterboro (TEB) Airports Part 150 Studies" [HMMH, November 2015] states that "the FAA's 2014 TAF (issued January 2015) were used as the baseline operational forecast."[38]

Table 4-2 presents a comparison of Port Authority prepared forecasts of total aircraft operations for the 2016 and 2021 years to the FAA forecasts for those years as presented in the 2014 TAF.[39]

Table 4-2: Comparison of 2016 and 2021 PANYNJ Forecasts to 2014 FAA Terminal Area Forecasts
Source: PANYNJ 2016, FAA 2015

Year	FAA TAF Forecast (2014)	PANYNJ Part 150 Forecast	% Different (PANYNJ-TAF)
2016	167,952	171,112	1.88%
2021	171,016	187,036	9.37%

Table 4-2 shows that for 2016 the Part 150 forecast differs from the 2014 TAF forecast by less than two percent, and for 2021 the Part 150 forecast differs from the 2014 TAF forecast by less than 10 percent.

Flight Operations

The INM uses departure "stage length" (the distance between the departure and arrival airport) to estimate aircraft departure weight, since fuel load is the largest factor affecting variation in aircraft weight, and longer flights require more fuel. Most air carrier aircraft types in the INM include a number of stage lengths. However, with few exceptions, general aviation aircraft types in the INM include only a single departure stage length. As shown in Appendix D.4 on page D-107 the Port Authority has received FAA approval for the use of non-standard inputs for modeling the Gulfstream V (GV) INM aircraft type with a 90,000 pound takeoff weight.

The purpose of this request is to reflect the fact that many TEB departures in the six aircraft types modeled using the GV INM type[40] depart at or near the GV's 90,500 pound maximum gross takeoff weight, rather than at the 76,000 weight assumed for the standard GV in the INM database. Based on the derivative forecast, 11% of the six aircraft types modeled using the GV INM type were assigned to this departure profile; the remaining 89% were assigned to the standard 76,000 pound departure profile. These percentages apply to both 2016 and 2021 operations.

Activity Levels/Fleet Mix

Appendix D.2 presents a detailed report that documents the preparation of activity and fleet mix forecasts for 2016 and 2021, beginning on page D-31.

The report addresses and summarizes the forecasts by aircraft type (i.e., jets, turboprops, piston propellers, and helicopters). Part 150 requires FAA approval of the forecasts. Appendix D also provides a copy of the FAA approval letter on page D-49 of Appendix D.2.

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[36] The numbers of unallocated operations were very small. In 2016: 41 jet, 10 turboprop, 17 piston, and 20 helicopter operations per day. In 2021: 43 jet, 10 turboprop, 16 piston, and 23 helicopter operations per day,

[37] FAA, op. cit.

[38] This requirement in the Study Protocol follows guidance provided in the September 2, 2015 letter from Mr. Andrew Brooks, FAA Environmental Program Manager, Airports Division, AEA-610, to Mr. Edward C. Knoesel, Manager Aviation Environmental Programs, The Port Authority of New York and New Jersey, "Re: Request to Utilize FAA Terminal Area Forecasts as Basis for Activity Levels for Part 150 Noise Studies at John F. Kennedy International, LaGuardia, Newark Liberty International, and Teterboro Airports."

[39] The comparison only addresses operations, because the Part 150 regulation only requires forecasts of aircraft operations; there is no requirement for consideration of either enplanements or based aircraft.

[40] The GV itself, and four types for which the INM identifies the GV as a pre-approved "standard" substitute (as discussed in Section 3.1); i.e., the Gulfstream 6, Gulfstream G650, Bombardier Global Express, and Bombardier Global 5000.

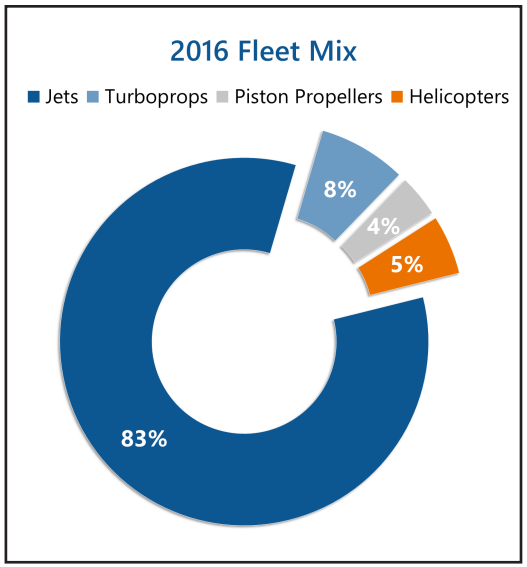


Figure 4-10: 2016 Forecasted Fleet Mix Percentages by Aircraft Category
Source: HMMH, 2016

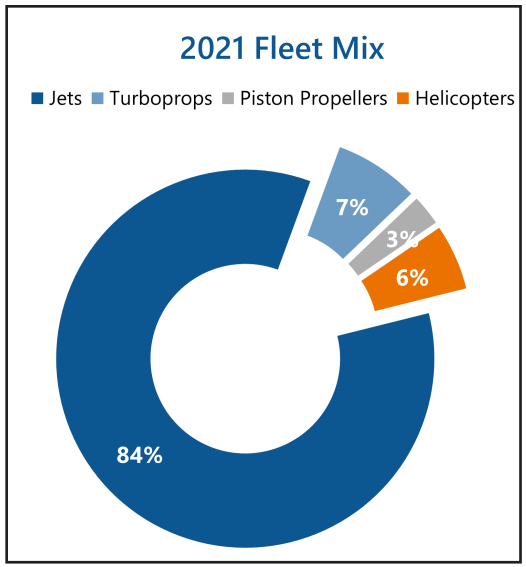


Figure 4-11: 2021 Forecasted Fleet Mix Percentages by Aircraft Category
Source: HMMH, 2016

To develop the existing conditions aircraft fleet mix, data was extracted from the Port Authority's ANOMS. Figure 4-10 and Figure 4-11 depict the activity level percentages by aircraft type that were modeled for 2016 and 2021, respectively. Both figures show that jets encompass the majority of TEB's fleet for both 2016 and 2021.

4.3. Ground Noise

In addition to aircraft in flight, the INM also includes the capability to model aircraft engine run-ups. Run-ups typically occur on the airfield following the completion of maintenance on aircraft engines. The following data are required to model aircraft engine run-ups in the INM:

- Aircraft type
- Location where the run-up occurred (latitude/longitude)
- Aircraft heading during run-up
- Time when the run-up occurred (start time and end time)
- Engine thrust setting (pounds or percent)
- Duration of the event
- Number of engines running

