

**Logan International Airport
Additional Taxiway Evaluation Report
Per FAA August 2, 2002 Record of Decision**

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Prepared for:

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- Attachment A: Operational Analysis of Taxi Queuing Alternatives for Taxiway November at Logan International Airport
- Attachment B: Noise Analysis of Taxi Queuing Alternatives for Taxiway November at Logan International Airport
- Attachment C: Air Quality Analysis of Aircraft Taxiing & Queuing Alternatives for Taxiway November at Logan International Airport
- Attachment D: Operational Analysis of Centerfield Taxiway Alternatives at Logan International Airport

- Attachment E: Noise Analysis of Taxi and Queuing Alternatives for the Centerfield Taxiway at Logan International Airport
- Attachment F: Air Quality Analysis of Aircraft Taxiing & Queuing Alternatives for the Proposed Centerfield Taxiway at Logan International Airport
- Attachment G: Correspondence and Meeting Minutes for Centerfield Taxiway Study, Logan International Airport

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1 INTRODUCTION

This document represents the Additional Taxiway Evaluation Report of the Phase 1 and 2 operational and environmental assessments, which were performed in response to the requirements in the Federal Aviation Administration's (FAA's) August 2, 2002 Record of Decision for the Logan International Airport Airside Improvements Planning Project.¹ Six technical reports have been produced to support this document; those are included as Attachments A through F. Attachment G includes project-related correspondence and meeting minutes. This document summarizes, and in some cases repeats the information provided in the attachments, which were prepared as stand-alone technical support documents. All of the reports have been prepared by Harris Miller Miller & Hanson Inc. (HMMH) and its subcontractors, under the direction of and with the participation of FAA New England Region Airports Division and Boston Tower.

1.1 Study Purpose and Overview

This study and report are a result of the FAA August 2002 Record of Decision (ROD) for the Airside Improvements Planning Project for Logan International Airport. The ROD documents the aircraft delay, air traffic control efficiency, aviation safety, and environmental factors considered in the FAA's decision to proceed with several Federal actions related to Logan International Airport. The ROD includes approval of the Logan Airport Layout Plan to depict the airside improvement planning projects proposed by the Massachusetts Port Authority (Massport). Approval of one of those projects, a new Centerfield Taxiway between Runways 22L and 22R, was deferred.

Regarding the Centerfield Taxiway, the ROD stated:

FAA is also deferring any decision concerning the Centerfield Taxiway until FAA conducts an additional evaluation of potential beneficial operational procedures that would preserve or improve the operational and environmental benefits of the Centerfield Taxiway shown in the Final EIS.²

As the ROD indicates in pertinent part, the analysis in the Environmental Impact Statement states that the Centerfield Taxiway has environmental benefits and does not adversely impact noise or reduce air quality in the areas adjacent to the northern portion of the airfield. However, a study was required to address the concerns of residents adjacent to the northern portion of the airfield prior to final approval of the Centerfield Taxiway. This report and the supporting Attachments document the methods and results of the study.

¹ Federal Aviation Administration, New England Region, "Record of Decision Airside Improvements Planning Project, Logan International Airport, Boston, Massachusetts," August 2, 2002.

² ROD, Section I, "Introduction"

1.2 Logan Airside Improvements Planning Project – Elements Approved by the ROD

The ROD documented factors considered in FAA’s decision to proceed with the project, subject to certain mitigation measures, with the following federal actions related to Logan International Airport:

- The approval of the Logan International Airport Layout Plan (ALP) to depict certain Airside Improvements Planning Projects (Airside Projects) proposed by Massport, pursuant to 49 U.S.C. § 40103(b) and § 47107(a)(16).³ The Airside Projects approved include: (1) construction and operation of unidirectional Runway 14-32, (2) reconfiguration of the southwest corner taxiway system, (3) extension of Taxiway Delta, and (4) realignment of Taxiway November. These projects are described as part of the Preferred Alternative (Proposed Action) of the *Final Environmental Impact Statement (FEIS) Logan Airside Improvements Planning Project* (June 2002).
- The Federal environmental approval necessary to proceed with the processing of an application for federal grant-in-aid funds (49 U.S.C. §§ 47101 *et seq.*) and Passenger Facility Charge funds (49 U.S.C. § 40117).
- The administrative action pursuant to 49 U.S.C. §§ 40101(d) and 40103(b) to reduce instrument approach minimums to Runways 22L, 27, 15R, and 33L.⁴

Factors included in FAA’s decision to proceed included aircraft delay, air traffic control efficiency, aviation safety, and environmental factors. The mitigation measures are discussed in detail in Chapter 4 of the FEIS and summarized in Section VIII of the ROD.

1.3 Centerfield Taxiway Additional Evaluation

The “Mitigation Measures” section of the ROD provided further information about the additional evaluation required for the Centerfield Taxiway.

Although the EIS analysis stated that the Centerfield Taxiway would have environmental benefits and would not cause adverse noise impacts or reduce air quality in the areas adjacent to the northern portion of the airfield, residents of certain areas of East Boston and Winthrop adjacent to the northern end of the airfield expressed concerns about the Centerfield Taxiway. In addition, these residents expressed concerns regarding the use of Taxiway November and questioned FAA’s compliance with the existing “good neighbor” policy regarding queuing aircraft on Taxiway November.⁵ Given these concerns, FAA committed to conduct an additional evaluation of taxiway

³ Approval of the ALP (August 19, 2002) to depict these projects does not constitute a commitment on the part of the FAA to participate in or fund the development.

⁴ ROD, Section I, “Introduction.”

⁵ FAA Order BOS TWR 7040.1 “Noise Abatement” states that whenever possible “No more than five turbojets, including one in position, shall be cleared beyond Runway 15L. Only one turbojet is allowed to be held on November Taxiway between Runways 22R and 22L.” The limit applies to aircraft north of Runway 15L/33R, the 2,600-foot runway. Under this policy, there is no limit on the number of aircraft between Runway 15R-33L and Runway 15L-33R.

operations in the northern portion of the airfield and agreed not to make any decision concerning the Centerfield Taxiway until after completion of the evaluation and appropriate environmental review, as specified in the ROD.

The ROD provided an outline for the evaluation. The overall taxiway evaluation would be conducted in two phases:

- Phase 1 would address operations on Taxiway November, and
- Phase 2 would address operations on the Centerfield Taxiway.

Phase 1 would begin by developing a clear understanding of the concerns that the neighborhoods near the approach ends of Runways 22L and 22R have regarding operations on the existing taxiway system north of Runway 15R/L. The ROD describes several specific tasks that the Phase 1 effort should undertake, including:

- Identify Federal and state regulations, policies and directives related to community concerns with taxi operations north of Runway 15R/33L. These include, at least, noise, air quality, and visual impacts.
- Meet with representatives from neighborhoods surrounding the north end of the airport to better ascertain their concerns, solicit potential actions to address their concerns, and discuss operational difficulties in meeting current policy.
- Review neighborhood concerns in the context of relevant federal and state policies, regulations, and directives in order to determine which relate to neighborhood concerns.
- Assemble and review recent field monitoring results (e.g., noise and air quality impacts) and analyses of taxi operations, their impacts, or potential mitigation measures north of Runway 15R/33L.
- Conduct further field studies, if warranted, to document existing impacts associated with taxi operations (e.g., noise monitoring, air quality).
- Review the results of field studies to determine whether existing conditions approach or violate applicable regulations and what actions are warranted to mitigate the impacts of taxi operations.
- Identify other candidate actions (beyond those suggested by the communities) that can mitigate impacts most appropriately. These actions will focus primarily on operational measures within the control of the FAA (e.g., taxi procedures) but may also include other actions that could address neighborhood concerns (e.g., physical changes to the airport, airline schedule, or gate management actions).
- Review candidate actions and assess them at a high level to determine their effectiveness in addressing neighborhood concerns and impacts to safety, efficiency, capacity, cost, or other consequences.
- Develop a detailed plan, if warranted, to implement promising actions. The evaluation could be terminated if current conditions related to neighborhood concerns do not exceed federal or state standards or if candidate actions are not expected to be effective, safe, or within reasonable cost.

With respect to Phase 2, any decision with regard to approval of the Centerfield Taxiway, including appropriate beneficial operating procedures, will be made following completion of a Phase 2 Scope of Work and evaluation. A written re-evaluation will be conducted by FAA as to whether the decision can be made based on the data and analysis contained in the EIS and evaluation, or

whether further environmental documentation is necessary before such a decision could be made. Any such written re-evaluation will conform to the requirements of paragraph 103 of FAA Order 5050.4A.

1.4 Study Process

1.4.1 Phase 1

Following the requirements of the ROD, the Phase 1 study involved meetings with three representatives each from the affected East Boston and Winthrop neighborhoods; the representatives were appointed by their respective municipal officials. In the meetings, the study team (FAA Boston Tower and Airports Division personnel, and HMMH) reviewed neighborhood concerns about the use of Taxiway November, and addressed them in the context of current policies, regulations and directives. Several meetings with the community representatives were held, beginning in 2003. Meeting minutes and other correspondence are presented as Attachment G to this report.

To address the neighborhood concerns as specified by the ROD, the study team evaluated nineteen candidate actions pertaining to Taxiway November. Sixteen of the actions were suggested by the community representatives, and three actions were identified by FAA staff. The evaluations addressed issues of safety, feasibility, and operational efficiency as well as the potential environmental benefits. As part of the evaluation process, the FAA held several in-house meetings to discuss the actions and coordinate among the appropriate FAA divisions. On May 27, 2005, the results of this Phase 1 study were presented to the community representatives. The minutes of this meeting are included in Attachment G to this report, which is bound separately.

Section 2 below presents summaries of the Phase 1 study methods and results. The operational and safety evaluation is summarized in Section 2.1 below, and presented in detail in the separately-bound Attachment A to this report. The noise and air quality effects are summarized in Sections 2.3 and 2.4, and presented in detail in separate Phase 1 study reports as Attachments B and C to this report, bound separately.

1.4.2 Phase 2

Phase 2 of the study addressed the Centerfield Taxiway, and began during the summer of 2005. The purpose of this effort is summarized in the mitigation section of the Final EIS: “the second task would...consider specific operating procedures that could mitigate community concerns regarding the impacts of the Centerfield Taxiway while preserving the operational and other environmental benefits shown in the EIS.”⁶ A meeting with the community representatives was held on November 18, 2005 to 1) discuss the operational characteristics of the Centerfield Taxiway, and 2) discuss the Phase 2 study scope and hear community members’ environmental and other concerns to assist in developing alternative operational procedures that may have environmental benefits.

Section 3 below describes the Phase 2 study process further and provides summaries of the operational, noise and air quality studies performed in connection with the Phase 2 Centerfield Taxiway study. Attachments D, E and F to this report (bound separately) provide the technical details of the operations, noise and air quality analyses, respectively.

⁶ “Logan Airside Improvements Planning Project Final Environmental Impact Statement,” Federal Aviation Administration, June 2002, p. 4-13.

FAA coordinated the preparation of this report with Massport, as it deemed appropriate. The community representatives who provided direction and feedback to the study in several meetings included Fran Rowan, Ron Hardaway and Tony D'Avolio, who was later replaced by Robert D'Amico all of East Boston, and Arthur Flavin, Harvey Maibor and Ed Patten, who was later replaced by Brian Dumser, all from Winthrop.

