APPENDIX E
ALTERNATIVES

This appendix contains background material, which supplements the material contained in main body of the EIS, especially **Chapter 3, Alternatives.** This appendix consists of the following sections:

- E.1 Background on Initial Screening of Alternatives
- E.2 Airport Development Parameters
- E.3 Facility Requirement Summary Based on the O'Hare International Airport Master Plan
- E.4 O'Hare Development Alternatives - Layouts with Land Use Delineation
- E.5 Further Description of Alternatives Retained for Detailed Consideration
- E.6 Operational and Delay Characteristics of Alternatives Retained for Detailed Consideration

E.1 BACKGROUND ON INITIAL SCREENING OF ALTERNATIVES

As noted in **Chapter 3, Alternatives,** the initial screening of alternatives was the first step in the screening process. This screening provides an assessment of the full range of alternatives identified relative to their ability to meet the purpose and need as stated in **Chapter 2, Purpose and Need:**

- Address the projected needs of the Chicago region by reducing delays at O'Hare, and thereby enhancing capacity of the NAS.
- Ensure that existing and future terminal facilities and supporting infrastructure (access, landside, and related ancillary facilities) can efficiently accommodate airport users.

Screening in NEPA is intended to focus study on potentially "reasonable" alternatives by eliminating concepts that would clearly not provide reasonable solutions to the problems, which are enumerated in the purpose and need. To meet NEPA's requirement that all "reasonable" alternatives be considered, the screening process must not eliminate any alternative that might provide a reasonable approach to the problem.

E.1.1 Delay Criterion

The purpose of this criterion is to screen out concepts that clearly do not have the potential to substantially reduce delays and ensure that the infrastructure will accommodate airport users. Although this criterion examines only the factors to be considered in eliminating or retaining alternatives for detailed evaluation, it is a critically important factor. A screening criterion based on delay should have the following characteristics.

- The criterion should not eliminate alternatives that could provide substantial benefits, even if such benefits are not optimal in terms of delay reduction.
- It must be applicable to very different types of alternatives including O'Hare development, use of other airports, congestion management, and combinations of partial solutions (blended alternatives).

E.1.1.1 Criteria Used in Other NEPA Studies

NEPA documents for airfield capacity enhancement/delay reduction projects frequently establish specific maximum acceptable levels of delay as criteria for retaining alternatives for detailed evaluation.

When explicit delay criteria are used, the average annual delay per operation is frequently used because it best represents the value of delay reduction to the airlines and traveling public and is typically provided through the master planning process. Airfield capacity related NEPA studies have established varying thresholds of acceptable delay. These thresholds of delay are sometimes justified on the basis of nationally recognized planning guidelines. The specific threshold of delay used for a given project may also be influenced by the anticipated environmental and economic costs of the project, and the potential benefits of the available alternatives.

The *Miami International Airport EIS*[1] used 10 minutes per operation of average annual delay as a measure of acceptable delay, citing it as a "national standard." The *Denver International Airport EIS*[2] used 6 minutes per operation of average annual delay. The *Logan Airside Improvements Planning Project EIS,*[3] for Boston Logan International Airport (Boston Logan), justified airfield improvements on the basis of existing problems, including high levels of delay. A number of metrics were used to illustrate these delays and their effects on the NAS. Among these analyses, the FAA Consolidated Operations and Delay Analysis System (CODAS)[4] was used to compare Boston delays with other airports for the 12 months ending November 2000. At Boston Logan, delays averaged 7.86 minutes per operation over this period, and it was concluded that actions to reduce delay were required as delays approached 8 minutes per operation.

E.1.1.2 Other Sources of Delay Criteria

The following sources of delay criteria were also investigated.

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1 Record Of Decision for Proposed New Parallel Runway and Associated Work at Miami International Airport, December1998 (http://www.faa.gov/arp/app600/5054a/rodmia.doc)
2 New Denver Airport Environmental Assessment, November, 1998.
3 Record of Decision for Airside Improvements Planning Project Logan International Airport, August 2, 2002.
4 The CODAS database has been superseded by the Aviation System Performance Metrics (ASPM) database.

National Plan of Integrated Airport Systems (NPIAS) 2005 – 2009

The most recent 2005-2009 NPIAS states the following:

> The relationship between aircraft operations and delay is non-linear, and often exponential. Experience shows that airfield delay increases gradually with rising levels of traffic until a certain level is reached. Thereafter, the delay rises more rapidly with increased traffic. For larger airports, it is our observation that the onset of the more rapid growth in delay often occurs when delay is between 4 and 6 minutes per aircraft operation. In 2002, 17 airports [including O'Hare] had an average delay in excess of 6 minutes per operation.[5]

NPIAS 2001- 2005

The 2001-2005 NPIAS provided the following planning guidelines related to airport congestion:

> Experience shows that delay increases gradually with rising levels of traffic until the practical capacity of an airport is reached, at which point the average delay per aircraft operation is in the range of 3 to 5 minutes. Delays increase rapidly once traffic demand increases beyond this level. An airport is considered to be congested when average delay exceeds 5 minutes per operation. Beyond this point delays are extremely volatile, and a small increase in traffic, adverse weather conditions, or other disruptions can result in lengthy delays that upset flight schedules and impose a heavy workload on the air traffic control system.[6]

NPIAS 1993-1997

In addition to the above statement, the 1993-1997 NPIAS stated that:

> Experience shows that delays increase gradually with rising levels of traffic until the practical capacity of an airport is reached, at which point the average delay per aircraft operation is in the range of 4 to 6 minutes. Delays increase rapidly if traffic demand increases beyond this level. An airport is considered to be severely congested when average delays exceed 9 minutes per operation.[7]

FAA Airport Capacity Benchmark Reports (2001 and 2004)

Review of the *Airport Capacity Benchmark Report 2001* and *2004* showed that no specific delay criterion was established – rather delay was quantified for each airport considered, along with the differences between good weather and adverse weather operational conditions.

Operating Limitations at O'Hare International Airport

Unprecedented levels of delay at O'Hare, and their "detrimental effect on the operational efficiency of the NAS"[8] prompted the FAA to convene delay reduction discussions by the authority vested pursuant to Section 422 of Public Law 108-176 (Vision 100 Century of Aviation Reauthorization Act, 49 USC §41722). In January of 2004, the FAA issued an *Order*

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5 National Plan of Integrated Airport Systems (NPIAS) 2005-2009 Report to Congress, FAA, September 30, 2004.
6 National Plan of Integrated Airport Systems (NPIAS) 2001-2005, FAA, August 28, 2002.
7 National Plan of Integrated Airport Systems (NPIAS) 1993-1997, FAA, April 7, 1995.
8 Order Limiting Scheduled Operations, FAA Docket FAA-2004-16944-1, January 21, 2004. See **Attachment A-4** in **Appendix A, Background**.