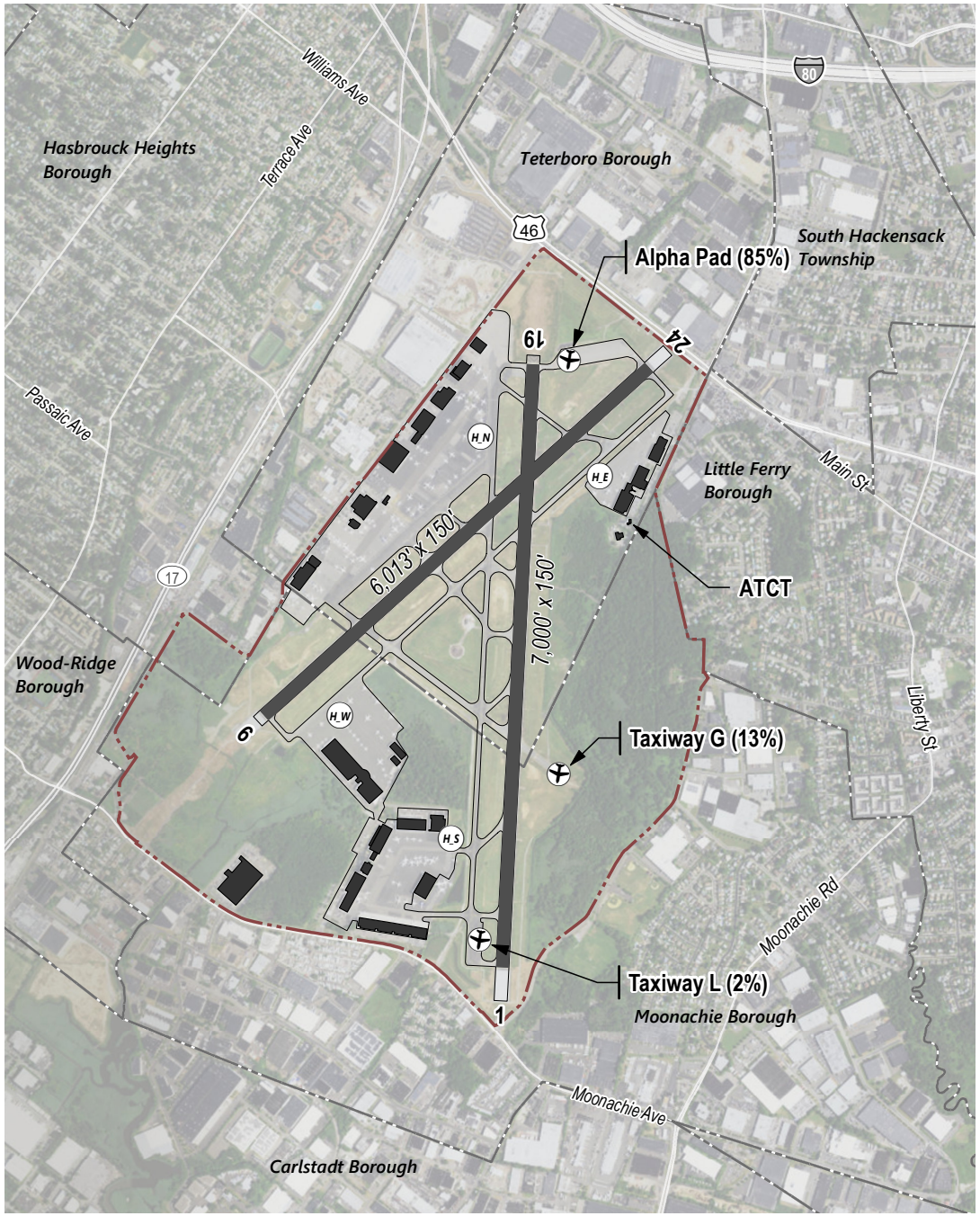
Run-up Operations

The TEB staff maintains logs of run-up activity. The data for all of calendar year 2014 were used to develop run-up modeling assumptions. High-power maintenance run-ups were modeled at the three designated run-up locations marked in Figure 4-12; i.e., on Taxiways A, G, and L. High-power maintenance run-ups accounted for 93% of total run-ups. Based on the run-up logs, the percentage use of these locations are also shown on Figure 4-12.

Based on established run-up procedures, the run-ups were modeled at the following headings:

- All run-ups on Taxiways A and L were modeled at a heading of 190° magnetic.
- Run-ups on Taxiway G were modeled at two headings: 38% at a 010° magnetic heading and 62% at a 190° magnetic heading. These heading percentages are based on the overall north-south split of jet runway use (approximately 38% on Runways 1 and 6 combined, and 62% on Runways 19 and 24 combined), under the assumption that run-up orientation – like runway use – is selected to be the one that is most closely aligned with the prevailing wind direction.

Given the relatively limited amount of run-up activity and modest growth in aircraft activity forecast through 2021, there was not sufficient basis for projecting a significant increase in run-ups over the five-year forecast period. The run-up duration was not logged for approximately 10% of all operations; those operations were assigned to the most common duration (five minutes). Run-ups by unknown aircraft types were modeled as the MU3001, the most common aircraft type conducting run-ups at TEB, where the type was known.



THE PORT AUTHORITY OF NY & NJ

Teterboro Airport

Airport Noise Compatibility
Part 150 Study
2016 and 2021 Noise Exposure Maps

Figure: 4-12

Ground Run-up Locations

- TEB Airport Boundary (Approximate)
- Runway
- Buildings
- Helicopter Pad Location
- Runup Location
  Aircraft Orientation
  - Alpha Pad -190°
  - Taxiway G - 010° or 190°
  - Taxiway L - 190°
- Municipal Boundary

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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community; New Jersey Geographic Information Network (NJGIN)

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5. 2016 and 2021 NEMs

The fundamental noise elements of a Noise Exposure Map are DNL contours for existing and forecast conditions (2016 and 2021), presented over base maps depicting the airport layout, local land-use control jurisdictions, major land-use categories, discrete noise-sensitive "receptors," and other information required by Part 150.

Section 5.1 presents the Noise Exposure Map Figures. Section 5.2 presents the associated land-use compatibility statistics[41] Section 5.3 compares the modeled DNL for 2016 to the DNL measured in 2014 at the four monitoring locations.[42] Section 5.4 gives a comparison of measured aircraft noise to ambient noise in the community.

5.1. Noise Exposure Map Figures

Figure 5-8 and Figure 5-9 are the official Noise Exposure Maps that the Port Authority is submitting under Part 150 for appropriate FAA review and determination of compliance, pursuant to §150.21.[43]

The scale on these figures is 1" to 2,000' which is the minimum scale as required by §A150.103(b)(1).[44] The two figures contain all graphical elements that Part 150 requires be depicted on Noise Exposure Maps, with the exception of flight tracks, which Part 150 permits airports to submit in supplemental graphics.[45,46]

As noted in item IV.D of Part 150 Noise Exposure Maps Checklist (the checklist), Part 150 requires that Noise Exposure Maps depict the 65, 70, and 75 DNL noise contours.[47]

The year of submission for these NEMs is 2016. Therefore, consistent with Part 150 requirements, the existing conditions noise contours are for 2016 and the five-year forecast-case contours are for 2021.

Figure 5-1 and Figure 5-2 present zoomed-in Noise Exposure Map figures for existing (2016) and five-year forecast conditions (2021), respectively, for easier visibility of the contours. Figure 5-3 presents a comparison of the 2016 and 2021 contours, in the same format as Figures 5-1 and 5-2.

5.2. Land Use Compatibility within 2016 and 2021 Noise Exposure Maps

FAA considers all land uses compatible outside of the 65 DNL contour. The 65 DNL contour is located completely within Bergen County, NJ. As shown in Figure 5-1 and Figure 5-2, the 65 DNL contours for both 2016 and 2021 extend off airport property in four areas

- To the southeast of the Runway 6 landing threshold the contour extends past Moonachie Ave out to State Route 17. Much of this area is commercial and manufacturing; however, there is a small residential area to the southeast of Moonachie and additional residential parcels west of State Route 17.
- To the north of Runway 19, the contour extends out to North Street. Most of this area is compatible land use except for a school just across Route 46 from the airport and a church at the northern tip of the contour.

41 As documented in detail in Appendix C.2, beginning on page C-31, in March 2017, as part of the development of the final NEM, the HMMH Team undertook final quality assurance / quality control (QA/QC) steps, including field surveys of land uses within the NEM contours. All figures and tables in this chapter that depict land uses and that present data on non-compatible land uses reflect refinements that resulted from that field work.