2 PHASE 1 EVALUATION – TAXIWAY NOVEMBER

This section of the report presents a summary of the Phase 1 study, which addresses the operational and environmental effects associated with operations on Taxiway November. Details on the Operations, Noise and Air Quality analyses are provided in Attachments A, B and C to this report, respectively.

2.1 Operational Evaluation of the Candidate Actions

The study team evaluated nineteen candidate actions, sixteen of which were suggested by the community representatives, and three actions were identified by FAA staff. The evaluations addressed issues of safety, feasibility, and operational efficiency as well as the potential environmental benefits. This section and Section 2.2 describe the operational and safety factors; the environmental effects are addressed in the two subsequent sections, 2.3 and 2.4.

The section below lists first the sixteen actions suggested by the community representatives, and second, the three actions identified by the FAA. Brief comments are provided. More complete comments are provided in Attachment A, Section 2.

- Action 1: Restrict the use of Taxiway November for queuing, including the use of a “hold line.” FAA previously used a hold line to limit queuing on Taxiway November. However, that hold line was in a non-standard location,⁷ and it proved problematic because pilots became confused by it. Therefore, the FAA New England Runway Safety Program Manager was asked if the FAA could support the replacement of a noise abatement hold line that had previously been used on Taxiway November.⁸ The Program Manager stated that the Program has been working with airport authorities across the U.S. to mark and sign all airports in accordance with current standards. This uniformity allows pilots to depart and arrive at any airport in the country and be familiar with the meaning of the markings and signage. The manager further stated that airports conforming to this standard have reduced pilot and vehicle operator confusion, thereby reducing the potential for runway incursions and aircraft accidents. As a result, the Runway Safety Program could not support the placement of a non-standard noise abatement hold line at Logan Airport. In addition to the safety concerns, a hold line placed farther from the runway end impedes the efficient flow of aircraft onto Runway 22R, and is therefore problematic from an operational efficiency perspective.
- Action 2: Revise the existing Noise Abatement Order to further limit the number of queued aircraft on Taxiway November. This action was determined to warrant further operational and environmental analysis. The approach, assumptions and results of the operational analysis are discussed below in Section 2.2. The noise and air quality environmental implications are summarized in Sections 2.3 and 2.4, respectively, and addressed in detail in the respective technical reports, Attachments B and C.

⁷ In accordance with FAA Advisory Circular 150/5340-1J, Standards for Airport Markings.

⁸ Letter from Robert S. Bartanowicz, FAA Regional Administrator, to Thomas Kinton of Massport, dated February 8, 2002. The letter is included in Attachment G of this report.

- Action 3: Prohibit queuing of aircraft between Runways 22R and 22L. The section of Taxiway November between Runway 22R and Runway 22L is used to stage aircraft for departure on Runway 22L and also when necessary to re-sequence aircraft departing on 22R. If this section of Taxiway November were not available for temporary queuing of aircraft, much longer queues and the potential for delays would be generated, thereby interfering with airport efficiency and increasing noise and air emissions.
- Action 4: Queue aircraft farther south on Taxiway November. This action requires the establishment of a hold line on Taxiway November south of the departure threshold. As a result, this action has the same problems with safety and efficiency issues as Action 1.
- Action 5: Impose a curfew on the use of Taxiway November or Runways 22L and 22R during certain hours. Closing the two primary runways or the access taxiway to those runways anytime winds are from the south or southwest would severely restrict airport usage and hamper airport operating efficiency. Therefore, such measures are not practical operationally. In addition, such action may constitute unjust discrimination of certain aeronautical activities.
- Action 6: Restrict the use of Taxiway November to certain aircraft types during specified hours. Such restrictions would limit the use of Runways 22L and 22R, and therefore have a negative impact on airport safety, efficiency and capacity. These runways represent one of the three most heavily-used configurations at Logan Airport, and such restrictions would have a serious impact on the airport's capacity.
- Action 7: Build berms at the north end of the airport. Earth berms of sufficient height to provide any noticeable noise benefit would obstruct access to the approach ends of Runways 22L and 22R, resulting in a negative impact on safety. Also, due to the large footprint that berms require (four times as wide as tall), the adjacent wetlands would require fill, resulting in a negative wetlands impact.
- Action 8: Tow aircraft to the departure end of 22R. This action would significantly decrease departure rates, due to the increased time towing takes compared with taxiing. There is also a likelihood of increased dwell time on the taxiway as pilots complete their checklists while starting the engines. In addition, performing engine checks at the runway ends instead of at the terminal gates will shift the associated noise and air emissions closer to the communities.
- Action 9: Ensure compliance with regulations, orders and other commitments related to use of Taxiway November. The FAA has been in compliance with all applicable regulations and orders relating to Taxiway November. The potential benefits of requiring the "good neighbor" policy at all times is addressed in the detailed evaluation of Action 2, discussed below in Sections 2.3 and 2.4, below, and in Attachments B and C..
- Action 10: Create an information system to monitor compliance with regulations, orders and other commitments related to use of Taxiway November. Massport has existing systems to monitor airport operations and their impacts, including PASSUR, noise monitoring, and air quality monitoring. Data from these systems are accessible to members of the community. FAA has not identified any problems with compliance.
- Action 11: Establish a telephone complaint line for citizens to report violations of regulations, orders and other commitments related to use of Taxiway November. Massport has existing capabilities to receive complaints, questions and concerns at 617-561-3333. FAA reviews Massport's written reports of complaints that are received on the telephone hotline.

- Action 12: Provide an air quality monitoring site for taxi operations at the north end of the airport. Massport maintains an extensive network of 27 air quality monitoring sites both on the airport and in surrounding communities. Those sites in the vicinity of the north end of airport are in line with Runways 22L/22R, in East Boston and in Winthrop. These monitors are positioned strategically to monitor air quality impacts, including taxi operations at the north end of the airport. To date, there have been no recorded violations of the ambient air quality standards.
- Action 13: Institute regulations or incentives to encourage shift to more “neighborhood-friendly” aircraft. While neither Massport nor FAA can prohibit the use of aircraft that meet pertinent Federal regulations, Massport has worked with airlines to encourage use of quieter Stage 3 aircraft.
- Action 14: Encourage development of more environmentally friendly aircraft engines. The Federal government (FAA and U.S. EPA) and international agencies (ICAO) are actively pursuing and mandating quieter and lower-emission aircraft engines. These developments are occurring on a global level, resulting from national and international agreements, and involving engine manufacturers, NASA and many other stakeholders. Massport and FAA have and will continue to support these efforts.
- Action 15: Increase the use of other airports in the region to reduce traffic at Logan. FAA is funding and providing technical support to a New England Regional Aviation System Plan (NERASP). The purpose of this study is to understand future air transportation needs of the region's population and economy and to assess the types of improvements that may be required to the region's system of commercial air service airports. It assumes that over the long term airline services will continue to develop at both Logan and regional airports in order to offer passengers the most convenient access to scheduled air services. Massport has committed to promoting increased utilization of other regional airports to relieve traffic at Logan, as stated in the Section 61 Findings published in the Logan Airside Improvements Project Final Environmental Impact Statement. FAA's funding decisions within the New England Region are consistent with that direction. From 1999 to 2003, the regional airports' share of commercial airline passengers has increased from 38% to 44%.⁹
- Action 16: Close Taxiway November if/when the Centerfield Taxiway is built. The purpose of constructing the Centerfield Taxiway is to improve safety and the efficiency of operations by adding additional flexibility for taxiing aircraft in the north end of the airport. By closing Taxiway November, the existing constraints and queues would be transferred to the Centerfield taxiway, and the safety and efficiency benefits would be lost.

The following three actions were identified by the FAA's Boston Tower Work Group.

- Action A: Install sound barriers around the north end of the airport, where possible, to shield the neighborhoods from aircraft visually and from some noise impacts. Massport has responsibility for construction on airport property, and has recently considered the construction of noise barriers at the north end of the airfield in connection with the removal of the blast fence. In consultation with community members, noise barriers were deemed costly and relatively ineffective. (Earth berms, an alternative form of barrier, are discussed above under Action 7.) Rather than pursue a noise barrier, Massport entered into an agreement with the Bayswater community that included a commitment of \$4,000,000 as mitigation for airport impacts on the

⁹ “2003 Environmental Data Report, Boston Logan International Airport,” June 2004, p. 4-3.

community. Consistent with the removal of the blast fence, Massport has stated that its goal is to avoid adding new obstructions.

- Action B: Plant trees around the north end of the airport, where possible, again to shield the neighborhoods from aircraft visually and from some noise impacts. Modest plantings of trees are not effective in reducing noise or air pollution noticeably. Only growths of trees several hundred feet deep with thick underbrush have been shown to reduce transportation noise levels noticeably.¹⁰ Further, there is very little land available on or off the airport property where trees could be planted between the aircraft and the surrounding homes.
- Action C: Hold aircraft waiting to depart on Runway 22R somewhere else on the airport surface, rather than on the north end of Taxiway November. Such a location could possibly be used either when traffic is light to keep queues from building at the north end of the airport and when traffic is heavy to reduce the number of aircraft that would otherwise be queued on Taxiway November. This action overlaps with Actions 1 through 4, above, and many of the difficulties with those actions are applicable to this one as well. The two primary difficulties with holding aircraft in locations other than on Taxiway November include 1) reduction of the efficient flow of aircraft and the introduction of delays, and 2) safety concerns relating to pilot confusion associated with holding in non-standard locations. The potential environmental benefits from the modest changes to the aircraft queue locations associated with Action 2 are presented in the sections below.

2.2 Candidate Action 2 Operational Evaluation

This section provides a summary of the operational evaluation conducted for candidate Action 2, described above. Details are provided in the technical report, included as Attachment A to this report.

The approach taken to the operational evaluation was to “bracket” the potential environmental effects of changes to the Noise Abatement Order by examining two extremes of its use. One extreme would have the Order not implemented at all, and the other would have the Order implemented and required at all times. Therefore, two alternative scenarios of aircraft queuing on Taxiway November were developed:

1. Free Flow –Unconstrained queuing of aircraft operations on Taxiway November
2. Limit All Jets – A maximum of five turbojet aircraft queued north of the intersection with Runway 15L *at all times*.

In the summer of 2003 during a 24-hour period when Runways 22R and 22L were in continuous use for departures, FAA staff in the Boston Tower kept a detailed log of the status of the queue on Taxiway November. This log was used to develop a model of the taxi and queue/hold times for each aircraft during that day. The model was then extended to compute taxi/queue times under the Limit All Jets restricted flow condition. Finally, the times were scaled up to represent the number of operations on a *worst-case busy day* for use in the analysis of environmental effects.

The Taxiway November departure queue log kept by FAA tower personnel described above includes a record for each departing aircraft, and lists the aircraft type, the time it arrived at the queue (to the

¹⁰ “Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation,” International Standard ISO 9613-2, Dec. 1996.

nearest minute) and the time it departed. There were 629 departures logged on that day, representing a day with average traffic volume.