Limiting Scheduled Operations (Docket No. 2004-16944-1) (Order) in response to the increasing delays at O'Hare. The voluntary limitations documented within the Order effectively required each carrier to reduce its published schedule for February 2004 by 5 percent between 1:00 p.m. and 8:00 p.m. Central time. A review of the FAA's ASPM database for November and December 2003 indicates that delays averaged in excess of 20 minutes per operation at O'Hare. The FAA decision to take this temporary action is a clear indication that delays of this magnitude are considered unacceptable. FAA followed the Order with an amendment and an additional order extending the limitations to April 30, 2005. For a full discussion of the Orders see **Chapter 2, Purpose and Need, Section 2.2.4, FAA Orders Approving Limited Operations at O'Hare.**

FAA Benefit-Cost Analysis Guidance

The FAA *Airport Benefit-Cost Analysis Guidance*[9] methodologies recognize 15-20 minutes as the maximum realistic level of delay that any one airport has historically sustained. While that level represents the theoretical saturation point for delay, it also represents a highly congested condition that provides value in identifying concepts offering substantial delay reduction benefits.

E.1.1.3 Conclusion on Delay Criterion

A range of general descriptive conditions can be used for average annual delay in minutes per operation.

- 4-6 minutes as the "onset of the more rapid growth in delay" as stated in the FAA 2005-2009 NPIAS
- 3-5 or 4-6 minutes as the threshold of practical capacity as defined by previous editions of the NPIAS
- 15-20 minutes as the current operating condition at O'Hare based on historical data presented in **Appendix A, Background**
- 6, 8, and 10 minutes used as levels of acceptable delay in previous NEPA studies nationwide
- monthly delays in excess of 20 minutes per operation, the point at which FAA initiated voluntary limitations at O'Hare
- 15-20 minutes as the theoretical maximum delay an airport can sustain based on *Airport Benefit-Cost Analysis Guidance*

For screening purposes, it is important that no reasonable alternative be eliminated from further consideration. Accordingly, screening criteria should only eliminate alternatives that would result in clearly unacceptable conditions and would perform more poorly than other alternatives without countervailing benefits. While average annual delays of 5 minutes or less notes the beginning of a congested condition, many hub airports routinely operate at higher

[9] FAA Airport Benefit-Cost Guidance, FAA, December 15, 1999.

levels of delay. At levels above 20 minutes, delays at O'Hare were considered to be so detrimental that the FAA initiated discussions with air carriers to temporarily limit activity. In this EIS, the FAA has elected to forego the use of any specific absolute level of delay in favor of a comparative analysis among the various alternatives.

E.1.2 Non-Airfield Alternatives

During the initial screening, each of the Non-Airfield alternatives was assessed individually, as described in detail in the following sections.

E.1.2.1 Other Modes of Transportation or Communication

Other modes of transportation or communication that were considered include: conventional rail, high-speed rail, highways, and telecommunications, as presented below.

Conventional Rail. The potential for conventional rail to divert air passengers and cargo from O'Hare depends on travel time, cost, and frequency of service. **Table E-1** compares the aviation and rail service between the 12 markets within 4 hours rail travel time that have both rail and air service (4 hour travel time represents the short haul markets for which rail transportation is most likely to be a viable alternative to air transportation). The table shows that the frequency of trips is far greater for air travel than for rail; and that the travel time is also much quicker by air than by rail (although the difference may be somewhat less pronounced when ground access, check-in, and security screening times are considered). Fares for air travel are on average five times that of rail.

TABLE E-1
AIR AND RAIL PASSENGER SERVICE TO CITIES WITHIN 4 HOURS RAIL TRAVEL TIME OF CHICAGO

Destination City	Air Miles(a) (nm)	Originating Passengers in CY 2002(b)	Number of Daily Departures from Chicago		Estimated Travel Time to Destination (minimum)		Current 14-Day Advance Roundtrip Fare	
			Air(c)	Train(d)	Air	Train(e)	Air(f)	Train(g)
1. Milwaukee, WI (MKE)	67	5,220	30	7T	0:50	1:29	$175	$40
2. South Bend, IN (SBN)	84	2,480	8	7T(h)	0:47	2:09	$180	$21
3. Champaign, IL (CMI)	135	3,480	7	2T,2T/B	0:44	2:10	$248	$28
4. Bloomington, IL (BMI)	116	1,730	8	3T	0:50	2:12	$240	$22
5. Kalamazoo, MI (AZO)	122	4,190	7	4T	0:40	2:21	$221	$34
6. Springfield, IL (SPI)	174	7,070	5	3T	1:00	3:18	$181	$32
7. Madison, WI (MSN)	108	6,310	27	4B	0:44	3:20	$181	$54
8. Toledo, OH (TOL)	212	14,700	4	2T	0:51	3:38	$203	$56
9. Indianapolis, IN (IND)	177	54,740	23	1T, 2B, 3T/B	0:59	3:45	$93	$32
10. Lansing, MI (LAN)	178	2,290	4	1T,2T/B	0:57	3:53	$238	$40
11. Grand Rapids, MI (GRR)	136	17,220	17	1T, 2T/B	0:44	3:55	$175	$52
12. Appleton, WI (ATW)	161	5,100	12	1T/B	0:50	4:00	$259	$82
Total		**124,530**	**152**	**47**				

Notes: (a) Air miles were provided by www.webflyer.com/travel/milemarker.
(b) USDOT 10% Passenger Ticket Survey – Domestic Calendar Year (DCY) 2002.
(c) Air frequencies listed are only for non-stop flights. In most cases, a considerably greater number of connecting options are available.
(d) Includes trains to and from Chicago. All trips to and from Madison are provided by bus service. Some of the Amtrak trips to other cities included both train "T" and bus "B" segments. These are indicated with a slash "/".
(e) Train travel times were provided by www.amtrak.com and were based on their schedule as of March 9, 2004.
(f) Airfares are based on the lowest 14-day advance, weekday, roundtrip, most direct flight from Chicago O'Hare to each market, www.expedia.com, April 15, 2004.
(g) Train fares for all but South Bend were provided by Amtrak and were based on their schedule as of March 9, 2004. Two of the seven trips to South Bend were provided by Amtrak; the other five are provided by the South Shore Line. The price shown is for the South Shore Line, www.nictd.com. The current roundtrip fare to South Bend on Amtrak ranges from $26-$29.

Additional Notes:
Total originating passengers at O'Hare (CY2002): 15,556,000 (100%).
Total originating passengers forecast at O'Hare (2018): 27,251,500.

While conventional rail service is an alternative in nearby markets, the potential is limited to short-haul markets as identified above. The originating passenger demand in the 12 short-haul markets identified on **Table E-1** represent about 0.8 percent of the total originating passenger traffic at O'Hare. Even if a significant portion of this short-haul market demand were converted from air to rail, this would not materially reduce the total aviation demand at O'Hare.

Furthermore, the historical growth in passenger activity at O'Hare indicates that air travel is preferred over rail travel, even in markets where rail fares are considerably lower than airfares. Limited service and longer travel times are major barriers to greater use of rail in the markets presented in **Table E-1.** Therefore, substantial increases in the number of trains and decreases in travel time would be required to divert significant numbers of air passengers to rail travel;

and either of those changes would require significant investments over extended periods of time.