42 NEM inputs are based on 2014 data from ANOMS (runway use and flight tracks).

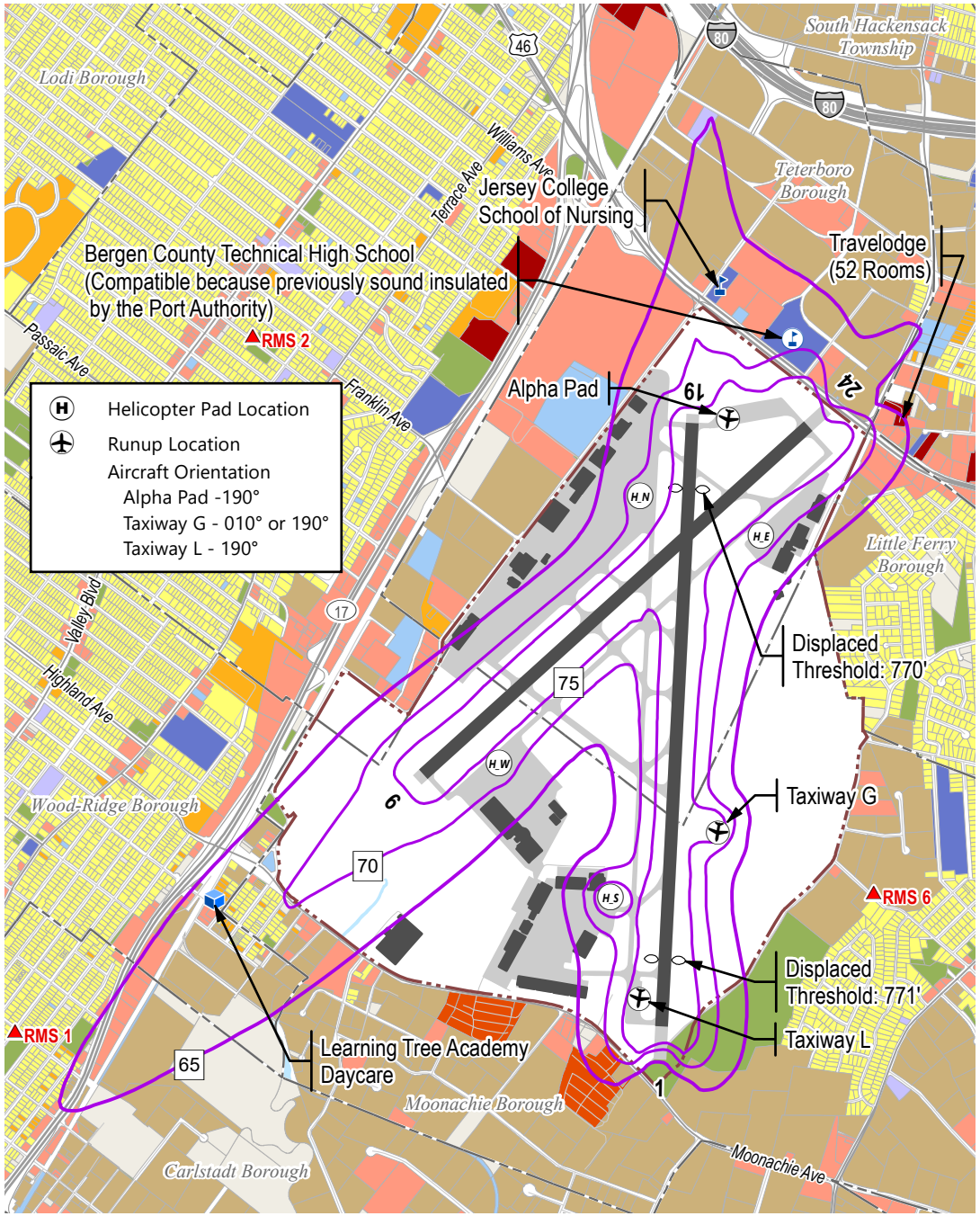
43 Figure 5-8 and Figure 5-9 are located in the rear pocket of the document in print and as Attachment C to the electronic version.

44 In print, see the back pocket of this document for Noise Exposure Map and flight track figures to this scale.

45 As noted in item IV.E of the Noise Exposure Map checklist, presented in Table 1 of this document.

46 These can be found at the end of Chapter 4, Figures 4-13 through 4-18 which can be found as an attachment to this document in the electronic version or in the back pocket of the print version.

47 The checklist can be found on page xv.



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Teterboro Airport

Airport Noise Compatibility
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2016 and 2021 Noise Exposure Maps

Figure: 5-1

Existing Conditions (2016) Noise Exposure Map

- 2016 DNL Contours (65-75)
- TEB Airport Boundary (Approximate)
- Runway
- RMS # Noise Monitor Locations
- Municipal Boundary
- Park / Open Space
- Water
- Highway
- Minor Roads
- Major Roads

Non-Compatible within DNL 65

- Single Family Residential
- Multi-Family Residential
- Mobile Home
- Transient Lodging (Hotel, Motel, etc..)
- School / University / Daycare
- Place of Worship

Compatible within DNL 65

- Recreational / Open Space / Cemetery
- Commercial Use
- Manufacturing and Production
- Public Use
- Vacant / Undefined

- School
- School *(Sound Insulated)*
- Daycare

Note: Entire area depicted on the figure is within Bergen County and Bergen County has jurisdictional and land use control

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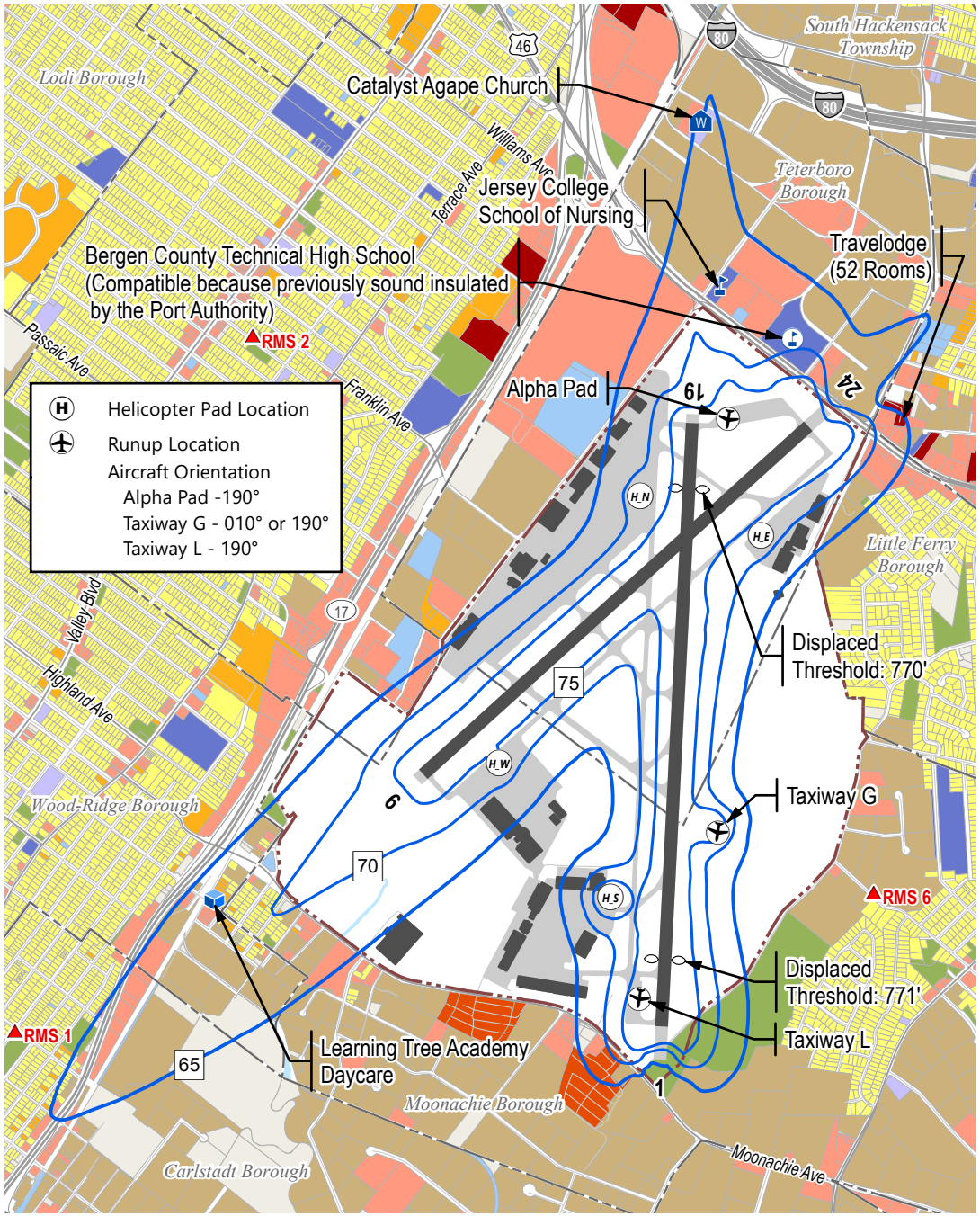
Source: The Port Authority of NY & NJ, Cornell University Geospatial Information Repository (CUGIR), NJ DEP Bureau of GIS, NYC Open Data, Environmental Systems Research Institute (ESRI)



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Airport Noise Compatibility
Part 150 Study
2016 and 2021 Noise Exposure Maps

Figure: 5-2

Forecast Conditions (2021) Noise Exposure Map

- 2021 DNL Contours (65-75)
- TEB Airport Boundary (Approximate)
- Runway
- RMS # Noise Monitor Locations
- Municipal Boundary
- Park / Open Space
- Water
- Highway
- Minor Roads
- Major Roads