To develop information needed for the noise and air quality analyses, the FAA log was used to determine the amount of time each aircraft spent in each of 15 taxi/hold segments along Taxiway November between runway 15R and 22L. This determination was accomplished with a “taxi/queue time” computer program developed for this purpose. Figure 1 shows the positions and names of taxi and queue segments on Taxiway November developed for the model. Most of the segments are 80 meters (260 feet) long, representing an average spacing between queued aircraft. The computer program was refined to compute the times in each segment under the Limit All Jets restricted condition where no more than five jets may hold north of Runway 15L. The model included taxi-through time as well as queue hold time.

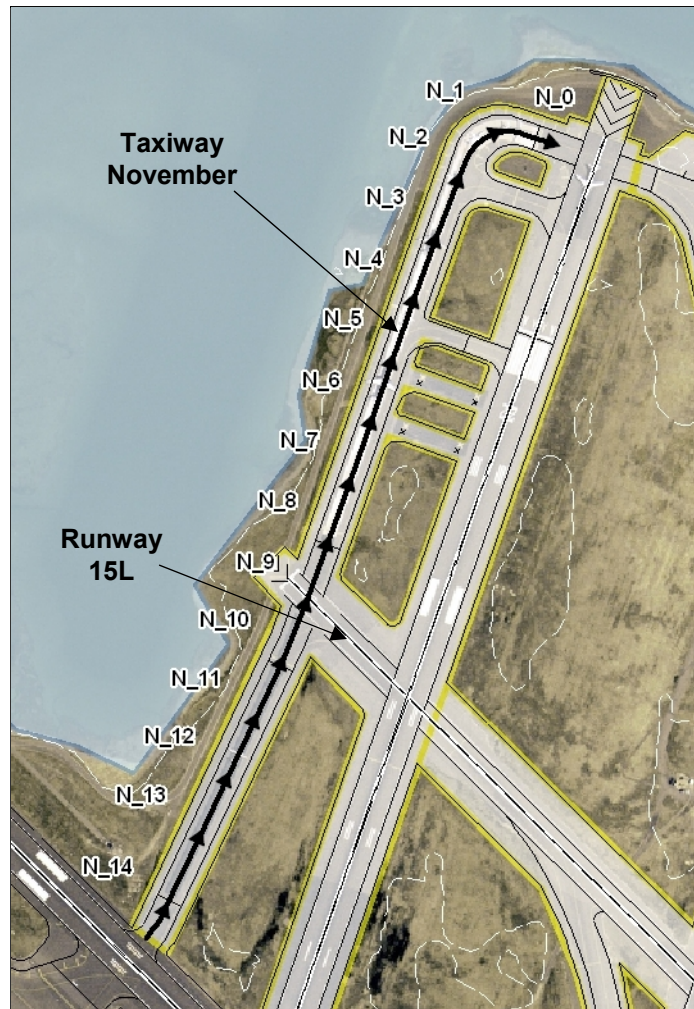


Figure 1 Taxi and Queue Positions Modeled on Taxiway November

The taxi/queue time modeling shows no differences in the times at positions N_0 through N_4, because there are no variables at those positions. That is, the Limit All Jets restrictions do not affect those positions because the restriction allows up to five jets to be queued north of Runway 15L, and

those represent the first five positions. During the peak daytime periods, the taxi/queue times at positions N_5 through N_9 are reduced in the Limit All Jets case. The reduction in total queue time between 7 AM and 10 PM (the “daytime” period for DNL noise computations) from the Free Flow case is between 13% and 31%, depending on location. However, there are commensurate increases in queue time at the N_10 through N_14 positions in the Limit All Jets case, such that the total queue times on the entire length of Taxiway November are nearly identical between the two cases. There are no differences between the cases during the DNL nighttime hours between 10 PM and 7 AM, since the queue lengths are always short.

For the purposes of the noise and air quality analyses, FAA tower staff carefully reviewed the operations log with the objective of scaling the activity level up from a day of average operational volume, as represented by the log, to a busy peak-day scenario. Their evaluation examined both historical records of busy periods as well as the capacity of the operational configuration. The FAA staff determined that the most activity that could or would occur over a 24-hour period would represent a 30% increase in the activity recorded in the log.¹¹ That 30% increase was incorporated into the noise and air quality studies with the assumption that the increased activity would occur uniformly throughout the day and night, with the same mix of aircraft as recorded in the log.

Table 1 presents the sums of all taxi and queue minutes over all aircraft types and queue positions to show the daytime, nighttime and total minutes for the two alternatives. Again, these times are for a worst-case busy 24-hour period with Runways 22L and 22R in continuous use for departures. The times have been grouped into three different sections of the taxiway, north of Runway 15L, between Runways 15R and 15L, and south of Runway 15R. As described above, the times have been scaled up from the FAA logs by 30%. Also as mentioned above, differences between the alternatives are only apparent during the daytime period, when queues are long enough for the limiting case to be different. During the daytime period, there is a reduction of 254 minutes (8%) in aircraft queue time north of Runway 15L in the Limit All Jets Alternative relative to the Free Flow case. The corresponding 254 minute increase in queue time south of Runway 15L in the Limit All Jets Alternative represents a 28% increase over the Free Flow alternative.

Table 1 Total 24-hour Taxi/Queue Time by Section of Taxiway by Alternative on a Worst-case Day

Section of Taxiway	Free Flow Alt. (minutes)			Limit All Jets Alt. (minutes)		
	Day	Night	Day+Night	Day	Night	Day+Night
North of 15L	3,275	182	3,457	3,021	182	3,203
15R to 15L	916	79	995	1,159	79	1,238
South of 15R	0	0	0	11	0	11
Total	4,191	261	4,452	4,191	261	4,452

After experience with implementing the “good neighbor” policy portion of Noise Abatement Order in recent years, and consideration of the proposed Limit All Jets Alternative, the FAA’s Boston Tower Work Group concluded that the restrictions would have an adverse impact on operational

¹¹ See Attachment A, Section 3.3.2.

efficiency, flexibility and safety. The following paragraphs describe these specific operational concerns and conflicts.

- When utilizing either a northeast- or southwest-flow configuration that includes Runways 4L/22R and/or Runways 4R/22L, the available taxiway area around the terminals is extremely limited. Alpha and Kilo taxiways, which surround all five airfield terminals, provide the only taxi routes between the runways and terminal gate areas for arriving and departing aircraft. The ground controller(s) must exercise extreme vigilance to prevent aircraft from becoming gridlocked on Alpha, Kilo and interconnecting taxiways, while handling all of the arrival and departure traffic and providing for a safe and expeditious departure flow.
- Sequencing of departures by ground control is critical when utilizing the southwest-flow configuration (27/22L/R), because all jet aircraft fly the Standard Instrument Departure (SID), which turns them eastbound over the water following each other. Before aircraft reach Taxiway November and establish the final aircraft departure queue, FAA ground controllers must consider many factors to determine an appropriate and efficient aircraft sequence. These factors include appropriate sequencing/queuing of propeller aircraft with the jets as well as wake turbulence separation requirements for each aircraft, which are based on aircraft type, initial route of flight, and traffic management restrictions imposed for certain destinations or routes of flight.
- Limiting the Taxiway November queue to no more than five jets north of Runway 15L at all times would result in:
 - Additional communication (“phraseology”) requirements that would increase radio-frequency congestion,
 - A requirement to monitor the number of aircraft north of Runway 15L, which would distract the ground controller from his/her critical and primary safety-related duties,
 - Increased aircraft traffic volume in the terminal areas due to the increased length of the taxi queues, directly affecting the expeditious flow of both arriving and departing aircraft, which ultimately has a negative impact on the National Airspace System.

2.3 Candidate Action 2 Noise Evaluation

This section provides a summary of the noise evaluation conducted for Candidate Action 2. Details are provided in the technical report (Attachment B).

Noise modeling and measurements were conducted to evaluate the potential difference in noise exposure in the surrounding community between the two taxi queuing alternatives. Detailed noise evaluations were performed at the four permanent noise monitoring stations (NMS) closest to Taxiway November, including NMS 7 at Loring Rd. near Court Rd. in Winthrop, and NMS 9 at Bayswater St. and Annavoy St., NMS 10 at Bayswater St. near Shawsheen Rd., and NMS 12 at the East Boston Yacht Club, all in East Boston.

The modeling computed Day-Night Sound Level (DNL) values for taxi operations for a worst-case busy day, during which Runways 22L and 22R are in constant use for departures. Noise from arriving and departing aircraft was not included, in order to focus only on taxiway noise and emphasize the differences between the queuing alternatives. The model used a widely-accepted international sound propagation standard that computes noise under worst-case downwind conditions; therefore, the computed sound levels are conservatively high. In addition to the

atmospherics, the model also accounted for the ground type in the study area, including over-water propagation. The model results compared favorably with measurements of “non-event” noise at the monitors during times when monitors were downwind from the aircraft.

Each aircraft listed in the FAA log was grouped into one of five categories represented by an aircraft type for which noise emission characteristics are well known under taxi/idle power settings. The model accounted for the directional characteristics of noise emission of each aircraft type. The five categories and their representative types are:

- Jumbo Air Carrier – Boeing 747
- Heavy Air Carrier – Boeing 767
- Large Air Carrier – Boeing 737-300
- Regional and Corporate Jets – Canadair Regional Jet
- Propeller Aircraft – Beech 1900

Aircraft taxi/queue positions incorporated into the model are shown in Figure 2 along with the surrounding residential community and the four permanent noise monitoring stations at which the noise computations were performed.

The aircraft operations and associated taxi/queue time incorporated into the noise model are summarized above in Section 2.2. The operations report (Attachment A) shows the detailed breakdown of taxi/queue time by taxiway position, time of day, aircraft noise group, and, in the report’s appendix, by aircraft type.

The results showed extremely small differences between the two taxi queuing alternatives, as indicated in Table 2. Under the worst-case condition of Runways 22L and 22R in constant use for departures, the maximum improvement in DNL computed at any monitor site was 0.1 decibels. The average reduction in taxiway DNL for the worst-case day over the four receivers between the Free Flow Alternative and the Limit All Jets Alternative was 0.05 decibels. This difference is substantially less than FAA’s 1.5-decibel threshold of significance, which is applicable to the *annual average* DNL. Therefore, no significant reduction in noise impact can be expected from implementing an alternative that limits aircraft queuing.

Table 2 Computed Day-Night Sound Level (DNL) Results from Taxi/Queue Noise Model

Permanent Noise Monitoring Station	Free Flow DNL (dBA)	Limit All Jets	
		Total DNL (dBA)	Change from Free Flow
NMS 7	62.4	62.4	0.0
NMS 9	67.1	67.0	-0.1
NMS 10	66.5	66.5	0.0
NMS 12	68.9	68.9	0.0

In conclusion, compared to the free-flow queuing practice, the restricted queuing alternative would provide extremely minimal noise reduction benefit in the communities surrounding the north end of the airport.



Figure 2 Phase 1 Study Area Map with Noise Model Source and Receiver Positions

2.4 Candidate Action 2 Air Quality Evaluation

The purpose of this assessment is to evaluate the potential effects on air quality resulting from two different aircraft taxiing and queuing alternatives for Taxiway November at Logan International Airport. The alternatives analyzed are referred to as “Free Flow” (i.e. the unrestricted case) and “Limit All Jets” (i.e. the restricted case).