The conclusion is that conventional rail would not satisfy the purpose and need—the investment required to attract more air passengers to rail cannot be assured, and the potential market "pool" is not sufficiently large to offset the forecast demand generating the need for O'Hare improvements.

High-Speed Rail. Congress has established several high-speed ground transportation corridors linking select high-density metropolitan areas for the ultimate development of high-speed rail service. The Chicago hub corridor links the major cities of St. Louis, Minneapolis, Detroit, Indianapolis, and Cincinnati, as well as several medium-sized cities, such as Ann Arbor, Kalamazoo, Bloomington, Springfield, and Madison.

Recent congressional legislation addressing high-speed rail is summarized below:

- The High Speed Rail Reinvestment Act, proposed in the Senate on January 31, 2001, allows Amtrak to raise $12 billion in capital funding for high-speed rail projects nationwide.[10]
- House of Representatives Bill 2571, Railroad Infrastructure Development and Expansion Act for the 21st Century (RIDE-21), was introduced on June 24, 2003. In addition to other items, RIDE-21 amends the Swift Rail Development Act in order to make corridor development activities eligible for federal assistance for FY 2004-2011. It also allocates funding for high-speed rail projects, passenger and freight rail infrastructure improvements, and development of modern high-speed ground transit technology such as magnetic levitation.[11]
- Safe, Accountable, Flexible, and Efficient Transportation Equity Act of 2003 (SAFETEA-21) includes $300 Million funding authorization through 2009 for High Speed Rail Corridor Planning and Technology Improvements.[12]

Congress has also appropriated funds for the improvement of grade crossings along the Chicago to St. Louis corridor to allow train speeds of up to 110 miles per hour. The Illinois Department of Transportation has published a Final Environmental Impact Statement[13] for the development of high-speed rail passenger service between Chicago and St. Louis, and Amtrak has been upgrading rail crossings and track to increase average speeds along the Chicago to St. Louis corridor.[14] Certain Midwest states and Amtrak will provide additional funding for continuation of the Midwest Regional Rail Initiative study.[15]

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[10] Greater Rockford Transportation Coalition, http://www.rockfordtransportation.org/issues/high_speed_rail.asp.
[11] THOMAS Legislative Information on the Internet, http://thomas.loc.gov/
[12] USDOT website, http://www.fhwa.dot.gov/reauthorization/authorizations.htm
[13] Chicago-St. Louis High Speed Rail Project, USDOT, Federal Rail Administration, Federal Highway Administration, Illinois Department of Transportation; http://www.dot.state.il.us/hsrail/highspdinfo.html
[14] Environmental Law and Policy Center website, www.elpc.org/trans/rail/rail.htm.
[15] Federal Railroad Administration web site, www.fra.dot.gov/site/index.htm. Transportation Secretary Slater Announces Extension of Chicago Hub High Speed Rail Corridor to Indianapolis and Cincinnati, www.dot.gov/affairs/fra0199.

Numerous research and development studies of high-speed ground transportation (HSGT) have been undertaken by and for the U.S. Department of Transportation (DOT) over the past 20 years. Congress recently enacted legislation promoting the development of state-of-the-art HSGT technology. In May 1999, the Department of Transportation selected seven projects to participate in a one-year program of pre-construction planning to identify the most promising project. None of the proposals, however, involved any part of the Chicago Hub HSGT corridor; these projects were located in California, Florida, Georgia, Louisiana, Maryland, Nevada, and Pennsylvania. On January 18, 2001, the U.S. Secretary of Transportation announced the selection of two projects in Maryland and Pennsylvania to be advanced into the next phase of the competition to build and demonstrate the first maglev high-speed train system in revenue service in the United States.[16]

There are currently no plans to implement high-speed rail in the Chicago area that would significantly reduce total passenger demand at O'Hare. In the absence of such plans, it is not reasonable to assume that high-speed rail development would satisfy purpose and need. If and when any such plans are approved, it is likely that (a) the time required to finance and construct major high-speed rail lines would be beyond the time horizon in which improvements are needed at O'Hare, and (b) the individual markets served by any new high-speed rail lines would represent a relatively small share of the total passenger demand at O'Hare.

Highway Travel. Highway travel is already an alternative to air travel at O'Hare, but does not provide the same benefits as air travel. A review of the trip characteristics of air travelers using O'Hare indicates that a majority of passengers begin or end their trips at a point more than 500 miles from O'Hare. Beyond 500 road miles (approximately ten hours or one day drive time), alternative modes of transportation to air travel would likely become less desirable, especially for business travelers. This would also be true for leisure travelers, particularly for those traveling on discounted fares. To travel the same 500 miles by air would take approximately one and one-half hours, exclusive of drive time to and from airport facilities and time spent in the check-in, security screening, and baggage retrieval processes. It is estimated that these pre and post-flight procedures add another two hours to the flight time. With a resultant air travel total trip time of approximately three and one-half hours, other modes of transportation, such as a bus or automobile, would not provide the same level of service.

Based upon an analysis of the top 25 markets for O'Hare travelers during 2002, approximately 93.5 percent of passengers in these markets begin or end their trips at a point more than 500 miles from the Airport. The time required for highway travel to destinations of 500 miles or more (ten hours by car compared to approximately three and one-half total trip hours by air) limits the attractiveness of highway travel as an alternative, especially for business travel.

Table E-2 lists the origin and destination data for the top 25 markets for O'Hare travelers, and compares the distances to those airports in both air and highway miles. Of these markets, only one is located within 250 miles of O'Hare, with four others located between 251 and 500 miles.

[16] http://www.dot.gov/affairs/fra201.htm

As presented, these markets accounted for 1,000,000 originating passengers in 2002 - about 6.5 percent of all originating activity at the Airport in 2002. Thus, even if all of the air travelers to these five markets could be induced to travel by automobile instead of by aircraft (about 1,800,000 annual originating passengers in 2018), it would not result in a significant reduction in activity at O'Hare and would not materially reduce or delay the need for the proposed projects. Thus, this highway travel alternative would not satisfy purpose and need.