Non-Compatible within DNL 65

- Single Family Residential
- Multi-Family Residential
- Mobile Home
- Transient Lodging (Hotel, Motel, etc..)
- School / University / Daycare
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- School
- School *(Sound Insulated)*
- Place of Worship
- Daycare

Note: Entire area depicted on the figure is within Bergen County and Bergen County has jurisdictional and land use control

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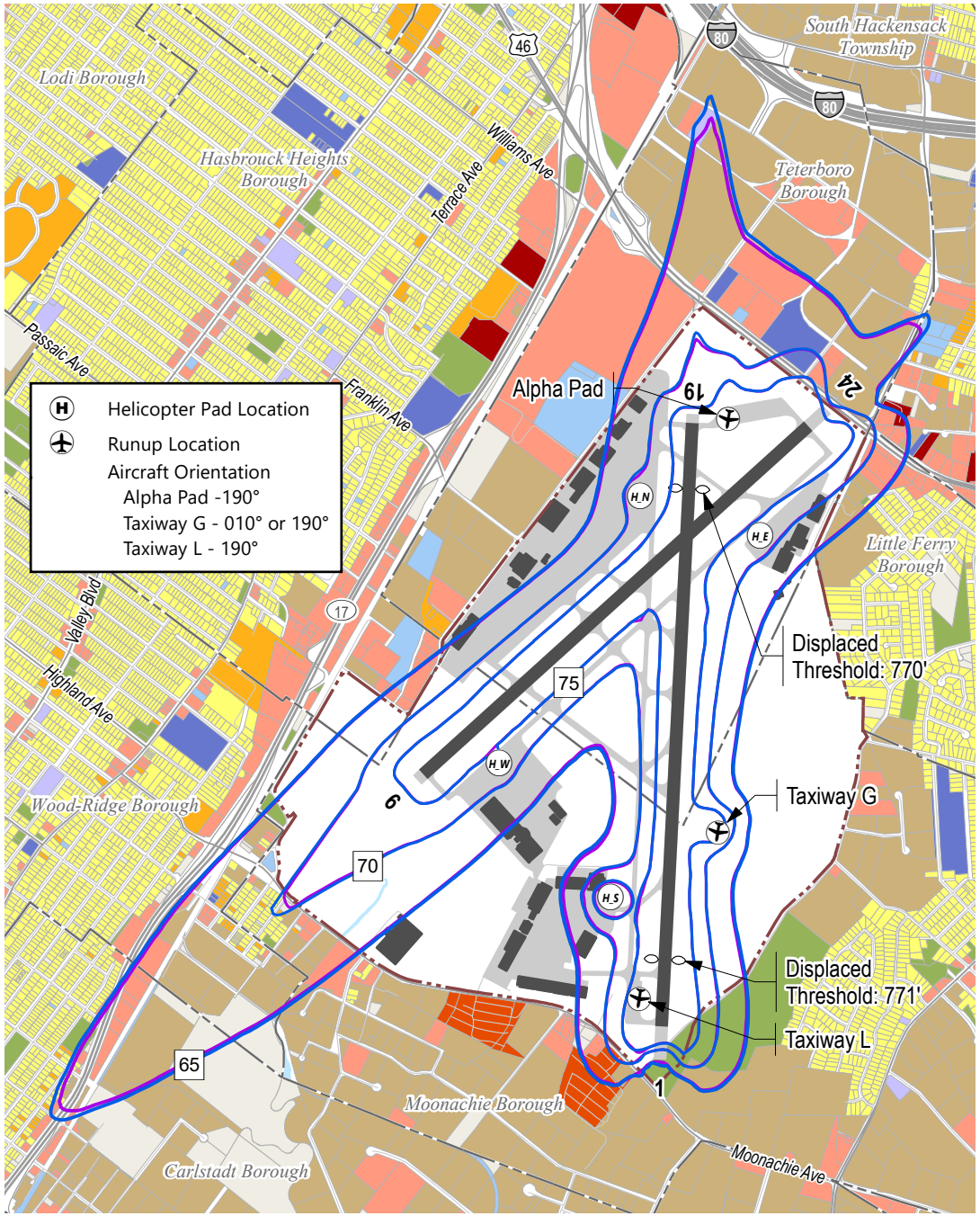
Source: The Port Authority of NY & NJ, Cornell University Geospatial Information Repository (CUGIR), NJ DEP Bureau of GIS, NYC Open Data, Environmental Systems Research Institute (ESRI)



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Teterboro Airport

Airport Noise Compatibility
Part 150 Study
2016 and 2021 Noise Exposure Maps

Figure: 5-3

Comparison of Existing (2016) and Forecast (2021) Noise Exposure Maps

2016 DNL Contours (65-75)
2021 DNL Contours (65-75)
TEB Airport Boundary (Approximate)
Runway
Municipal Boundary
Park / Open Space
Water
Highway
Minor Roads
Major Roads

Non-Compatible within DNL 65
Single Family Residential
Multi-Family Residential
Mobile Home
Transient Lodging (Hotel, Motel, etc..)
School / University / Daycare
Place of Worship

Compatible within DNL 65
Recreational / Open Space / Cemetery
Commercial Use
Manufacturing and Production
Public Use
Vacant / Undefined

Note: Entire area depicted on the figure is within Bergen County and Bergen County has jurisdictional and land use control

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Source: The Port Authority of NY & NJ, Cornell University Geospatial Information Repository (CUGIR), NJ DEP Bureau of GIS, NYC Open Data, Environmental Systems Research Institute (ESRI)

- To the northwest of the Runway 24 end, the land use is mostly commercial and manufacturing except for a technical high school which has been sound insulated. To the northeast the area is mostly commercial except for a motel and some residential property in Little Ferry.
- The 65 DNL extends across airport property near the Runway 1 end of the airport also. To the southeast the contour extends into a wooded area, to the southwest the contour extends into a mobile home park and some commercial and vacant land.[48]

The contours and land use data clearly illustrate that within the 65 DNL Noise Exposure Map contours for either 2016 or 2021 there are residents and potentially non-compatible land uses, including:

- There are noise-sensitive public buildings or other discrete "sensitive receptors" (e.g., schools, health care facilities, places of worship, or properties on or eligible for inclusion on the National Register for Historic Preservation).
  - There is one daycare center and two schools within the 2016 65-70 DNL contour. One of the schools (the Bergen County Technical High School) is considered compatible due to previous sound insulation. There is no evidence that the daycare center or the second school have been sound insulated.
  - The noise sensitive sites within the 2021 65-70 DNL contour remain the same as those within the 2016 65-70 DNL contour, with the addition of one place of worship. There is no evidence that the additional place of worship has been sound insulated.

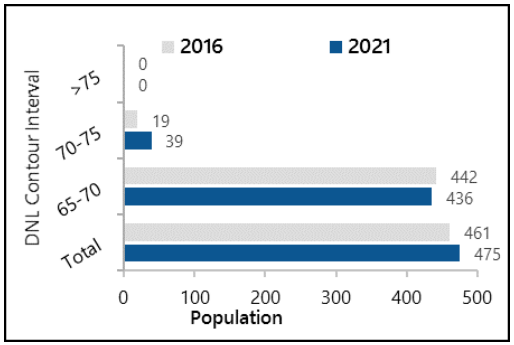


Figure 5-4: Comparison of Existing (2016) and Forecasted (2021) Population within the 65 DNL Contour Interval
Source: RS&H and HMMH, 2016

In summary, within the Noise Exposure Map contours for 2016 there are 137 non-compatible parcels and three noise sensitive sites and for 2021 there are 156 non-compatible parcels and four noise sensitive sites.

Figure 5-4 displays the increase from 2016 to 2021 in dwelling units within the 65 DNL contour and Figure 5-4 shows the increase of affected population within the 65 DNL contour from 2016 to 2021. This information is broken down in detail in Table 5-1 and Table 5-2.