The approach to completing this assessment involves models, data and other supporting information common to airport-related air quality analyses. The latest version of the FAA Emissions Dispersion & Modeling System (EDMS) was used to compute aircraft emissions. The modeling incorporated the same aircraft operational data as the noise analysis, as described above in Sections 2.2 and 2.3, and the same taxi and queuing positions shown above in Figure 2.

The primary aim of this assessment was the evaluation of aircraft emissions along Taxiway November and their potential impacts to regional air quality and the residential areas of East Boston and Winthrop that are closest to the airport. To achieve this goal, the assessment was comprised of two primary components, a quantitative analysis and a qualitative analysis.

According to the results, two primary findings important to air quality are evident when comparing the Free Flow and Limit All Jets Alternatives. These are summarized as follows:

- The Limit All Jets Alternative will result in the same amount of total aircraft emissions when compared to the Free Flow Alternative. This is because the total aircraft taxi and queue times are forecasted to be the same on Taxiway November under both alternatives.
- Under the Limit All Jets Alternative, fewer aircraft emissions will be generated north of Runway 15L when compared to the Free Flow Alternative. This is because taxiing and queuing aircraft will spend less time in this area under the restricted condition. However, in the context of the total emissions from the airport as a whole, these differences are quite small, as shown in Figure 3.

Based on these findings, the Limit All Jets Alternative is not expected to have any impact on regional air quality conditions when compared to the Free Flow Alternative. This is because the total amounts of emissions are essentially the same under both alternatives. Local air quality in the areas of East Boston and Winthrop, which are closest to Taxiway November, will also likely not experience any measurable effects from the Limit All Jets Alternative for much the same reason and because the emissions on Taxiway November are a small percentage of the overall total at the airport.

Finally, the effects of total airport-related emissions (including those associated with Taxiway November) were also analyzed in the *Logan Airside Improvements Planning Project Supplemental DEIS/FEIR*. The dispersion modeling results from this analysis indicated that these emissions will not cause nor substantially contribute to any violation of the National Ambient Air Quality Standards. Furthermore, the differences in emissions between the alternatives evaluated in this study are not expected to exceed the *de minimis* emission thresholds contained in the Federal Clean Air Act General Conformity Rule.

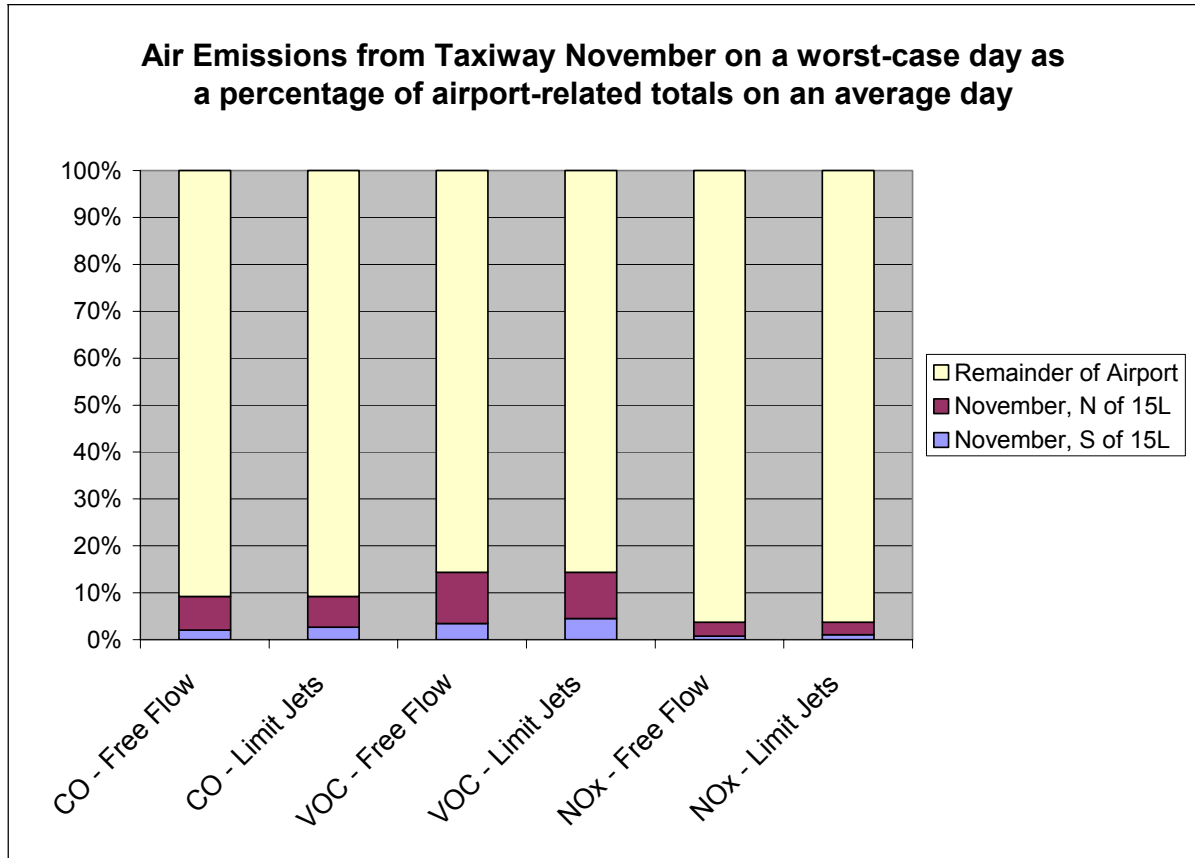


Figure 3 Air Emissions from Taxiway November on a Worst-case Day as a Percentage of Airport-related Totals on an Average Day

2.5 Conclusion

Both the noise and air quality analyses (sections 2.3 and 2.4 above) conclude that the taxi/queuing restrictions of the Limit All Jets Alternative would not provide a significant environmental benefit. As described in Section 2.2, the FAA’s Boston Tower Work Group concluded that the restrictions would have an adverse impact on operational efficiency, flexibility and safety. Since the Limit All Jets Alternative represents the most extreme restriction in queuing because it applies at all times, any less restrictive alternative between the Limit All Jets and the Free Flow Alternative would have even smaller environmental benefits. Therefore, since the negative operational impact of the Limit All Jets Alternative outweighs the very small environmental benefits, there is no basis for imposing taxi/queue restrictions on Taxiway November.

3 PHASE 2 EVALUATION – CENTERFIELD TAXIWAY

3.1 Study Scope

In the summer and fall of 2005, the FAA held internal discussions among study team members, and the team met with the community representatives to share a scope of work for the Phase 2 study, as called for in the ROD and Final EIS. A meeting was held with the study team and community representatives on November 18, 2005 to 1) discuss the operational characteristics of the Centerfield taxiway, and 2) discuss the Phase 2 study scope and hear community members' environmental and other concerns to assist in developing alternative operational procedures that may have environmental benefits.

At the November 18, 2005 meeting, the FAA presented the planned operational characteristics of the airport under two configurations if the Centerfield Taxiway is constructed. The two operational configurations presented were "southwest flow," with departures on Runways 22R and 22L, and "north flow," with arrivals on Runway 4L and 4R. The presentation made it clear that in north flow, the presence of the Centerfield Taxiway significantly increases the efficiency of arriving aircraft in moving from the north end of the airport back to the terminal area, as compared with the existing situation. This improvement is particularly noticeable for aircraft arriving on Runway 4R, which currently must wait to cross the active Runway 4L before accessing Taxiway November to return to the terminal. Since the presence of the Centerfield Taxiway would serve to *reduce* aircraft hold times at the north of the airport during north flow, it was concluded that there was no need to address that configuration in this study.

Community members expressed concern that during southwest flow, aircraft at the north end of the airport would queue on the Centerfield Taxiway in addition to Taxiway November, thereby potentially increasing noise and air quality emissions in their neighborhoods. The FAA presented the expected usual use of both the November and Centerfield Taxiways during southwest flow. Figure 4 is a schematic of how aircraft may use the two taxiways during southwest flow, taken from the FAA's November 18, 2005 presentation. Aircraft that will depart on Runway 22L would use the Centerfield Taxiway; one is shown on the taxiway in the graphic. Other aircraft, which will depart on runway 22R, will usually queue on Taxiway November.

After some discussion, it appeared that when the taxiways could be used to maximum efficiency (i.e., free flow), queue/hold times would be minimized to the greatest degree, thereby likely representing the most environmentally beneficial scenario. It was agreed that this would be studied as "Alternative 1," which would represent the most environmentally beneficial "bracket" alternative.

To address the community members' concerns about potential use of the Centerfield Taxiway to queue aircraft for departure on both Runways 22R and 22L, the study team identified an alternative for evaluation in the scope of work that represented the greatest number of queued aircraft at the northern end of the airfield that was considered plausible. This "Alternative 2" would represent a "bracket" for the least environmentally beneficial operational scenario. The assumption developed for Alternative 2 is that Runway 22R departures would be re-routed to the Centerfield Taxiway when queues on Taxiway November reach the Runway 15L intersection.