TABLE E-2
TOP 25 ORIGIN-DESTINATION MARKETS
CHICAGO O'HARE INTERNATIONAL AIRPORT

Airport	3 Letter Airport Identifier	Originating Passengers in 2002 (a)	Air Miles (sm) (b)	Estimated Air Travel Time (hours) (c)	Road Miles (sm) (d)	Estimated Road Travel Time (hours) (e)
1. LaGuardia	LGA	586,150	731	2.1	818	16.4
2. Los Angeles International	LAX	562,020	1,740	4.4	2,089	41.8
3. Newark Liberty International	EWR	440,120	717	2.2	802	16.0
4. McCarran International	LAS	431,850	1,511	3.9	1,749	35.0
5. San Francisco International	SFO	394,760	1,841	4.7	2,138	42.8
6. Phoenix International	PHX	380,560	1,438	3.8	1,914	38.3
7. Philadelphia International	PHL	353,880	676	2.0	783	15.7
8. Hartsfield-Jackson Atlanta International	ATL	344,050	605	2.0	749	15.0
9. Boston-Logan	BOS	331,920	864	2.3	1,004	20.1
10. Denver International	DEN	326,860	885	2.6	992	19.8
11. Dallas/Fort Worth International	DFW	304,160	801	2.5	989	19.8
12. Orlando International	MCO	296,630	1,004	2.7	1,219	24.4
13. Washington-Reagan	DCA	290,850	610	1.8	719	14.4
14. Detroit Metropolitan Airport	**DTW**	**261,610**	**234**	**1.3**	**289**	**5.8**
15. Houston -Intercontinental	IAH	243,590	926	2.8	1,219	24.4
16. Seattle-Tacoma International	SEA	228,150	1,714	4.5	2,055	41.1
17. Minneapolis-St. Paul International	**MSP**	**224,270**	**334**	**1.5**	**397**	**7.9**
18. Fort Lauderdale – Hollywood International	FLL	223,000	1,183	3.0	1,447	28.9
19. Baltimore-Washington International	BWI	212,010	620	1.9	720	14.4
20. Tampa International	TPA	193,510	1,014	2.6	1,233	24.7
21. Lambert-St. Louis International	**STL**	**193,140**	**262**	**1.2**	**305**	**6.1**
22. San Diego International	SAN	191,240	1,719	4.4	2,143	42.9
23. John Wayne	SNA	173,490	1,722	4.4	2,011	40.2
24. Kansas City International	**MCI**	**168,330**	**403**	**1.5**	**523**	**10.5**
25. Cleveland Hopkins International	**CLE**	**160,420**	**314**	**1.3**	**350**	**7.0**
Total		7,516,570				

Notes: (a) CY 2002, USDOT 10 % Passenger Ticket Survey via BACK Aviation Solutions.
(b) Air miles - Great Circle Distance (statute miles) calculated from OAG schedules via BACK Aviation Solutions.
(c) Estimated from OAG schedules for November 12, 2004 via BACK Aviation Solutions.
(d) Road miles - statute miles from www.randmcnally.com; based on fastest route.
(e) Based on an average speed of 50 mph.

Additional Notes:
Bold text indicates those markets within 500 statute miles of O'Hare.
Total originating passengers at O'Hare (CY2002): 15,556,000 (100 %).
Total originating passengers forecast at O'Hare (2018): 27,251,500.

Telecommunications. Rapidly emerging technology, such as fiber optics, state-of-the-art electronic signal technology, video-conferencing, and collaborative computing could potentially satisfy at least some of the demand for air travel for business purposes. Considerable progress in the reliability and speed of voice and data communication has been made in the last decade. Two notable studies have been conducted to assess the impact of communication technology on air travel demand.

A report prepared for the Massachusetts Aeronautics Commission indicated that video-conferencing could reduce air travel demand at Boston Logan International Airport by 7 percent in 2010 and 15 percent by 2030.[17] Additional key findings applicable to Chicago include: (1) video conferencing has the potential to reduce non-discretionary travel (typically a business traveler) between 5 percent and 30 percent; and (2) new technology will have little influence on reducing discretionary travel demand.

A 1994 study by Apogee Research for the Federal Aviation Administration estimated that telecommunication has the potential to reduce business-related air travel demand by 11 percent and overall air travel demand by 4 percent.[18] However, the report also noted that improved telecommunications may have the opposite effect on aviation demand. Cost savings and productivity gains produced by telecommunications may enable businesses to expand their market areas or decentralize their operations in ways that were not previously possible.

Despite the emergence and availability of wide-scale telecommunications technology for many years, telecommunications technologies seem to have had little or no impact on demand for air travel at O'Hare, as can be seen in the increase in originating passengers served by the Airport between 1992 and 2002. During this period, originating passengers at O'Hare increased over 10 percent, notwithstanding the nationwide downturn in aviation activity associated with the events of September 11, 2001 and the weakened global economy of the early 2000's. The FAA's Aerospace Forecasts, Fiscal Years 2004-2015,[19] includes consideration of new technology such as videoconferencing, noting that this is one factor that has made business travel more price elastic (or, sensitive to changes in airfares). However, FAA does not list new technology or videoconferencing as a factor that, by itself, materially affects the expected growth in future aviation demand nationwide.

Improved telecommunications capability is reflected in the historical trend of activity at O'Hare, including the historical data analyzed by FAA in preparing the TAF for O'Hare. It is therefore reasonable to conclude that this factor is accounted for, at least implicitly, in the expected future trend of growth at O'Hare indicated by FAA's TAF.

Consequently, increased use of telecommunications would not meet the purpose and need for the proposed action.

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[17] Strategic Assessment Report, Executive Summary, Report to the Massachusetts Aeronautics Commission, July 1993, Arthur D. Little, Inc.

[18] Assessing the Impact of Telecommunications of Business and Pleasure Travel, Prepared for the Federal Aviation Administration, January 7, 1994, Apogee Research, Inc.

[19] FAA Aerospace Forecasts, Fiscal Years 2004-2015, March 2004.

Conclusions Regarding Other Modes of Transportation and Communication

Individually or collectively, the Other Modes of Transportation and Communication Alternative described above would not meet the purpose and need of the proposed action. The uses of conventional rail, high-speed rail, and highways would each be targeted to the short-haul origin-destination markets at O'Hare. These markets, after redundancy in rail (0.8 percent) and highway segments (6.5 percent) is accounted for, represent at most about 7 percent of the total originating passenger demand at O'Hare, which is far less than the amount that would need to be diverted in order to avoid the need for capacity improvements at O'Hare. The use of telecommunications is not guaranteed to reduce travel demand. In fact, some analysts believe that improved telecommunications could actually increase travel demand, as improved connectivity would potentially increase the number of business relationships and therefore require additional travel to service these relationships. Further, the impact of telecommunications is reflected in historical data on airline activity, as there have been continuing advancements in this technology over the past several years. Because FAA uses historical trend data in preparing the TAF, and telecommunications have been in use during the historical period considered by FAA, it is reasonable to expect that improvements in telecommunications are reflected in the FAA's TAF.

E.1.2.2 Use of Other Airports

All alternatives considered within the EIS were given careful consideration. However, the detailed consideration of the Use of Other Airports is lengthy and of particular interest to various Federal, State, and local agencies, as well as the public. Therefore, this alternative is presented separately in its own **Appendix C, Use of Other Airports. Appendix C** has two main sections: **Section C.1, Use of Other Regional Airports,** and **Section C.2, Use of Other Mid-Continent Hubs.**

E.1.2.3 Congestion Management

Congestion management has been increasingly suggested as an alternative to the development of increased airport capacity, particularly where development of new capacity is substantially precluded by site constraints. The options discussed below are classified as either market-based or administrative options. It would also be possible to create hybrid options based on the characteristics of each option; however, these options would produce results that would be in the range of the market-based and administrative options.