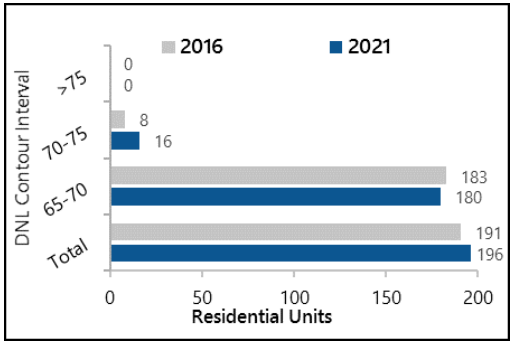


Figure 5-5: Comparison of Existing (2016) and Forecasted (2021) Dwelling Units within the 65 DNL Contour Interval
Source: RS&H and HMMH, 2016

[48] The names and addresses for these are provided in Table 5-3

Table 5-1 presents the number of dwelling units within the 65 DNL contour for 2016 and 2021, broken down by contour interval and residency type

Table 5-2 presents the numbers of residents within the 65 DNL contours for 2016 and 2021, broken down by contour interval and residency type. Table 5-3 presents the noise sensitive sites within the 65 DNL contours for each year. For 2016, the contour encompasses one daycare center, Learning Tree Academy, and two schools, the Bergen County Technical School, which is considered compatible due to previous sound insulation, and the Jersey College School of Nursing In 2021, those three noise sensitive sites remain within the 65 DNL contour, but one additional noise sensitive site, the Catalyst Agape Church, also falls within the 65 DNL contour interval.

Figure 5-6 on page 5-8 and Figure 5-7 on page 5-9 show land use clipped to the 65 DNL contour. These figures coincides with the information presented in Table 5-1 on page 5-6 through Table 5-3 on page 5-7 and demonstrate land use compatibility analysis within the 65 DNL contour.

Table 5-1: Residential Units within 2016 and 2021 65 DNL Contours[49]
Source: 2010 US Census Block Data, RS&H, HMMH, 2016

Year	Metric	Dwelling Units within DNL Contour Interval			
		65-70	70-75	>75	Total
2016	Single Family	88	0	0	88
	Multi-Family	51	0	0	51
	Mobile Home	44	8	0	52
	Total	183	8	0	191
2021	Single Family	83	5	0	88
	Multi-Family	49	2	0	51
	Mobile Home	48	9	0	57
	Total	180	16	0	196

[49] As documented in detail in Appendix C.2, in March 2017, as part of the development of the final NEM, the HMMH Team undertook final quality assurance / quality control (QA/QC) steps, including field surveys of land uses within the NEM contours. NEM graphics and tables of non-compatible land uses presented in this document reflect the results of those surveys. For that reason, the residential unit da data presented in Table 5-1 and the population data presented in Table 5-2 differ slightly from the values presented in the public review draft of the NEM.

Table 5-2: Population within 2016 and 2021 65 DNL Contours[50,51]
Source: 2010 US Census Block Data, RS&H, HMMH, 2016

Year	Residence Type	Population within Contour Interval (DNL)			
		65-70	70-75	>75	Total
2016	Single Family	213	0	0	213
	Multi-Family	123	0	0	123
	Mobile Home	106	19	0	125
	Total	442	19	0	461
2021	Single Family	201	12	0	213
	Multi-Family	119	5	0	124
	Mobile Home	116	22	0	138
	Total	436	39	0	475
Note: Population = 2.42 people * Number of residential units					

Table 5-3: Noise Sensitive Sites within 2016 and 2021 65 DNL Contour
Source: RS&H, HMMH, 2016

Year	Noise Sensitive Site	Type	Address	Town
Within 2016 and 2021	Learning Tree Academy	Daycare	150 Park Place East	Wood-Ridge
	Bergen County Technical High School(Note 1)	School	504 US-46	Teterboro
	Jersey College School of Nursing(Note 2)	School	546 US-46	Teterboro
Within 2021 Only	Catalyst Agape Church(Note 3)	Place of Worship	370 North St	Teterboro

Note 1: The Bergen County Technical School has been soundproofed as a part of the School Soundproofing Program discussed in Section 2.5

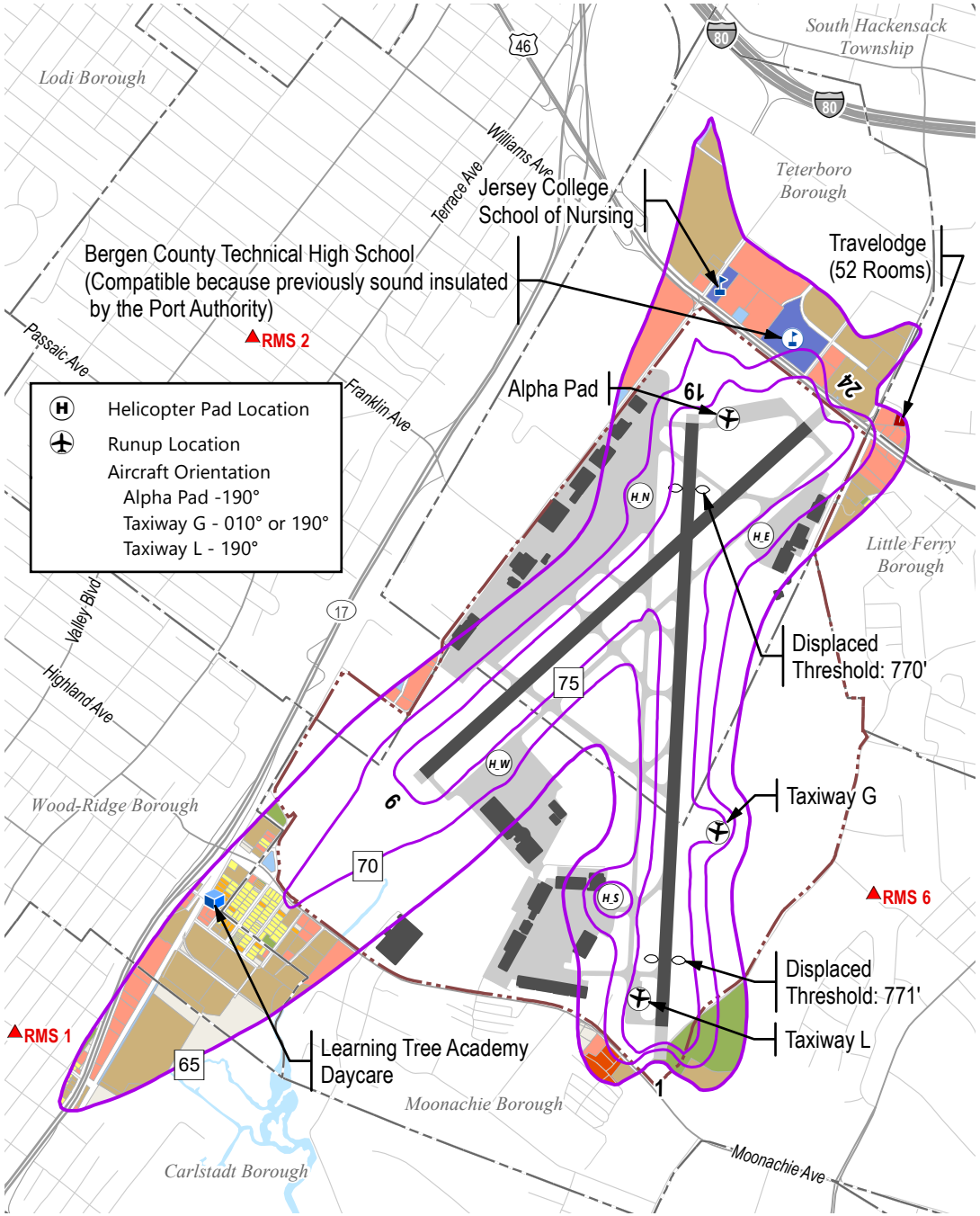
Note 2: The Jersey College School of Nursing is in a former commercial structure.

Note 3: The North Jersey Vineyard Church changed to a different congregation – the Catalyst Agape Church – in the same location. The church occupies a portion of a former commercial structure.

50 2010 US Census Block Data. In order to estimate the number of people residing within the noise contours, existing parcel boundary land use maps were overlaid on 2010 US Census TIGER file maps that depict Census blocks – the smallest Census enumeration unit. "Populated Area" data polygons were then created by combining Census blocks with the residential land use concentrating population and housing unit values into the residential portion of the census block where people actually live. For example, in some areas the population is concentrated along the road rather than over several square miles of open or undeveloped land.