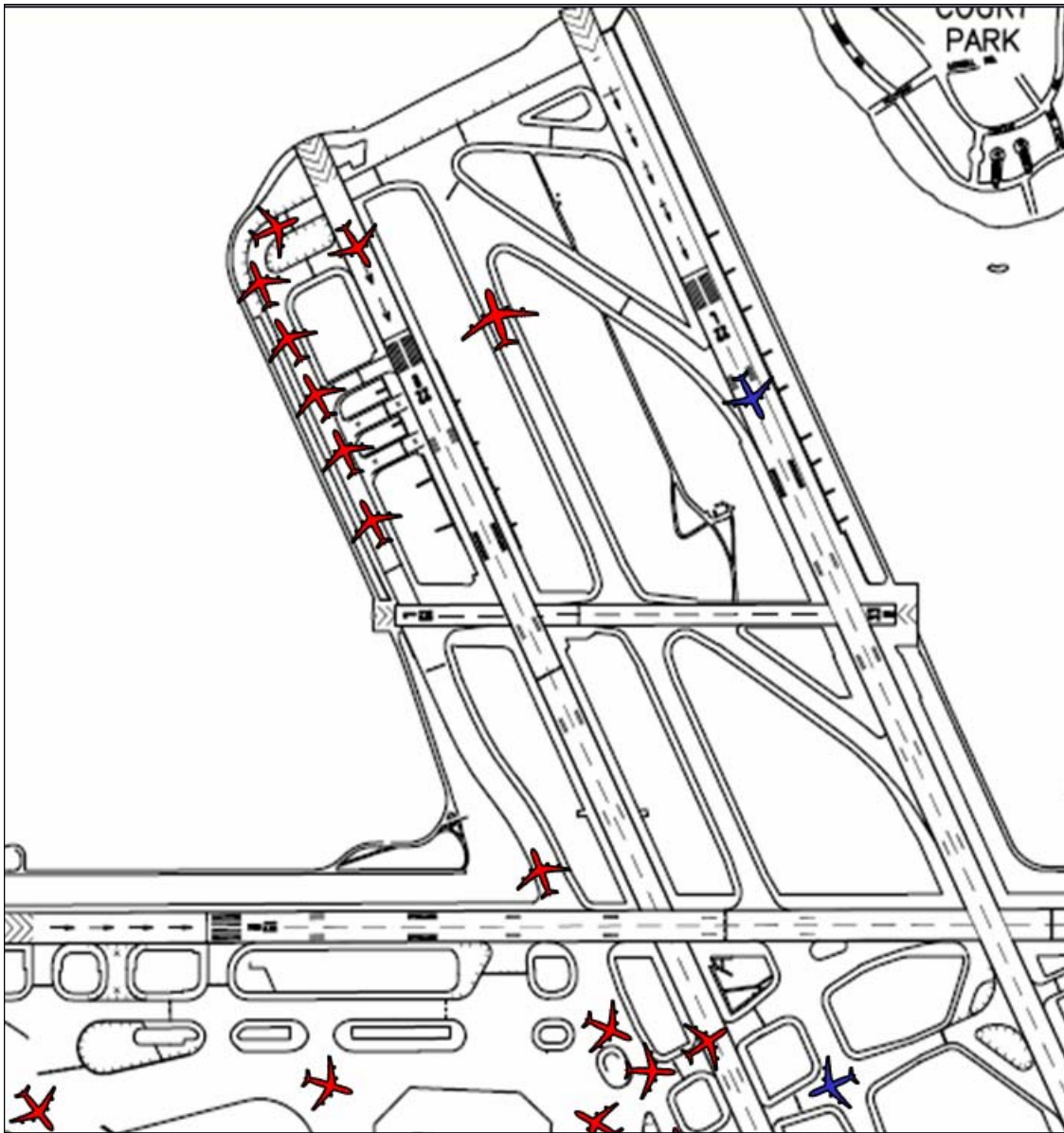


Figure 4 Schematic of Taxiway Use during Southwest Flow

The study scope was defined to evaluate the operational, noise and air quality effects of two taxiway use alternatives, Alternative 1 representing the most efficient use of the taxiways, and Alternative 2, which somewhat balances the queues on the November and Centerfield taxiways, outlined in the paragraph above. These two alternatives represent the extremes of how taxi and queue operations are expected to be carried out during southwest flow if the Centerfield Taxiway is constructed, thereby representing two conditions to bracket the environmental effects. The characteristics and the operational development of both alternatives are described in more detail in Section 3.2, below, and in Attachment D, the Phase 2 operations report.

Since it was not possible to use the same operational scenario for the study of the Centerfield Taxiway as was used in the Taxiway November study (which was based on logs of operations on that taxiway in 2003), the study team evaluated the environmental and operational characteristics of the Centerfield Taxiway anticipated in the year 2010, which is the year the taxiway could be expected to be opened. Section 3.2, below, and Attachment D describe the development of the operational scenarios.

The approach, methods and results of the Phase 2 operational and environmental analyses were presented to the community representatives on May 18, 2006, and are reported in the sections below.

3.2 Operations

The Total Airspace and Airport Modeller (TAAM), an airport operations simulation model, was used to simulate the southwest flow configuration at Boston-Logan International Airport. The purpose of this analysis was twofold: 1) assess how the Centerfield Taxiway – a full-length taxiway that will be provided between Runways 4L-22R and 4R-22L – will change aircraft taxiing patterns, departure queuing locations, and departure queuing durations, and 2) provide operational input data to the noise and air quality modeling efforts.

The simulation effort focused on the southwest flow configuration at Logan Airport, when Runways 27 and 22L are used by arrivals and Runways 22R and 22L are used by departures. Modeling assumptions associated with these operating configurations were developed collaboratively with air traffic controllers from the Boston Airport Traffic Control Tower and reflect current air traffic control rules and Boston Tower standard operating procedures.

Two Centerfield Taxiway use scenarios were evaluated in this analysis. In Alternative 1, departures assigned to Runway 22L were assumed to taxi out to depart via Taxiways Q and the Centerfield Taxiway. Departures assigned to Runway 22R were assumed to taxi out to depart via Taxiway November in the same manner as they do today. Departures assigned to Runway 22L were presumed to be similar to those that currently use this runway for departure, namely long-haul domestic and international flights that require use of this longer runway. The top image in Figure 5 shows the Alternative 1 scenario.

In the Alternative 2 scenario, Runway 22R departures were rerouted to the north end of Runway 22R via Taxiway Q and the Centerfield Taxiway on a demand responsive basis to reduce the length of the departure queue that forms on Taxiway November. Runway 22R departures were rerouted in this manner whenever the Runway 22R departure queue on Taxiway November reached Runway 15L. In all other aspects, Alternative 2 was the same as Alternative 1. The bottom image in Figure 5 depicts the Alternative 2 scenario.

All TAAM simulations were conducted using a flight schedule intended to represent average day, peak month activity projected in the year 2010,¹² and consisted of 1,503 daily flights. This 2010 “design day” schedule used in TAAM reflects a high-activity day to approximate worst-case noise and air quality impacts. Table 3 provides 2010 annual activity totals obtained from the FAA’s Terminal Area Forecasts (TAF) and the corresponding 2010 design day traffic totals used in the simulation. A temporal distribution of the simulated traffic sample and a detailed description of the

¹² If the Centerfield Taxiway is approved, 2010 is expected to be the first full year the taxiway would be in operation.

future flight schedule assumptions and development are provided in the Phase 2 operations technical report (Attachment D).

Table 3 Simulated 2010 Aircraft Activity Levels

Aircraft Group	2010 Operations	
	Annual	“Design day” TAAM traffic sample
Air carrier	246,909	776
Air taxi/Commuter ¹	191,326	600
General aviation/Military	40,417	127
Total	478,652	1,503
¹ Includes regional jets Source: Leigh Fisher Associates, Attachment D.		

Results of the TAAM simulation experiments for both Centerfield Taxiway use scenarios were summarized in terms of unimpeded taxiing time and additional taxi/queue time separately for arrivals and departures, and combined overall average additional taxi/queue time. Table 4 shows these results in terms of averages per operation by alternative. Since the difference between the two alternatives affects departures only, the average time for arrivals is the same between the alternatives. For departures, Alternative 2 shows slightly greater average unimpeded ground time (by 1/10 minute), and noticeably greater additional taxi/queue time (1.5 minutes per operation) when compared with Alternative 1. This is because the model projects reduced overall operational efficiency in Alternative 2, and aircraft must travel a greater distance taxiing to the runway end via the Centerfield Taxiway.

Total taxi/queue times over the 24-hour period are given below in Table 5 in Section 3.3 Noise. Detailed taxiing times for individual segments of Taxiway November and the Centerfield Taxiway were summarized for use in the noise and air quality modeling efforts, and are given in an appendix in the Phase 2 operations technical report (Attachment D). The noise technical report (Attachment E) provides further breakdown by aircraft type.

Table 4 Average Taxi/Queue Time per Operation – Results Summary

Scenario	Average unimpeded ground taxi time (minutes)		Average additional taxi/queue time (minutes)		Overall avg. additional time (minutes)*
	Arrivals	Departures	Arrivals	Departures	
Alternative 1	5.0	8.4	1.5	6.7	4.9
Alternative 2	5.0	8.5	1.5	8.2	5.6
* Overall average additional taxi/queue time per operation, averaged over all operations. Source: Leigh Fisher Associates, Attachment D.					

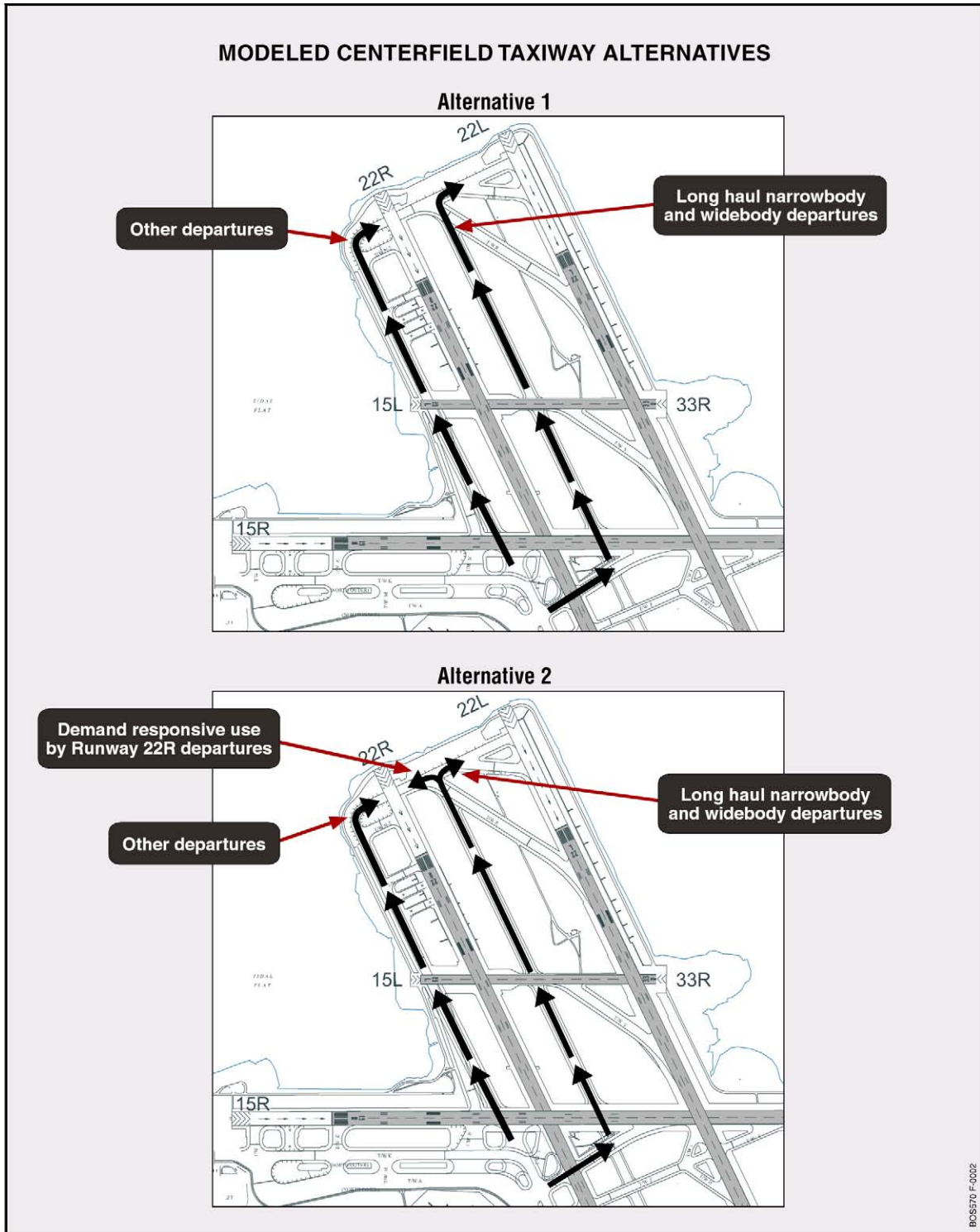


Figure 5 Modeled Centerfield Taxiway Alternatives

3.3 Noise

This section provides a summary of the noise evaluation conducted for the two alternative use scenarios for the Centerfield Taxiway, described above. Details are provided in the noise technical report, included as Attachment E to this Report.