Market-Based Options

Market-based options would use economic incentives to manage demand. Two general types of market-based options are typically considered.

- Under a congestion based pricing approach, the price would first be set and carriers would then respond to it by changing the number of operations at the airport. By setting a congestion-based fee, the monetary cost of operating at O'Hare could vary throughout the congested period. The increase in aircraft activity despite increasing delays at O'Hare following the grant of unlimited exemptions from the High Density

Rule indicates that airlines will not necessarily limit activity to maintain levels of delay consistent with the efficient operation of an individual airport or the NAS.[20] Analysis done for the Port Authority of New York and New Jersey and the FAA in response to the addition of exempted operations[21] indicates that establishing the congestion price would be an iterative process until a balance between the demand for and the supply of available capacity is achieved.

- Under an auction, the operational limit of the airport is first established and then carriers are allowed to bid on the use of this capacity. Similarly to the congestion pricing approach, carriers would pay a premium for those landing and arrival rights that they valued most.

Administrative Options

An alternative congestion management approach is to administratively allocate capacity. Once the operational limit of the airport is established, administrative approaches typically rely on mechanisms such as grandfathering and lotteries as a means to allocate this capacity. The most common type of administrative measure considered is the imposition of slot limits, such as those incorporated in the FAA High Density Rule.

The FAA's new reauthorization bill (Vision 100)[22] contains a provision (49 U.S.C. 41722) permitting the Department of Transportation to convene a public delay reduction meeting of all scheduled airlines at a severely congested airport (such as O'Hare) on a determination of a serious transportation need or important public benefit. In light of delays at O'Hare and the substantial inconvenience to the traveling public, in January 2004, the Department of Transportation and the FAA determined that a delay-reduction meeting concerning O'Hare would be necessary. The FAA separately contacted the two air carriers with the most operations at O'Hare to discuss the impacts of their schedules on operations and delays at the airport to ascertain whether each carrier contacted would accept the FAA's imposition of a temporary limit on the carrier's operations during peak hours. Because each carrier independently agreed to reduce its scheduled operations, the Department of Transportation and the FAA deferred a schedule-reduction meeting until further notice. Instead on January 21, 2004, Secretary of Transportation Norman Y. Mineta announced that United and American Airlines had agreed to a voluntary 5 percent reduction of flights at O'Hare during the peak hours of between 1 and 8 p.m.

In January of 2004, the FAA issued Order 2004-16944, Limiting Scheduled Operations (Order) in response to the increasing delays at O'Hare, stating:

> FAA Aviation System Performance Metrics (ASPM) data showed that on a daily basis, from November 1 through December 31, 2003, 39 percent of O'Hare arrivals were delayed, with an

[20] Notice of Proposed Rulemaking, Federal Register: June 12, 2001 (Volume 66, No. 113); Dockets No. FAA-2001-9852 and No. FAA-2001-9854; Page 31738. Notice of Alternative Policy Options for Managing Capacity at LaGuardia Airport and Proposed Extension of the Lottery Allocation.

[21] Notice of Proposed Rulemaking, Federal Register: June 12, 2001 (Volume 66, No. 113); Dockets No. FAA-2001-9852 and No. FAA-2001-9854; Page 31738. Notice of Alternative Policy Options for Managing Capacity at LaGuardia Airport and Proposed Extension of the Lottery Allocation.

[22] Vision 100 – Century of Aviation Reauthorization Act, December 12, 2003.

> average of 492 delays per day and an average of 57 minutes delay per delayed aircraft…In November [2003], delays at the airport more than doubled from the prior year period, resulting in the most delays ever reported at any airport in FAA's OPSNET in a single month since the FAA has been compiling daily statistics: over 15,000 delayed arrivals with an average delay of 62 minutes per aircraft. In November and December 2003, arriving passengers experienced a total of 1.7 million delay minutes at O'Hare…Because of O'Hare's unique status, this level of congestion at O'Hare has a detrimental effect on the operational efficiency of the NAS.[23]

This Order recognized recent voluntary agreements between FAA, United and American Airlines to temporarily (beginning March 2004 and ending September 2004) reduce the number of flights during peak periods between 1 and 8 p.m. by 5 percent in an effort to reduce the delay at O'Hare. Because activity levels at O'Hare are typically highest during the summer months, an urgent need to find a more permanent solution persists. The Order also notes that the FAA does not intend to establish a permanent practice of reducing delays by limiting scheduled operations. The Order is included in **Appendix A, Background.**

In April of 2004, the FAA issued Amendment 1 to the Order, which required,

> Beginning no later than June 10, 2004: (1) an additional schedule reduction of 2.5 percent of each carrier's total operations in the 1:00 p.m. through 7:59 p.m. hours including arrival reductions in specific times; (2) a reduction in the number of scheduled arrivals in the 12:00 p.m. hour; and (3) reductions to continue through October 30, 2004.

The Order Amendment 1 is also included in **Appendix A.**

By mid-summer 2004, the delays became so critical that the Secretary of Transportation determined that it was in the public interest to convene public delay-reduction meetings involving each of the carriers serving O'Hare to discuss additional flight reductions at O'Hare. The severe congestion and delays at O'Hare during peak periods coupled with airline over scheduling led FAA Administrator Blakey (Administrator) to take action. **Appendix A** contains the following items:

- Determination by the Administrator July 16, 2004;
- Letter from FAA Chief Counsel to Department of Justice, July 14, 2004;
- Letter from Department of Justice to FAA Chief Counsel, July 15, 2004;
- Written comments from United Airlines related to the Order, August 13, 2004;
- Written comments from American Airlines related to the Order, August 13, 2004; and
- Written comments from the City of Chicago related to the Order, August 13, 2004.

An agreement was reached between all parties on August 18, 2004, which culminated with the issuance of a third Order, see **Appendix A.** This third Order stated,

> Based on discussions that occurred between the FAA and each of the participants, this order requires the two largest operators [United Airlines and American Airlines] at the airport to reschedule and reduce flight arrivals by approximately 5% during peak hours, freezes the level of arrivals operated by other large incumbent carriers (while requiring them to reschedule certain flights), and permits a small number of additional flights by limited incumbent air carriers and

[23] FAA Order, Docket FAA-2004-16944, Order Limiting Scheduled Operations, January 21, 2004.

> new entrant carriers. Although the product of voluntary action by various air carriers, this order is enforceable under the Administrator's civil penalty authority.

On March 25, 2005, the FAA issued a Notice of Proposed Rulemaking (NPRM) to extend the limitation of flight schedules:

> The FAA is proposing this rule to address persistent flight delays related to over-scheduling at O'Hare International Airport (O'Hare). This proposed rule is intended as an interim measure, because the FAA anticipates that the rule would yield to longer term solutions to traffic congestion at the airport. Such solutions include an application by the City of Chicago that, if approved, would modernize the airport and reduce levels of delay, both in the medium term and long term. For this reason, the proposed rule includes provisions allowing for the limits it imposes to be gradually relaxed and in any event would sunset in 2008.