Using Geographic Information Systems (GIS) tools, the noise contours were intersected with these "Residential/Census" data for each DNL noise contour interval. The resultant wholly or partially encompassed Residential/Census areas were then identified and the proportion of total area within the contour level was calculated to determine the estimated residential population and housing unit counts." This analysis led to an average population multiplier of 2.42 people per residential unit in the vicinity of the TEB 65 DNL contour and was used in Table 5-2 to determine the number of people within each DNL contour interval.

51 See footnote 47 on page 5-6



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Airport Noise Compatibility
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2016 and 2021 Noise Exposure Maps

Figure: 5-6

Existing Conditions (2016) Noise Exposure Map

- 2016 DNL Contours (65-75)
- TEB Airport Boundary (Approximate)
- Runway
- RMS # Noise Monitor Locations
- Municipal Boundary
- Park / Open Space
- Water
- Highway
- Minor Roads
- Major Roads

Non-Compatible within DNL 65

- Single Family Residential
- Multi-Family Residential
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- Transient Lodging (Hotel, Motel, etc..)
- School / University / Daycare
- Place of Worship

Compatible within DNL 65

- Recreational / Open Space / Cemetery
- Commercial Use
- Manufacturing and Production
- Public Use
- Vacant / Undefined

- School
- School *(Sound Insulated)*
- Daycare

Note: Entire area depicted on the figure is within Bergen County and Bergen County has jurisdictional and land use control

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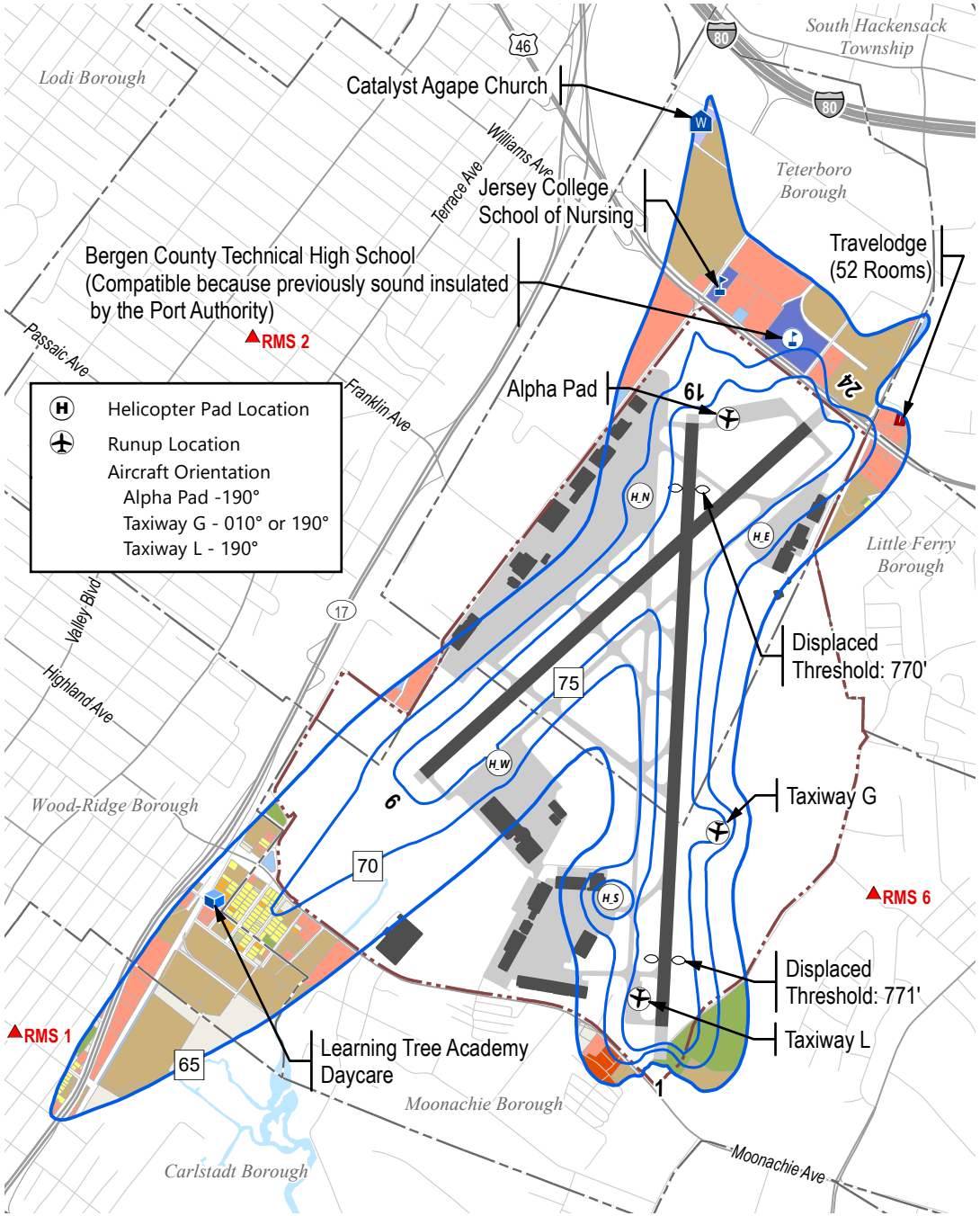
Source: The Port Authority of NY & NJ, Cornell University Geospatial Information Repository (CUGIR), NJ DEP Bureau of GIS, NYC Open Data, Environmental Systems Research Institute (ESRI)



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2016 and 2021 Noise Exposure Maps

Figure: 5-7

Forecast Conditions (2021) Noise Exposure Map

- 2021 DNL Contours (65-75)
- TEB Airport Boundary (Approximate)
- Runway
- RMS # Noise Monitor Locations
- Municipal Boundary
- Park / Open Space
- Water
- Highway
- Minor Roads
- Major Roads

Non-Compatible within DNL 65

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- School / University / Daycare
- Place of Worship

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- Commercial Use
- Manufacturing and Production
- Public Use
- Vacant / Undefined

- School
- School *(Sound Insulated)*
- Place of Worship
- Daycare

Note: Entire area depicted on the figure is within Bergen County and Bergen County has jurisdictional and land use control

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Source: The Port Authority of NY & NJ, Cornell University Geospatial Information Repository (CUGIR), NJ DEP Bureau of GIS, NYC Open Data, Environmental Systems Research Institute (ESRI)

Table 5-4: Compatible and Non-Compatible Land Area within 2016 and 2021 65 DNL Contours (Outside of the Airport Boundary)
Source: HMMH, 2016

Year	Land Use within the 65 DNL	Area Outside Airport Boundary (Square Miles)
2016	Compatible	0.342
	Non-Compatible	0.037
	Total	0.379
2021	Compatible	0.363
	Non-Compatible	0.040
	Total	0.403

Table 5-4 presents the area of compatible and non-compatible land uses within the 65 DNL contours for each year, exclusive of the airport property. Consistent with the small increase in the 2021 DNL contour due to increased operations, both the area of non-compatible and compatible land uses increase between 2016 and 2021.

5.3. Comparison of Measured and Modeled Noise Exposure

As discussed in Section 2.5, TEB has a noise and operations monitoring system with six permanently installed noise monitors.

Figure 2-5 on page 2-9 depicts all six locations. The Noise Exposure Map figures presented in this chapter show the monitors that fall within the area depicted.

The Port Authority's noise monitoring system includes algorithms that endeavor to match measured noise to specific aircraft operations. The system then adds the noise contributions from all such events to develop an annual aircraft DNL.

Table 5-5 compares the DNL measured at the six monitoring locations in 2014 (the Permanent Monitoring Sites year from which the NEM inputs are based) to the modeled DNL for the 2016 NEM.

While humans can readily discriminate between aircraft and non-aircraft noise, it is a very challenging task for an automated system. This is particularly true at locations where aircraft noise levels are relatively low, as is the case at TEB, where each noise monitor is outside the 65 DNL contour. At such locations, aircraft noise levels tend to be close to, or even below, those of community noise sources; e.g., street traffic, children playing, dogs barking, landscaping equipment, weather sources such as wind and rain, etc. As a result, the monitoring system can have difficulty identifying all aircraft noise events, or the events may even be masked by non-aircraft events.