Detailed noise evaluations were performed at the four permanent noise monitoring stations closest to the Centerfield Taxiway, including NMS 7 at Loring Rd. near Court Rd. in Winthrop, and NMS 9 at Bayswater St. and Annvoy St., NMS 10 at Bayswater St. near Shawsheen Rd., and NMS 12 at the East Boston Yacht Club, all in East Boston. These are the same locations evaluated in Phase 1.

The noise analysis took the a similar approach as in the Phase 1 study; the modeling computed Day-Night Sound Level (DNL) values for taxi operations during a busy day, during which Runways 22L and 22R are in constant use for departures. Noise from flight activity was not included, in order to focus only on taxiway noise and emphasize the differences between the queuing alternatives. The same noise prediction model was used as for the Phase 1 study, which used a widely-accepted international sound propagation standard that computes noise under worst-case downwind conditions; therefore, the computed sound levels are conservatively high. In addition to the atmospheric, the model also accounted for the ground type in the study area, including over-water propagation. The model compared favorably with measurements of “non-event” noise at the monitors during times when monitors were downwind from the aircraft.

In a similar manner as in the Phase 1 study, each aircraft in the 24-hour operations model was grouped into one of five categories represented by an aircraft type for which noise emission characteristics are well known under taxi/idle power settings. The model accounted for the directional characteristics of noise emission of each aircraft type. The five categories and their representative types are:

- Jumbo Air Carrier – Boeing 747
- Heavy Air Carrier – Boeing 767
- Large Air Carrier – Boeing 737-300
- Regional and Corporate Jets – Canadair Regional Jet
- Propeller Aircraft – Beech 1900

Aircraft taxi/queue positions incorporated into the model are shown below in Figure 6 along with the surrounding residential community and the four permanent noise monitoring station locations for which the noise computations were performed.

Aircraft operations and associated taxi/queue times were developed with the TAAM model described above for the Alternative 1 and Alternative 2 operational scenarios, also described above in Section 3.2. The total taxi/queue times incorporated into the noise model are summarized in Table 5, and are broken down by daytime and nighttime periods and by sections of the taxiways – north and south of Runway 15L. The total taxi/queue time in Alternative 2 is approximately 17% higher than in Alternative 1. This is because the model projects reduced overall operational efficiency for this configuration, and aircraft must travel a greater distance taxiing to the runway end via the Centerfield Taxiway. The Phase 2 noise technical report (Attachment E) shows the detailed breakdown of taxi/queue time by taxiway position, time of day, and aircraft noise group.



Figure 6 Phase 2 Study Area Map with Noise Model Source and Receiver Positions

Table 5 Total 24-hour Taxi/Queue Time by Alternative in 2010

Location	Period	Total Taxi/Queue Time (minutes)	
		Alternative 1	Alternative 2
North of Runway 15L	Day	4,054	5,496
	Night	151	151
	Subtotal	4,205	5,648
South of Runway 15L	Day	1,296	800
	Night	81	81
	Subtotal	1,377	880
Total		5,582	6,528

The computed DNL values at each noise monitoring station for each taxiway use alternative are given in Table 6. At each location, the computed DNL values are higher in Alternative 2 than in Alternative 1. The differences range from 0.3 decibels at NMS 12 (East Boston Yacht Club) to 1.6 decibels at NMS 9 (Bayswater and Annvoy St.). It is expected that noise levels east of the taxiways (NMS 7) would be higher in Alternative 2, due to the greater number of aircraft queuing closer to the receivers. It is notable that Alternative 2 DNL values are also higher west of the taxiways (NMS 12), given that some of the queuing aircraft are relocated farther to the east, at the Centerfield Taxiway in Alternative 2. The reason for the small increase in noise at NMS 12 in Alternative 2 is that the 17% increase in total taxi/queue time is a more significant factor than the relocation of some of the aircraft farther away.

Table 6 Computed Day-Night Sound Levels for a Worst-case Day in 2010 from Taxi Noise Model

Permanent Noise Monitoring Station	Alternative 1 Total DNL (dBA)	Alternative 2	
		Total DNL (dBA)	Increase re Alternative 1 (dBA)
NMS 7	64.2	65.3	1.1
NMS 9	66.8	68.4	1.6
NMS 10	65.7	66.8	1.1
NMS 12	67.8	68.1	0.3

For *annual average* DNL at airports, the FAA evaluates significant changes in noise levels above 65 dBA DNL based on a 1.5-decibel threshold of significance. While one of the sites (NMS 9) shows a difference of 1.6 decibels between the two alternatives, the FAA's level of significance is not approached in this case. This is because the DNL values in Table 6:

1. are computed for taxi operations only, and exclude all flight activity (including takeoff roll, climbout, approach, landing roll, and reverse thrust from each departing and arriving aircraft),
2. represent a worst-case 24-hour day, not an annual average, and
3. are based on worst-case downwind conditions, not average atmospheric conditions.

The annual average DNL value at NMS 9 from flight activity in 2003 was 71.0 dBA.¹³ The noise levels from taxi and queue activities shown in Table 6 result from periods when aircraft are departing on runways 22R and 22L, which occurs only 36 percent of the time during a year.¹⁴ Even if taxi and queue activities as modeled were present year-round, and weather conditions always represented worst-case downwind sound propagation in all directions, the total DNL from taxi/queue operations plus flight operations for the two taxi/queue alternatives would differ by only 0.5 dBA (72.4 dBA for Alternative 1 and 72.9 dBA for Alternative 2). Therefore, the difference in total DNL between the two alternatives is well below the FAA's threshold of significance.

3.4 Air Quality

This section provides a summary of the air quality assessment conducted for the two alternative use scenarios for the Centerfield Taxiway, described in Section 3.2 above. Details are provided in Attachment F, the Air Quality technical report.

The overall approach to completing this assessment involved the use of an airport air quality computer model, appropriate input data and other supporting information. The newest version of the FAA EDMS was used to compute emissions from aircraft engines. The pollutants evaluated in this study included carbon monoxide (CO), nitrogen oxides (NO_x), sulfur oxides (SO_x), volatile organic compounds (VOC), and particulate matter (PM).¹⁵ For consistency, the same aircraft and taxiway operational data were used for this analysis as for the Phase 2 noise analysis. Sections 3.2 and 3.3 above, describe these in more detail.

The air quality assessment is comprised of two primary components: a quantitative analysis and a qualitative analysis. According to the results, two primary findings are evident when comparing Alternative 1 and Alternative 2. These are summarized as follows:

- Alternative 1 will result in lower (less) total aircraft emissions of all pollutants evaluated when compared to Alternative 2. This is because the total aircraft taxi and queue times are forecasted to be less for Alternative 1 than for Alternative 2.
- Under Alternative 1, fewer (less) aircraft emissions will also be generated north of Runway 15L when compared to Alternative 2. This is because taxiing and queuing aircraft will spend less time in this area of the airfield under Alternative 1.

The outcome of the air emissions inventory for the two taxi/queue alternatives is summarized in Table 7. As stated above, this inventory is only for taxiway operations north of Runway 15R. Expressed in units of tons/day, the results show that the total amounts of aircraft emissions are lower (less) under Alternative 1 when compared to Alternative 2. This is to be expected since the

¹³ 2003 Environmental Data Report (EDR), Boston Logan International Airport, June 2004, Table 6-8, p. 6-18, 2003 Modeled INM Results (DNL).

¹⁴ 2003 EDR, Table 6-4, p. 6-8.

¹⁵ For this assessment, VOCs also include hydrocarbons (HC) and it is assumed that PM includes both respirable (PM-10) and fine (PM-2.5) particulates. Because the pollutant ozone (O₃) is formed as a secondary pollutant from the interaction of NO_x and VOC, the two precursors are considered to be surrogates to the formation of this pollutant. Finally, emissions of hazardous air pollutants (HAPs) are assumed to be included as subsets to the pollutants VOCs and PM.

forecasted aircraft taxi and queue times on the November and Centerfield Taxiways are less by comparable amounts for Alternative 1 when compared to Alternative 2. For purposes of comparison, Table 7 also lists the total airport emissions for the same future condition taken from the Airside Improvements Planning Project Supplemental DEIS/FEIR. Figure 7 shows the emissions in graphical form, with the taxiway emissions north of Runway 15R on the worst-case day as a percentage of the airport-related total for an average day by type of pollutant and by taxi/queue alternative.

Importantly, neither alternative is expected to have a significant impact on regional air quality conditions. This is because the differences in the amounts of emissions between the alternatives are small when compared in context to the total amounts associated with the airport. Local air quality in the areas of East Boston and Winthrop, which are closest to Taxiway November, will also likely not experience any measurable effects from either alternative for much the same reason.

Table 7 Aircraft Taxiing & Queuing Emissions by Alternative and Total Airport Emissions

Location and time period	Alternative	Pollutant (tons per day)				
		CO carbon monoxide	VOC volatile organic compounds	NOx nitrogen oxides	SOx sulfur oxides	PM particulate matter
North of Runway 15R/33L on worst-case day	Alternative 1	1.72	0.27	0.27	0.06	0.009
	Alternative 2	2.04	0.33	0.33	0.07	0.011
Airport-related totals for an average day		13.58	2.23	7.20	0.59	0.24

Sources: Alternative 1 and Alternative 2 data from KB Environmental Sciences based upon EDMS output. Airport totals from Logan Airside Improvements Planning Project Supplemental DEIS/FEIR pp. 6-116 to 6-120, and converted from tons per year to tons per day.

Finally, the effects of total airport-related emissions (including those associated with Taxiway November and the Centerfield Taxiway) were also analyzed in the *Logan Airside Improvements Planning Project Supplemental DEIS/FEIR*. The dispersion modeling results from this analysis indicated that these emissions will not cause nor substantially contribute to any violation of the National Ambient Air Quality Standards. Furthermore, the differences in emissions between the alternatives evaluated in this study are not expected to exceed the *de minimis* emission thresholds contained in the Federal Clean Air Act General Conformity Rule.