The NPRM makes clear, however, that the use of arrival caps as a method of reducing flight delays is not preferable to the long-term goal of increasing airport capacity through infrastructure enhancements. As stated:

> Although arrival caps are being proposed in this rule, imposing caps on the use of airport capacity does not meet aviation demand; rather, such caps artificially limit operations during certain hours to achieve the benefit of delay reduction. The FAA's preferred approach to reducing delay and congestion is to increase airport infrastructure so that capacity meets demand. Because a timely increase to airport capacity is not always feasible, alternative measures may be necessary to address congestion that adversely affects the efficiency of the national airspace system.

A copy of the NPRM is included in **Appendix A, Attachment A-19**.

While these voluntary provisions are intended to be temporary, the FAA views physical improvements that expand airport capacity system-wide as the only long-term means of addressing the purposes and need and ensuring the efficiency of the national air transportation system. Additionally, the most recent NPIAS states: "In announcing these [scheduling] agreements, both DOT and FAA emphasized that the restriction of services is not an acceptable long-term solution to congestion."[24]

Applicability of Congestion Management to O'Hare

Based on review of congestion management concepts that have been discussed in the U.S. airport industry, it was determined that there are 3 potential areas of improvement that could be provided by the introduction of some form of congestion management at O'Hare:

1. Peak-Spreading;
2. Aircraft Up-Gauging;
3. Use of Other Airports.

[24] National Plan of Integrated Systems (NPIAS) 2005-2009 Report to Congress, September 30, 2004.

Peak-Spreading. O'Hare is a mature aviation market, and flights are already spread throughout the day. See **Chapter 2, Exhibit 2-5,** for the daily activity profiles for O'Hare in both 2001 and 2003.

Aircraft Up-Gauging. In conjunction with the development of constrained demand forecasts (presented in **Appendix B, Aviation Demand Forecast**), there was an evaluation of potential use of larger aircraft by the airlines serving O'Hare. Based on analysis of the fleet development plans of airlines serving O'Hare, and the markets served, it was determined that there could be potential for airlines to "up-gauge" average aircraft size at O'Hare to serve passenger demand with fewer aircraft. Specifically, it was estimated that the number of passengers per operation (or enplaned passengers per departure) could increase from 84 (unconstrained forecast) to 92 (constrained forecast) in 2018. This is the equivalent of a 9.5 percent increase in capacity. Based on the forecast number of enplaned passengers and aircraft operations in 2018, this can be translated into the ability to accommodate about 4 million additional enplaned passengers at a given level of aircraft operations.

Use of Other Airports. A congestion management scheme could encourage the use of other airports in the Chicago area by increasing the average or peak-period price of operating at O'Hare. It is expected that the potential for use of other airports would be similar to that reported above in **Appendix C, Use of Other Airports.**

Conclusion Regarding Congestion Management

The estimated reasonable impacts of congestion management described above would not be sufficient to accommodate all of the forecast unconstrained demand at O'Hare, for the following reasons:

1. Peak spreading: this would not be expected to have any significant positive benefit.
2. Aircraft up-gauging: this would be expected to allow for the accommodation of an additional 4 million enplaned passengers at the forecast level of 2018 aircraft operations. This is far short of the forecast increase in unconstrained passenger demand.
3. Use of other airports: while congestion management could help encourage airline use of other regional airports, this effect is expected to be more related to airline strategic decisions. The potential use of other regional airports is separately analyzed in **Appendix C, Section C.2, Use of Other Regional Airports.** It is not expected that congestion management would significantly add to the incremental use of other airports to serve regional demand.

Therefore, the Congestion Management Alternative would not, by itself, meet purpose and need.

E.1.2.4 Airspace-Only Improvement

To evaluate whether airspace improvements by themselves would meet the stated purpose and need of the Project, the TPC prepared a comparative assessment of the capacity of the airfield and airspace systems that serve O'Hare.

Airfield capacity estimates for use in this comparative assessment were developed using actual runway throughput rates obtained from the City of Chicago Aircraft Noise and Operations Monitoring System (ANOMS). These data were obtained for days in July 2002—the peak month at O'Hare in 2002—during which the Plan X and Plan W operating configurations were used. These operating configurations were selected because they represent the highest capacity VFR operating configurations at O'Hare.

The ANOMS data indicated that maximum sustained departure rates were in the range of 50-60 operations per hour on primary runways and 25-35 operations per hour on secondary, or overflow, runways in each operating configuration. Typical maximum arrival rates were in the range of 40-44 operations per hour on primary runways and 20-30 operations per hour on secondary or overflow runways in each operating configuration. The data indicated that peak arrival and departure periods at O'Hare were in the evening hours between 5 p.m. and 7 p.m.

Airspace capacity estimates for use in the comparative assessment were estimated by evaluating the throughput capacity of each of the major arrival and departure airspace routes serving O'Hare. The airspace route structure is described in the following paragraph.

For aircraft arriving to O'Hare generally use one of four arrival routes. These arrival routes begin at one of four "corner-posts": STORY, BEARZ, NEWRK, and KRENA. These corner-posts are located approximately 40 nautical miles from the Airport. Aircraft departing from O'Hare exit the O'Hare TRACON airspace along broad departure corridors that are aligned with the four cardinal directions (north, east, south, and west). Within these departure corridors there are multiple departure routes, which are named in accordance with navigational fixes that the departures using these routes fly over. The westbound departure corridor is served by three departure routes—MZV, IOW, and PLL. The northbound departure corridor is served by two departure routes—BAE and PETTY. The eastbound departure corridor is served by two departure routes—ELX and GIJ. The southbound departure corridor is served by three departure routes—EON, GUIDO, and RBS. In addition to the "primary" arrival and departure routes described above, there are several "secondary" arrival and departure routes that serve cities near O'Hare, including South Bend and Milwaukee. These secondary routes were also considered in this analysis.

The capacities of the airspace routes that serve O'Hare were estimated assuming that aircraft would be separated by 5 nautical miles in-trail separation and maintain a speed of 250-300 knots as they enter or leave O'Hare TRACON airspace.[25] Route capacities developed using these assumptions were further refined using the results of TAAM analyses of the "no action" alternative. Once these conceptual evaluations of airspace route capacities were complete, the TPC allocated these route capacities among O'Hare's various runways. Allocations were performed for both the Plan X and the Plan W operating configurations. Allocating the route capacities among O'Hare's runways enabled the TPC to evaluate whether O'Hare's runways or airspace routes impose more critical capacity constraints. Airspace route capacities were allocated to O'Hare's runways based on current air traffic control procedures and operating configurations. Because airspace routes can serve more than one runway,

[25] Draft Airside Simulation Analysis, Ricondo and Associates, Inc. [CCT], January 2003.

arrival and departure route capacities were allocated to runways in accordance with the proportion of traffic runways serve from these routes.