Table 5-5: Comparison of 2016 Modeled DNL to the 2014 Measurements at Six Permanent Monitoring Sites
Source: PANYNJ ANOMS, 2014 (Measured) HMMH, 2016 (Modeled)

Site	Aircraft DNL Measured at Site in Calendar Year 2014	Modeled Aircraft DNL for Calendar Year 2016	Difference (Measured Minus Modeled in DNL)
RMS 1	58	62	-4
RMS 2	40	47	-7
RMS 3	61	61	0
RMS 4	52	55	-3
RMS 5	48	50	-2
RMS 6	52	53	-1

As a result of this difficulty, the modeled DNL is higher than the measured DNL at all but one of the monitoring locations, Site 3, where the measured and modeled levels are equal (which is less than the monitors' 1.5 dB accuracy, as discussed below).

Other factors that may contribute to the differences between the measured and modeled levels include:

- The modeling was for forecast 2016 operations, whereas the measurements are for 2014.
- The measurements and noise model involve some inherent technical accuracy tolerances.[52]

5.4. Comparison of Measured Aircraft Noise to Ambient Noise in the Community

A potential consideration in evaluating land use compatibility relative to aircraft noise is the non-aircraft or "ambient" contribution to total noise levels. 14 CFR Part 150 §A150.101(e)(5) states: "No land use has to be identified as noncompatible if the self-generated noise from a given use and/or the ambient noise from other non-aircraft and non-airport uses is equal to or greater than the noise from aircraft and airport sources." This section of Part 150 provides the Port Authority with discretion to take ambient noise into account when determining which land uses are noncompatible.

To assist in considering ambient noise around TEB, Table 5-6 compares the aircraft, non-aircraft, and total DNL measured at the six TEB noise monitors in 2014. Measured non-aircraft DNL was higher than measured aircraft DNL at all sites. This is not surprising, since the monitors are all outside the 65 DNL aircraft noise contours.

Measured non-aircraft and total DNL exceeded 65 DNL at only RMS 3, on the roof of the Hackensack University Medical Center, which is in a relatively built-up area compared to the other sites. In addition, the monitor is is near an HVAC system, and is also on the roof above a loading dock and is exposed to unusual vehicular noise sources typical of a hospital environment, such as ambulances, police vehicles, and sirens.

Measured non-aircraft levels at the other five sites were below 65 DNL. At sites 1, 2, and 5, which are in residential areas, the non-aircraft DNL ranged from 58-62 dB; at sites 4 and 6, which are in commercial areas, the non-aircraft DNL was 63 and 64 dB.

It is likely that residential and commercial areas within the 2016 and 2021 NEM contours have non-aircraft levels similar to monitors 1, 2, 4, 5, and 6. Therefore, aircraft noise will dominate within the 65 DNL NEM contours, so that ambient levels are not a factor for consideration in assessing land use compatibility.

Table 5-6: 2014 Measured Aircraft, Non-Aircraft, and Total DNL
Source: PANYNJ ANOMS, 2014

Site	2014 Aircraft DNL	2014 Non-Aircraft DNL	2014 Total Measured DNL
RMS 1	58	61	63
RMS 2	40	62	62
RMS 3	61	70	71
RMS 4	52	63	63
RMS 5	48	58	59
RMS 6	52	64	64

[52] The measurements were conducted using noise monitors that meet American National Standards Institute (ANSI) S1.4-1983 standards for Type I "precision" sound level meters (SLMs), which must meet a ± 1.5 dB end-to-end accuracy tolerance requirement. These monitors exceed the Part 150 requirement for the use of Type 2 "survey" SLMs, for which the end-to-end accuracy tolerance is ± 2.3 dB. However, even the higher accuracy monitors used in the measurements may contribute as much as 1.5 dB to the differences between measured and modeled results. As a result, measurement tolerances alone can contribute to three decibels of difference.

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6. Stakeholder Engagement

A critical element of the Part 150 Process is stakeholder engagement. This chapter describes outreach efforts conducted as part of the development of this draft NEM.

6.1. Stakeholder Engagement and Public Participation

A critical element of the Part 150 Process is stakeholder engagement. This chapter describes outreach efforts conducted as part of the development of this draft NEM.

The Part 150 Study process includes several efforts to engage the public. The most prominent of these is the Technical Advisory Committee (TAC), which is scheduled to meet up to 18 times over the course of the Part 150 Study. As of December 2016, it has met nine times. In addition, the Port Authority has hosted two public workshops; one was held as an introduction to the study in fall of 2015 and one that took place in September 2016 to receive public input on the draft NEM document, and finally, the Port will conduct a public hearing on the NCP.

14 CFR Part 150 Guidance on Public Participation for the NEM

FAA's acceptance of the NEM will be contingent on an FAA finding that Section 150.21(b) consultation requirements have been met; i.e:

§ 150.21 (b) [for Noise Exposure Maps]: Each map, and related documentation submitted under this section must be developed and prepared … in consultation with states, and public agencies and planning agencies whose area, or any portion of whose area, of jurisdiction is within the Ldn 65 dB contour depicted on the map, FAA regional officials, and other Federal officials having local responsibility for land uses depicted on the map. This consultation must include regular aeronautical users of the airport. The airport operator shall certify that it has afforded interested persons adequate opportunity to submit their views, data, and comments concerning the correctness and adequacy of the draft noise exposure map and descriptions of forecast aircraft operations. Each map and revised map must be accompanied by documentation describing the consultation accomplished under this paragraph and the opportunities afforded the public to review and comment during the development of the map. One copy of all written comments received during consultation shall also be filed with the Regional Airports Division Manager.

6.2. Technical Advisory Committee

The Part 150 Study process benefits from the creation and participation of a Technical Advisory Committee (TAC). The TAC serves several important functions, such as:

- Representing a broad range of stakeholder groups
- Receiving information about the Study and sharing it with their constituencies
- Reviewing information and providing timely input to the Study
- In some cases, providing technical advice to the Study Team

In order for the TAC to be effective and to be representative of all of the key positions involved in aircraft noise issues, the Port Authority composed a diverse group of key stakeholders including, but not limited to, community representatives, aircraft operators/airlines, affected jurisdictions, and land use planners. While representation needed to be broad, the TAC needed to remain a reasonable size so that deliberations are efficient. The Port Authority identified and invited members to serve on the TAC for the TEB Part 150 Study.

Formation of the TAC

An initial invitation was distributed for the TAC to a key set of stakeholders, designated with an asterisk (*) in Table 6-1. These were identified as agencies requiring consultation based on the regulations governing the Part 150 process at 14 CFR 150.21 (b) and 14 CFR 150.105(a).53. Not all member organizations invited to the TAC chose to send a representative.

Table 6-1: Member Organizations of the Technical Advisory Committee (TAC)
Source: HMMH, 2016

Stakeholder Identified in 14 CFR 150.21 (b) and A150.105(a)			
States, public agencies or planning agencies whose area of jurisdiction is within the 65 dB DNL contour	**FAA regional officials**	**Regular Aeronautical Users of the Airport**	**Interested Persons**
- Bergen County* - PANYNJ TEB Airport Staff* - TANAAC* - PANYNJ Noise Office* - NJ Meadowlands Commission	- FAA Airport Traffic Control Tower (ATCT)* - FAA TRACON - FAA Airports Division* - FAA Flight Standards District Office (FSDO)*	- Teterboro Users Group (TUG)* - United Airlines* - Net Jets* - Signature Flight Support (FBO)* - Jet Aviation (FBO)* - Landmark Aviation (FBO)* - Atlantic Aviation (FBO)* - Meridian Teterboro (FBO)*	- National Business Aviation Association (NBAA)* - Aviation Development Council* - EWR Noise Community Roundtable* - Aircraft Owners and Pilots Association (AOPA)* - Dassault Falcon Jet - NJ Sports Authority - AvPORTS TEB Staff*
Note: All organizations designated with an asterisk (*) were identified as agencies requiring consultation based on the regulations governing the Part 150 process at 14 CFR 150.21 (b) and received an initial invite to the TAC			

[53] 14 CFR 150.105 (a) states: "The airport proprietor shall identify each public agency and planning agency whose jurisdiction or responsibility is either wholly or partially within the Ldn 65 dB boundary."

Membership

TAC meetings are open to the public, and a standing agenda item exists to offer the opportunity for public comments and discussion at every TAC meeting. Table 6-1 provides member organizations represented in the TAC.