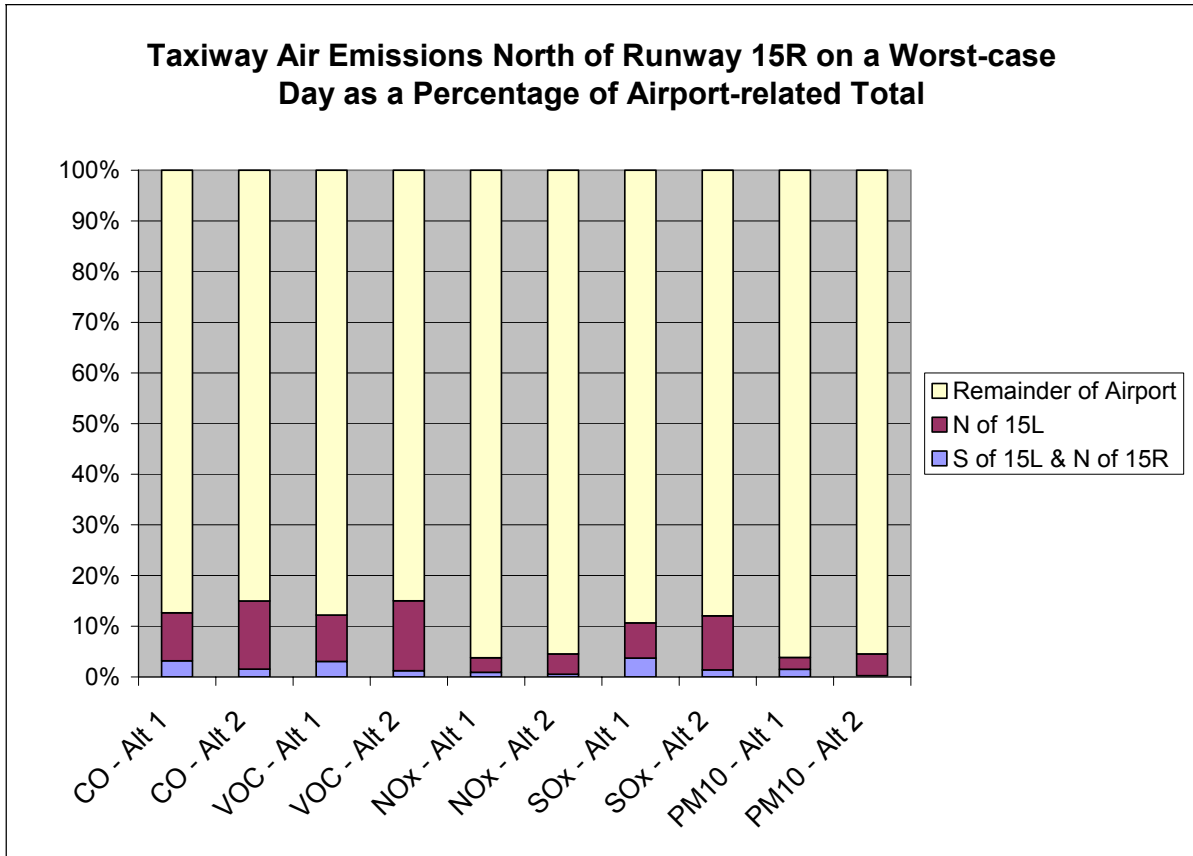


Figure 7 Taxiway Air Emissions North of Runway 15R on a Worst-case Day as a Percentage of Airport-related Totals on an Average Day

3.5 Conclusion

Phase 2 of this study evaluated the operational, noise and air quality effects of two taxiway use alternatives. Alternative 1 was modeled to represent the most efficient use of the taxiways, minimizing taxi/queue time, and Alternative 2 was intended to balance the queues on the November and Centerfield taxiways during busy periods. These two alternatives represent the extremes of how taxi and queue operations are expected to be carried out during southwest flow if the Centerfield Taxiway is constructed, thereby representing two conditions to bracket the range of potential environmental effects.

Alternative 2 as modeled was shown to be a somewhat less efficient use of the taxiways for departing aircraft on Runways 22R and 22L, resulting in approximately 17% additional taxi/queue time relative to Alternative 1 on worst-case busy days with those runways in continuous use for departures. However, the noise and air quality analyses reported above concluded that the environmental differences between the two alternatives are small enough such that there is not a significant environmental benefit to using one alternative over the other.

Since the two alternatives bracketed the range of environmental effects that could be expected for the full range of plausible use of the taxiways, no operational action could be identified that would yield

environmental benefits. It follows that FAA could operate the taxiways without restrictions and not cause environmental impacts on the community adjacent to the north end of the airfield.

4 SUMMARY OF EVALUATION FINDINGS

Conclusions of the Phase 1 studies are provided above in Section 2.5, and the conclusions of the Phase 2 evaluation are given above in Section 3.5.

The section below restates the requirements of the FAA's 2002 Record of Decision for the Airside Improvements Planning Project pertinent to the additional study process for the Centerfield Taxiway, and provides summary statements of actions taken to comply with and/or address these requirements. Most of the statements of compliance refer to sections of this report or its attachments that address the stated requirements. The language in the ROD is given in *italics*, and the response actions are in standard font.

Phase 1 would begin by developing a clear understanding of the concerns that the neighborhoods near the approach ends of Runways 22L and 22R have regarding operations on the existing taxiway system north of Runway 15R/L. The ROD describes several specific tasks that the Phase 1 effort should undertake, including:

- *Identify Federal and state regulations, policies and directives related to community concerns with taxi operations north of Runway 15R/33L. These include, at least, noise, air quality, and visual impacts.*

The policy that directly relates to community concerns with taxi operations north of Runway 15R/33L is the "Good Neighbor" policy. Noise and air quality impacts have been addressed in detail in other sections of this report and in four technical reports that are supporting attachments to this report. With respect to visual impacts, the viewscape at the north end of the airfield will not be changed by the construction of the Centerfield Taxiway.

- *Meet with representatives from neighborhoods surrounding the north end of the airport to better ascertain their concerns, solicit potential actions to address their concerns, and discuss operational difficulties in meeting current policy.*

Several meetings were conducted with three community representatives each from East Boston and Winthrop from 2003 through 2006. Actions were identified to address their concerns (Section 2.1), and operational issues and difficulties were discussed.

- *Review neighborhood concerns in the context of relevant federal and state policies, regulations, and directives in order to determine which relate to neighborhood concerns.*

This report has cited relevant federal and state regulations and policies as they relate to neighborhood concerns. Sections 1.2 and 1.3 refer to pertinent regulations and policies. Sections 2 and 3 of the report directly address community concerns about environmental conditions. Attachments A through G also contain many additional references to policies and regulations.

- *Assemble and review recent field monitoring results (e.g., noise and air quality impacts) and analyses of taxi operations, their impacts, or potential mitigation measures north of Runway 15R/33L.*

Noise and air quality field monitoring studies were assembled and reviewed in the course of the studies conducted for this report.

- *Conduct further field studies, if warranted, to document existing impacts associated with taxi operations (e.g., noise monitoring, air quality).*

A noise measurement program was conducted at community noise monitoring sites in June 2004 to determine taxi/queue noise levels and to validate the noise computation model. Details are given in the Attachment B Phase 1 noise study technical report Section 4 “Noise Model Validation – Comparisons with Measurements.”

Air quality monitoring was not conducted specifically for this study for several reasons. First, air monitoring is generally undertaken over a minimum time period of one year in order to account for the seasonal variations in meteorological conditions (i.e., wind speed and direction, atmospheric mixing heights, ambient temperature, sunlight, etc.) and the operational characteristics of air emission sources and background air pollution levels.

Second, historical long-term air monitoring data is collected regularly by Massport in the vicinity of the airport as part of their NO₂ air monitoring program, and is presented and analyzed in the Annual Environmental Data Reports (EDR) for Logan.

Finally, a new air monitoring study is called for as part of the approval of the Logan Airside Improvements Planning Project. This program is under development and will involve air monitoring in the vicinity of Logan over the appropriate timeframes.

- *Review the results of field studies to determine whether existing conditions approach or violate applicable regulations and what actions are warranted to mitigate the impacts of taxi operations.*

Both noise and air quality field studies were reviewed as a part of the analyses conducted in Phase 1 and 2. No existing violations of state or federal environmental regulations were identified.

- *Identify other candidate actions (beyond those suggested by the communities) that can mitigate impacts most appropriately. These actions will focus primarily on operational measures within the control of the FAA (e.g., taxi procedures) but may also include other actions that could address neighborhood concerns (e.g., physical changes to the airport, airline schedule, or gate management actions).*

The FAA identified three potential candidate actions for consideration. These are discussed in Section 2.1.

- *Review candidate actions and assess them at a high level to determine their effectiveness in addressing neighborhood concerns and impacts to safety, efficiency, capacity, cost, or other consequences.*

The assessment of the candidate actions is summarized in Section 2.1 of this report, and given in further detail in Attachment A, the Phase 1 operations report.

- *Develop a detailed plan, if warranted, to implement promising actions. The evaluation could be terminated if current conditions related to neighborhood concerns do not exceed federal or state standards or if candidate actions are not expected to be effective, safe, or within reasonable cost.*

The actions investigated either proved to be unworkable from a safety, efficiency, or cost standpoint, or the environmental benefits proved to be insignificant.

With respect to Phase 2, the ROD states the following:

Any decision with regard to approval of the Centerfield Taxiway, including appropriate beneficial operating procedures, will be made following completion of a Phase 2 Scope of Work and evaluation. A written re-evaluation will be conducted by FAA as to whether the decision can be

made based upon the data and analysis contained in the EIS and evaluation, or whether further environmental documentation is necessary before such a decision could be made.

The Phase 2 Scope of Work, evaluation and conclusions are given above in Section 3. In addition, three technical supporting documents are included as Attachments D, E and F.

The FAA written re-evaluation is prepared as a separate document.

5 CONCLUSION

5.1 Conclusion Summary

The sections above and the associated Attachments constitute the in-depth “additional evaluation of potential beneficial operational procedures that would preserve or improve the operational and environmental benefits of the Centerfield Taxiway shown in the Final EIS,” as called for in the FAA’s 2002 Record of Decision.

The Phase 1 participatory process outlined in the ROD identified nineteen candidate actions pertaining to ground operations in the northern end of the airfield under existing conditions (affecting primarily Taxiway November). An initial screening of the actions indicated that Massport or FAA had taken steps to address several of the actions at the time of the Phase 1 study. One of these actions (“revise the existing FAA noise abatement order to further limit the number of queued aircraft on Taxiway November”) was carried forward for more in-depth operational analysis and evaluation of environmental effects. This further analysis concluded that this procedure had negligible environmental benefits and was not appropriate for implementation. The overall conclusion to the Phase 1 study is that there are no appropriate taxi/queue restrictions, or other alternatives, that would provide significant environmental and/or operational benefits beyond those shown in the Final EIS.

Phase 2 of the process modeled two operational alternatives for the proposed Centerfield Taxiway and Taxiway November. The two alternatives were chosen to address the concerns of the community at the north end of the airfield and to bracket the range of environmental effects that could be expected for the full range of plausible use of the taxiways. The noise and air quality analyses concluded that the environmental differences between the two alternatives are small enough such that there is not a significant environmental benefit to using one alternative over the other. Therefore, since the alternatives studied bracketed the range of potential uses, no operational action could be identified that would yield environmental benefits.

5.2 Consistency with EIS Analysis

The noise and air quality environmental analyses conducted for this report were a focused evaluation in a small section of the surrounding community at the northern end of the airfield associated with varying operational procedures on specific taxiways. The analyses in the Additional Evaluation reflected in this report are consistent with those performed for the Logan Airside Improvements Planning Project Environmental Impact Statement, which addressed the environmental effects of the entire project on the entire community. The models, methodologies and data used in the analyses are similar to those used for the EIS and act as a refined analysis in a narrow context. Therefore, the results of the analysis on noise and air quality described in this report and its Attachments do not change any of the conclusions that were reached in the EIS from a cumulative impact perspective.