The analysis of the two primary operating configurations (Plan X and W)[26] is summarized in **Tables E-3.** This analysis indicates that airfield capacity at O'Hare is a more critical constraint than airspace capacity. These findings are corroborated by the TAAM analysis[27] performed by the CCT at the FAA's and TPC's direction and supervision. The TAAM analysis indicated that airspace improvements taken alone (*i.e.*, without airfield improvements) would produce only marginal reductions in aircraft delays, reducing average annual delays by less than 1 minute per aircraft operation.

Conclusion Regarding Airspace Improvements

Based on the information presented above, airspace improvements would not significantly reduce delays at O'Hare unless these improvements were undertaken in conjunction with airfield improvements. Thus, an "airspace only" solution would not meet the stated purpose and need.

TABLE E-3
COMPARISON OF EXISTING AIRSPACE AND RUNWAY CAPACITIES—PLAN X AND PLAN W OPERATING CONFIGURATIONS

		Arrival Capacities			Departure Capacities		
Operating configuration	Weather condition	Arrival Fix Capacity (a)	Airfield Arrival Capacity (b)	Controlling Capacity Constraint	Departure Fix Capacity (a)	Airfield Departure Capacity (b)	Controlling Capacity Constraint
Plan X	VFR	>120	104	Airfield	>220	110	Airfield
Plan W	VFR	>120	114	Airfield	>220	111	Airfield

Notes:

(a) Estimated by Leigh Fisher Associates [TPC].

(b) From TAAM simulation results for the Baseline (2002) airfield as reported in Table I-9 of TAAM Simulation Data for Noise and Air Quality Analysis, January 2004, CCT.

Source: Leigh Fisher Associates [TPC] analysis.

E.1.2.5 New Air Traffic Control and Aircraft Navigation Technologies

While it is difficult to predict the introduction of specific new technologies, it is possible to estimate the maximum potential benefits of such technologies. Most of these technologies are intended to eliminate uncertainty about aircraft location with respect to runways, obstacles, and other aircraft. Theoretically, these new technologies could ultimately eliminate the additional space between aircraft required for IFR operations. Assuming that new technologies eventually eliminate the need for additional separation, the result would be to bring IFR acceptance and release rates up to the VFR rates for a given airport. Peak VFR throughput was estimated through the EIS TAAM analysis at ranges from 206 to

[26] For a detailed description of the various operating configurations at O'Hare, see **Appendix A, Background.**

[27] Preliminary Draft TAAM Simulation Data for Noise and Air Quality Analysis, Ricondo and Associates, Inc. [CCT], 2007 No Action with NAR, February 2004.

217 operations per hour, while peak IFR throughput ranges from 163 to 166 operations per hour.[28] The FAA O'Hare Delay Task Force estimated peak VFR throughput at 167 to 204 operations per hour and peak IFR throughput at 137-173 operations per hour.[29] Both studies indicate that the IFR capacity at O'Hare is about 20 percent less than the VFR capacity. Consequently, while average delays in 2001 were estimated at less than 7 minutes per operation in the most frequently used VFR configurations, IFR delays averaged 11 to 38 minutes per operation, depending upon the configuration used and the degree of adverse weather.

The FAA and the aviation industry are pursuing a wide range of initiatives to improve the efficiency of the NAS. The following documents summarize the major plans for future enhancement of the NAS.

- *Free Flight Program Performance Metrics Results to Date: June 2003 Report*, Federal Aviation Administration, June 2003.
- *Airport Capacity Benchmark Report 2001,* Federal Aviation Administration, April 2001.
- *Concept of Operations and Vision for the Future of Aviation (CONOPS)*, Radio Technical Commission for Aeronautics (RTCA), Inc., November 2002.
- *NAS Target System Description (TSD)*, FAA Architecture 5 is a comprehensive, multi-year plan for improving the NAS and is a view into the Architecture for the year 2015.
- *The Operational Evolution Plan (OEP)*, FAA's rolling ten-year plan to increase the capacity and efficiency of the National Airspace System (NAS), Version 5.0, December 2002.
- *2001 O'Hare Delay Task Force*, A series of data packages that examine the potential delay reduction from numerous proposed capacity enhancement projects, April 2002.

Free Flight Phase 1 (FFP1)

FFP1 was established in 1998 to deliver new air traffic control technologies focused on early benefits to the National Airspace System. Implementation of the planned FFP1 software was completed in 2002. The four major programs under FFP1 are the Traffic Management Advisor (TMA), User Request Evaluation Tool (URET), Surface Movement Advisor (SMA), and Collaborative Decision Making (CDM), which are briefly described below:

- **TMA** is a strategic planning tool for en route controllers, providing improved arrival sequencing and runway assignments at major airports with the goal of increasing runway capacity.

[28] Draft TAAM Simulation Data Package, 2007 No Action, Tables I-7, I-8 and I-10, Ricondo and Associates, Inc., [CCT], July 2004.
[29] 2001 O'Hare Delay Task Force, FAA and City of Chicago, April 2002.

- **URET** provides en route controllers with projections of future conflicts for current and proposed routes, and also automates controller flight data, with the goal of increasing the number of direct routes.
- **SMA** provides airlines and other users with precisely estimated touchdown times. This information helps ATC and airlines manage ground resources at the terminal more efficiently.
- **CDM** provides a mechanism for airline operations centers and the FAA to share key flight and NAS status information in real time, with the goal of reducing delays by optimizing the use of existing capacity during weather events.

FAA Airport Capacity Benchmark Reports

The FAA has published two *Airport Capacity Benchmark Reports*, one in 2001 and one in 2004, that provide "benchmark" airfield capacity estimated for current and future conditions at 31 of the nation's busiest airports.. The Benchmark Reports also include sections on plans to improve operational efficiency at each of these 31 airports, including Chicago O'Hare International Airport.

The planned improvements considered in the two Benchmark Reports specifically excluded new runways, but included procedural, airspace, and technology improvements. The 2001 Benchmark Report estimates that, over the next 10 years, these technological and procedural improvements could increase O'Hare's airfield capacity by about 6 percent in good weather, and by about 12 percent in adverse weather. These capacity increases were assumed to result from the following avionics improvements and their associated procedures:

- **Flight Management System/Area Navigation (FMS/RNAV)** allows a more consistent flow of aircraft to the runway and more direct routings. The aircraft installed with FMS (integrating Digital Flight Control, Autothrottle, Inertial Reference, and Flight Management Computer Systems) is capable of four-dimensional (latitude, longitude, altitude & time) Area Navigation (RNAV), which is a method of navigation that enables aircraft to fly on any desired flight path.
- **Required Navigation Performance (RNP)** is a statement of navigation performance accuracy necessary for operation within a defined airspace. RNP RNAV merges accuracy standards, containment requirements, and area navigation performance standards, which collectively lead to reliable, predictable, and repeatable ground tracks, with the goal of developing reduced obstacle-clearance and/or aircraft-to-aircraft separation standards.
- **Automatic Dependent Surveillance-Broadcast/Cockpit Display of Traffic Information (ADS-B/CDTI)** provides a cockpit display of the location of other aircraft to help pilots maintain the desired separation more precisely under instrument meteorological conditions, much as pilots do today under visual approach procedures and visual separations.
- **Wide Area Augmentation System (WAAS) and Local Area Augmentation System (LAAS)** rely on the Global Positioning System (GPS) augmented by a combination of

geostationary satellites and ground reference signals. WAAS would provide en route and terminal guidance and Category I landing guidance. LAAS would provide Category II and III landing guidance, and Category I landing guidance where it is not provided by WAAS.