It is important to note that the TAC is advisory only to the Study. That is, the TAC is able to offer opinions, advice and guidance to the Study, but the Port Authority has the sole discretion to accept or reject the TAC recommendations in accordance with 14 CFR Part 150.

As the sponsor of the Part 150 Study and as the operator of TEB, the Port Authority is a member of the TAC. The FAA, as the primary funding agency for the Studies and as the approval authority, is a key advisor of the TAC. A complete list of the members of the TEB TAC can be found in Appendix F on page F-5.

Summary of TAC Meetings

The Study Team handles all aspects of meeting logistics. The Study Team also identifies specific meeting goals and objectives in advance of each meeting and recommends meeting formats. The Study Team prepares presentations and meeting materials for each TAC meeting, and serves as the facilitator for the TAC meetings. Topics discussed at the first nine TAC meetings are found in Table 6-2.

Table 6-2: TAC Meeting Topics
Source: HMMH, 2016

TAC Meeting #	Date	Topics Covered
1	7/30/2015	Overview of the Part 150 process and roles and responsibilities
2	9/25/2015	Noise terminology, noise modeling overview, existing noise abatement measures at TEB
3	11/12/2015	Public workshop overview, noise modeling inputs: runway usage, flight tracks, forecast approach, land use approach
4	1/29/2016	Noise modeling inputs: forecast, aircraft substitutions, user-defined profiles, flight track development
5	3/30/2016	Study process, noise model status, Runway 19 quiet visual, materials submitted for FAA review, noise model inputs review
6	5/24/2016	Noise model input review, comparison of measured and modeled DNL, complaint graphics, and NCP development process
7	7/29/2016	Draft 2016 and 2021 noise exposure maps, land use analysis, supplemental DNL contours, NCP process
8	9/23/2016	Summary of public workshop #2, overview of Draft NEM Document, discussion of NCP
9	11/17/2016	Review comments received on draft NEM in comment period and continuing NCP noise abatement discussion

The TAC Meeting facilitators are responsible for keeping the discussion on-topic and on time and for providing meeting summaries. Copies of agendas and summaries for the nine TAC meetings that have occurred thus far are provided in Appendix F.3 beginning on page F-121.

6.3. Public Involvement

Members of the public who have an interest in the Studies had a role to play and a responsibility to the Study's outcome. Members of the general public were encouraged to stay informed of the Study's progress by visiting the Study's website, attending TAC meetings, participating in public workshops and submitting comments on the Study.

Presentations to the TANAAC

With this, the Study Team presented updates on the progress of the study to the TANAAC to receive public input on four occasions throughout the course of the development of the NEM. These occurred on the following dates:

- January 28, 2015
- January 27, 2016
- April 27, 2016
- July 27, 2016

Public Outreach

The Study Team worked with Port Authority to create and distribute press releases about the public meetings, inform media and elected officials about the public meetings, and develop supporting media materials for each meeting. The Study Team worked with the Port Authority to identify meeting locations, handle all logistics for securing space and assure that they are Americans with Disabilities Act (ADA) accessible and (to the extent possible) public transit accessible.

The Study Team members as well as Port Authority staff served as facilitators at various stations at the public workshop and answered questions from public. The Study Team members served as facilitators at stations or at breakout groups as well as for any question and answer sessions; and prepared a brief meeting summary for each public meeting.

The first public meeting occurred on October 15, 2015 at Holiday Inn Hasbrouck Heights in Hasbrouck Heights, NJ. The second was held at the Bergen County Offices in Hackensack, NJ on September 22, 2016. All workshop materials, including copies of presentations, are provided in Appendix G.3 beginning on page G-39.

Public Review and Comment on Draft NEM

The Port Authority made the draft NEM available for public review and comment from September 15 through October 17. The draft NEM was the primary topic of the second public workshop, held on September 22, 2016. The draft NEM report was made available for public review at the following locations:

- On the Port Authority website, at: http://panynjpart150.com/TEB_DNEM.asp
- At two physical locations: (1) TEB Manager's office, 90 Moonachie Avenue, 9:30 am to 4:00 pm (Mon to Fri), and (2) Bergen County Plaza, 1st Fl. Multi-Purpose Room, Hackensack, 9:30 am to 4:00 pm (Mon to Fri).

The workshop and draft NEM report availability and comment period were advertised through:

- The project website (http://panynjpart150.com/TEB_homepage.asp)
- Legal advertisements in numerous print publications, including: the Hasbrouck Heights Gazette (September issue distributed late August), the September 24, 2016 edition of the Hasbrouck Heights Observer, and the September 15, 2016 editions of the following publications: Newark Star Ledger, Bergen Record, El Especialito (in Spanish), Korea Daily (in Korean), and three North Jersey TEB area weeklies (Community News, which covers Hasbrouck Heights and Woodridge, the Little Ferry / Bogota / Ridgefield Hackensack Chronicle, and the South Bergenite. See Appendix G, Section G.3.1 on beginning on page G-41.
- Emailed notices to elected officials. See Appendix G, Section G.3.1 on page G-65.
- TAC Meeting # 8

The Port Authority received 22 comments during the comment period, including:

- 10 comment forms were submitted at or following the September 22, 2016 workshop
- One letter was submitted at the September 22, 2016 workshop
- 11 emails were submitted via the Port Authority's Part 150 website

Two comments were submitted via the Part 150 website prior to the comment period; their content was similar to those received during the comment period. These comments also are addressed in the NEM.

A petition supporting the Runway 19 Quiet Visual Approach was submitted with a request that it be provided to the FAA for their consideration in that separate study. That petition included 28 full or partial pages of signatures. The petition will not be treated as a Part 150 comment; however other Part 150 comments raised similar issues, so the topic of Runway 19 approaches is covered.

Table 6-3: Top Five Most Frequent Public Comments Received
Source: PANYNJ and HMMH, 2016

Comment Category	Description
Noise Compatibility Program (NCP) Measures	Suggested noise abatement, administrative, or other NCP measures
Frequency and Volume of Aircraft Operations	Number of aircraft operations occurring during certain time periods
Data Collection and Noise Exposure Maps (NEMs)	The collection and use of data to produce Noise Exposure Maps as well as the locations of noise contours on the Noise Exposure Maps, and the methodology used to produce noise contours
Quality of Life	The effects of TEB aircraft operations on quality of life, including health effects and activity interference
Public Participation/Outreach	Methods of public participation in the TEB 14 CFR Part 150 Study, including the locations and times of Public Information Workshops

Table 6-3 lists, and provides summary descriptions of, the five most frequent categories of comments received during the public comment period, in descending order from most to least frequent. These five categories account for 80 percent of comments received; the remaining comments fall into dispersed categories. Appendix H presents all public comments received during the course of the Part 150 Study and responses to those comments.

Appendix H.1 beginning on page H-3 presents a table that summarizes the comments. Appendix H.2 beginning on page H-33 to that appendix includes scanned copies of the comments. The following items were entered into the table for each comment:

- First and last name (and title, if applicable)
- Affiliation/organization, if applicable
- Address (city only)
- The medium in which the comment originated – Comment Form, electronic mail, letter
- Comment identification number (including sub-identification number for comments addressing multiple topics)
- Comment topic (general categories addressed in each comment)
- Verbatim transcription each comment, broken down into separate topics, where multiple topic categories were addressed
- Response to each comment topic raised

All comments were entered verbatim, as accurately as feasible for handwritten comments. Typographical or grammatical errors were not corrected.

As review of the table in Appendix H.1 indicates, the comments largely identified noise issues of concern and/or suggested noise compatibility measures to consider in the Noise Compatibility Program phase of the study. None of the comments raised issues that required revision of the draft NEM.

6.4. Newsletters

The Study Team prepared a quarterly newsletter, distributed in electronic format, to TAC members, community representatives, elected officials, and other interested stakeholders. These newsletters are also posted on the project website. Copies of the newsletters are provided in Appendix G.2, beginning on page G-35.

6.5. Website

Working with the Port Authority, the Study Team developed and maintains a Part 150 Study website. The website address is: http://panynjpart150.com/. The Study Team also monitors social media channels for news and commentary on the Part 150 Study, and makes recommendations for responses or engagement, on a case-by-case basis. The Study Team coordinated with the Port Authority to design and manage the Part 150 public website where all Study related information and resources are posted.

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