The airport layout and projected uses of the taxiways were the same in this study as they were in the EIS analysis. In addition, the following safety and efficiency enhancements provided by the Centerfield Taxiway as listed in Section 3.9.2 of the Final EIS were not modified in any way in this Additional Evaluation; the proposed taxiway:

- Provides multiple paths for routing aircraft to and from the ends of Runways 4L/22R and 4R/22L;
- Reduces the number and frequency of crossings of Runway 4L/22R;
- Enhances the efficiency of runway configuration changes;
- Avoids closing an active runway for use as a taxiway when other taxiways are temporarily unavailable;
- Enables controllers to position ground-delayed aircraft in locations other than the runway end areas;
- Facilitates the return of departing aircraft to the terminal area when required by equipment malfunction or de-icing, without delaying other aircraft;
- Increases the margin of safety by providing opportunities to move crossings away from areas where aircraft are operating at higher speeds.

The projected level of operations for future conditions in this focused Additional Evaluation (479,000 annual operations, based on the FAA's latest Terminal Area Forecast) is within 6 percent of the value used in the EIS for the 29M Low fleet scenario (510,000 annual operations).

5.2.1 Noise

A specific comparison of the noise results from this Additional Evaluation to those of the EIS for the communities at the northern end of the airport is addressed below. Since the EIS addressed the effects of both the proposed Centerfield Taxiway and Taxiway November together, the comparisons given below relate to the Additional Evaluation's Phase 2 study of those two taxiways, which is covered in detail in Section 3.3, above.

Three of the four Noise Monitoring Stations where noise levels were computed in this Additional Evaluation were also included in the EIS evaluation; these were NMS 7 at Loring and Court Roads in Winthrop, NMS 10 at Bayswater and Shawshen Streets in East Boston, and NMS 12 at East Boston Yacht Club. (The fourth NMS used in the Additional Evaluation was added to emphasize this study's examination of the area identified in the ROD).

The Additional Evaluation computed noise exposure (DNL) during *worst-case downwind* sound propagation conditions and on a *worst-case busy 24-hour day* for taxi/queue operations in the north end of the airfield. Table 3.10-2 of the Final EIS gives projected ground operations (taxi/queue) noise levels in terms of *annual average* DNL and for *average* sound propagation conditions. A more appropriate direct comparison of results is possible by comparing additional information presented in the Draft EIS/EIR in Tables 5.2-6 and 5.2-7 on page 5-38. There, computed ground taxi noise levels are given for both average sound propagation conditions (Table 5.2-6) and for "maximum" (worst-case) propagation conditions (Table 5.2-7). The differences in DNL between these two conditions averages 15 dBA at NMS 7, 10 and 12. While the models used to compute these noise levels are somewhat different than the model used in the Additional Evaluation, the difference between average and worst-case propagation conditions is comparable, and reasonable to apply to the Additional Evaluation results. Therefore, 15 dBA can be reasonably subtracted from the projected values in the Additional Evaluation to estimate DNL values for average propagation conditions. In addition, to account for differences between worst-case busy day and annual average day operations, a second adjustment is warranted. As stated in Section 5 of Attachment E, the Centerfield Taxiway noise technical report, departures on Runways 22R and 22L will only occur about 36 percent of the

time during a year.¹⁶ As such, annual average DNL values from taxi and queue operations as heard at the NMS locations surrounding the northern end of the airfield would be approximately 4 or 5 decibels lower¹⁷ than the values computed for the worst-case busy 24-hour period in the Additional Evaluation. Therefore, a total of approximately 19 or 20 decibels can be subtracted from the computed busy-day worst-case downwind DNL values to approximate the values shown in the Final EIS for NMS 7, 10 and 12. Table 8 presents the Taxi/Queue DNL noise levels computed in the Additional Evaluation (from Table 6, above), then subtracts the adjustments described above and presents the adjusted values for comparison with the annual average taxi-operations DNL values presented in the Final EIS in Table 3.10.2. Ranges or approximate noise levels are given as DNL values for the Additional Evaluation, to represent the range of levels computed for operational Alternatives 1 and 2, as modeled. The estimated annual average DNL values for the Additional Evaluation (Column 5) are very comparable to those listed in the EIS (Column 6).

Table 8 Computed DNL from Taxi/Queue Operations at the North End of the Airfield

Permanent Noise Monitoring Station	Addnl. Eval. Computed worst-case Busy-day DNL	Adjustment for Average Propagation	Adjustment for Annual Average DNL	Estimated Annual DNL range for Addnl. Eval.	DNL from FEIS Table 3.10-2 for 29M Low fleet	Flight activity DNL from Table 6.2-10 of SDEIS/FEIR*
1	2	3	4	5	6	7
NMS 7	64 to 65	-15	- 4 to -5	44 to 46	45.1	75.1
NMS 9	66 to 67	-15	- 4 to -5	46 to 48	42.1	65.1
NMS 10	68	-15	- 4 to -5	47 to 48	47.3	70.0

* DNL from departing and arriving aircraft for Alternative 1A and the 29M Low fleet, from p. 6-45 of the Logan Airside Improvements Planning Project Supplemental DEIS/FEIR, Vol. 2, March 2001.

The last column in Table 8 lists the DNL from flight operations only (departing and arriving aircraft) for Alternative 1A and the 29M Low fleet, from Table 6.2-10 of the Airside Improvements Project Supplemental DEIS/FEIR. At each of the sites, these values are between 17 and 31 decibels higher than the computed taxi/queue noise DNLs at the same locations. As a result, the combined total aircraft noise from the taxiway plus aircraft in flight is less than 0.1 decibels higher than the flight operations noise alone. This finding is consistent with the conclusions stated in the Logan Airside Draft EIS/EIR (p. 5-37), which states “The results clearly show that the noise exposure from taxi operations is significantly less than that from in-flight operations, especially for the case of average propagation.”

A refined conclusion is reached in the current analysis. Even under worst-case sound propagation conditions, there is no significant difference between the noise of the alternative operational scenarios evaluated in this study, and the results of either alternative clearly show that the noise exposure from taxi operations is significantly less than that from in-flight operations.

¹⁶ Taken from 2003 Environmental Data Report (EDR), Boston Logan International Airport, June 2004, Table 6-4, p. 6-8.

¹⁷ $10 \log (0.36) = -4.4 \text{ dB}$. This adjustment would increase further with average-day traffic, but this factor was not quantified.

5.2.2 Air Quality

A specific comparison of the air quality studies from this Additional Evaluation to those of the EIS for the communities at the northern end of the airport is addressed below. Since the EIS addressed the effects of both the proposed Centerfield Taxiway and Taxiway November together, the comparisons given below relate to the Additional Evaluation's Phase 2 study of those two taxiways, which is covered in detail in Section 3.4, above.

For consistency, the Additional Evaluation air quality analyses for the Taxiway November and proposed Centerfield Taxiway alternatives were accomplished using the same basic approach, models and methodology as were used in the Logan Airside Improvements EIS air quality assessment. In this way, the results and findings from both sets of analyses are more easily evaluated and compared.

As an example, the application of emissions inventories to compare the potential air quality impacts of one alternative to another was used in all cases. Expressed in units of tons/day and tons/year for the primary U.S. EPA criteria pollutants and their precursors (e.g., CO, VOCs, NO_x, SO_x and PM), the results of the emissions inventories disclose the differences (if any) in airport-related emissions between the various alternatives. In the case of the Additional Evaluation, the focus was on aircraft-related emissions north of Runway 15R whereas the EIS included these emissions as well as the emissions from all other sources and areas of the airport. Because of this, the Additional Evaluation emphasizes any differences that might exist between taxiway use alternatives.

In accordance with FAA requirements and EPA recommendations, the FAA Emissions & Dispersion Modeling System (EDMS) was also utilized for both the Additional Evaluation and the EIS air quality analyses. In both cases, the most recently available versions of the model were used. EDMS is a computer-based model developed specifically for the purpose of evaluating airport-related sources (e.g., aircraft) of air emissions. EDMS contains the latest emission factors for aircraft engines, including those operating at Logan.

Other common methodologies between the Additional Evaluation and the EIS air quality analyses involve the modeling of aircraft-related emissions while in the taxi/idle mode. The aircraft engine emissions generated during these low-power, ground-based periods are important when evaluating the effects of aircraft taxing and queuing alternatives. Again, the principal difference between the two sets of analyses is that the EIS assessment evaluated aircraft taxi/idle emissions airport-wide while the Additional Evaluation focused on aircraft emissions generated on the north end of the airport (north of Runway 15R). In other words, the latter (e.g., the Additional Evaluation) is a subset of the former (e.g., the EIS) with respect to aircraft taxi/idle emissions at Logan.

Another important similarity between the air quality analyses is that the future-year aircraft operational levels analyzed in the Additional Evaluation are closely representative of the 29M-Low operational level analyzed in the EIS.

The emissions inventory results for the Taxiway November and proposed Centerfield Taxiway alternatives are summarized in Table 1 of Attachments C (*Air Quality Analysis of Aircraft Taxing & Queuing Alternatives for Taxiway November*) and F (*Air Quality Analysis of Aircraft Taxing & Queuing Alternatives for the Proposed Centerfield Taxiway*), respectively, of this report.

Section 6.4 (*Air Quality / Odors*) of the EIS contains the results of the emissions inventory, including those associated with the 29M "Low" operational forecasts (i.e., as discussed above, the level of

operations most closely aligned with the operational conditions evaluated in the Additional Evaluation analysis).

By comparing the two sets of data, it is evident that aircraft taxi/idle emissions on the north end of the airport (e.g., north of runway 15R) are but a fraction of the airport-wide totals. (This is also shown in Table 1 of Attachments C and F.) Moreover, the differences in emissions between the Taxiway November and proposed Centerfield Taxiway alternatives is an even smaller fraction of the airport-wide totals. These small percentages and differences in aircraft taxi/idle emissions are important as they help to form the findings and conclusions of the Additional Evaluation report.

For example, based on the emissions inventory results for the Taxiway November and proposed Centerfield Taxiway alternatives summarized in Table 1 of Attachments C and F, respectively, the proposed actions are not expected to exceed the *de minimis* emission thresholds contained in the Federal Clean Air Act General Conformity Rule. Therefore, the requirements of the General Conformity Rule do not apply. This same conclusion was drawn in the air quality analysis of the EIS.

Finally, because the dispersion of emissions from Logan is affected by a wide assortment of influences and variables (e.g., total emissions and meteorological conditions airport-wide), the dispersion modeling results in the EIS are among the best indicators of air quality conditions in areas adjoining the airport. As shown in Figure 6.4-1 (*Air Quality Modeling Receptor Locations*), several of the off-airport areas specifically evaluated for air quality impacts in the EIS include Constitution Beach (receptor 2), Bayswater (receptor 3) and Court Road (receptor 4). Table 6.4-10 (29M Low fleet Scenario Dispersion Modeling Results Summary) contains the EIS modeling results.

As shown, total air emissions associated with the airport are not predicted to cause violations of the National Ambient Air Quality Standards (NAAQS). Because of the consistency and similarities between the Additional Evaluation and the EIS air quality analyses discussed above, it can also be concluded that none of the Taxiway November and the proposed Centerfield Taxiway operational alternatives will cause violation of the NAAQS.