- **Controller-Pilot Data Link Communications (CPDLC)** reduces the number of voice messages between ATC and pilots by using a special electronic link for routine messages. These messages are digitally displayed on a computer screen in the cockpit, thereby freeing up voice frequencies and reducing controller and pilot communications workload.

The 2004 Benchmark Report is less optimistic than the 2001 Benchmark Report—projecting no measurable increase in benchmark flow rates due to new air traffic control and aircraft navigation technologies through 2013.

Concept of Operations and Vision for the Future of Aviation (CONOPS) and the Target System Description (TSD)

The Target System Description (TSD) details what the NAS Architecture would look like when the current CONOPS is achieved. Specifically, it describes what the FAA expects to achieve by 2015. The Architecture also provides the framework for the work being performed by the FAA's Joint Planning Office (JPO), which is currently developing a national plan through the year 2025.

The TSD envisions that by 2015 traffic will be managed from gate-to-gate for safety, capacity, and efficiency. An integrated Air Traffic Management/ Communications, Navigation, and Surveillance (ATM/CNS) system will provide a seamless airspace system (Surface, Terminal, En Route, and Oceanic). The airspace structure will be flexible to match the dynamics of demand. New GPS-based technologies will permit 3-mile separation throughout the airspace (i.e., in terminal and en-route airspace), and pilots will participate along with controllers in managing aircraft separation.

In the next 5 years, extended surveillance service should be available where currently there is no radar coverage using ADS-B in oceanic and remote areas. For instrument navigation and landing guidance, WAAS and LAAS procedures will be developed for small airports. Increased use of RNP-RNAV procedures and expanded implementation of Domestic Reduced Vertical Separation Minimums (DRVSM) will increase en route airspace capacity by reducing airspace complexity and increasing the available altitudes above 29,000 ft. During this period, the TSD assumes certain flight deck equipage, such as advanced altimetry for DRVSM and other equipage required to achieve the full benefits of the operational improvements, including LAAS/WAAS/GPS, ADS-B, and RNAV with RNP.

In the next 5-10 years, the TSD envisions implementing GPS precision approach and departure procedures and additional RNP-RNAV procedures, permitting more direct routes, flexible routing around weather, offset routes, reduced in-trail separation, reduced communication workload, and more uniform crew/controller training. Required flight deck equipage will include new air/ground radios, improved airborne sensors for humidity and turbulence, along with ADS-B and multi-function display, CPDLC, and the LAAS for CAT-1 approaches (LAAS

CAT II/III approaches will likely follow beyond the 10-year period). In summary, the TSD is expected to result in the following avionics related operational improvements.

- Flexible approaches and departure routes.
- Delegated responsibility to pilot to maintain required sequence and spacing.
- Enhanced traffic situational awareness.
- More RNP/RNAV routes.

Operational Evolution Plan (OEP)

The OEP is the FAA's rolling ten-year plan to increase the capacity and efficiency of the NAS. A partial list of accomplishments of the OEP follows.[30]

- The Traffic Management Advisor (TMA) is operational.
- New and overlay Area Navigation (RNAV) routes have been implemented.
- The FAA has implemented the Administrator's Policy on RNP by establishing the RNP-RNAV Program Office.
- The User Request Evaluation Tool (URET) is now operational.
- The Controller Pilot Data Link Communications (CPDLC), Build 1, tool is in use at Miami Center.
- Precision Runway Monitor (PRM) installations completed at 5 airports, including St. Louis, Minneapolis-St. Paul, JFK, Philadelphia, and Logan International Airports.
- The first production unit of the Integrated Terminal Weather System (ITWS) is in use at Atlanta.
- Ground delay programs are being executed with improved compliance.
- Weather radar data are now available on en route controller's display.

Each of the foregoing initiatives has increased the capacity and efficiency of the NAS, and has provided direct benefit to NAS users. In particular, FAA estimates that overall capacity at the OEP airports has increased over 2 percent since OEP inception.

2001 O'Hare Delay Task Force

The 2001 O'Hare Delay Task Force (DTF) was convened to identify and evaluate potential delay reduction initiatives for Chicago O'Hare International Airport. Selected delay reduction alternatives were evaluated through simulation modeling, while other alternatives benefits were quantified through other analytical methods or discussed in qualitative terms. These alternatives included several alternatives that would rely on new generation air traffic control and navigation technologies, including area navigation (RNAV) flight procedures, the Local

[30] http://www.faa.gov/programs/oep/

Area Augmentation System (LAAS), wake vortex detection and avoidance systems, and automatic dependent surveillance-broadcast (ADSB) systems.

Because of the uncertain benefits and implementation timelines associated with most of these new generation technologies, most of these potential improvements were only evaluated qualitatively. Improvements related to new generation air traffic control and navigation technologies that were quantified were:[31]

- Implementation of LAAS-enabled Category II/III approach procedures, which were estimated to reduce average annual delays by less than 1 percent and flight cancellations by about 18 percent at a daily activity level of 3,400 operations.
- Implementation of RNAV flight procedures to improve operations in instrument flight rules (IFR) conditions, which were estimated to reduce average annual delays by about 1 percent and flight cancellations by about 7 percent at a daily activity level of 3,400 operations.
- Implementation of RNAV departure procedures, which were also estimated to reduce average annual delays by about 1 percent with no reduction in estimated flight cancellations at a daily activity level of 3,400 operations.
- Use of new generation technologies to facilitate triple converging instrument approaches, which were estimated to *increase* average annual delays by about 6 percent but reduce flight cancellations by about 15 percent at a daily activity level of 3,400 operations.

As shown, the results from the 2001 DTF indicate that new technologies are expected to provide only limited, incremental reductions in aircraft delays in cases where delay savings can be quantified at all. For more information regarding the DTF, see **Appendix A, Background**.

Conclusions Regarding New Air Traffic Control and Aircraft Navigation Technologies

Based on the above data and analysis, potential technology improvements appear capable of providing only marginal, incremental improvements to airfield and airspace capacity at O'Hare. Furthermore, the benefits of many of these potential improvements are speculative, relying on technologies and flight procedures that have not yet been fully developed and tested. Consequently, it is concluded that these technology improvements would not be capable of increasing O'Hare's capacity to a level sufficient to accommodate the forecast unconstrained demand levels through the planning period considered in this EIS, and therefore would not meet the stated purpose and need.

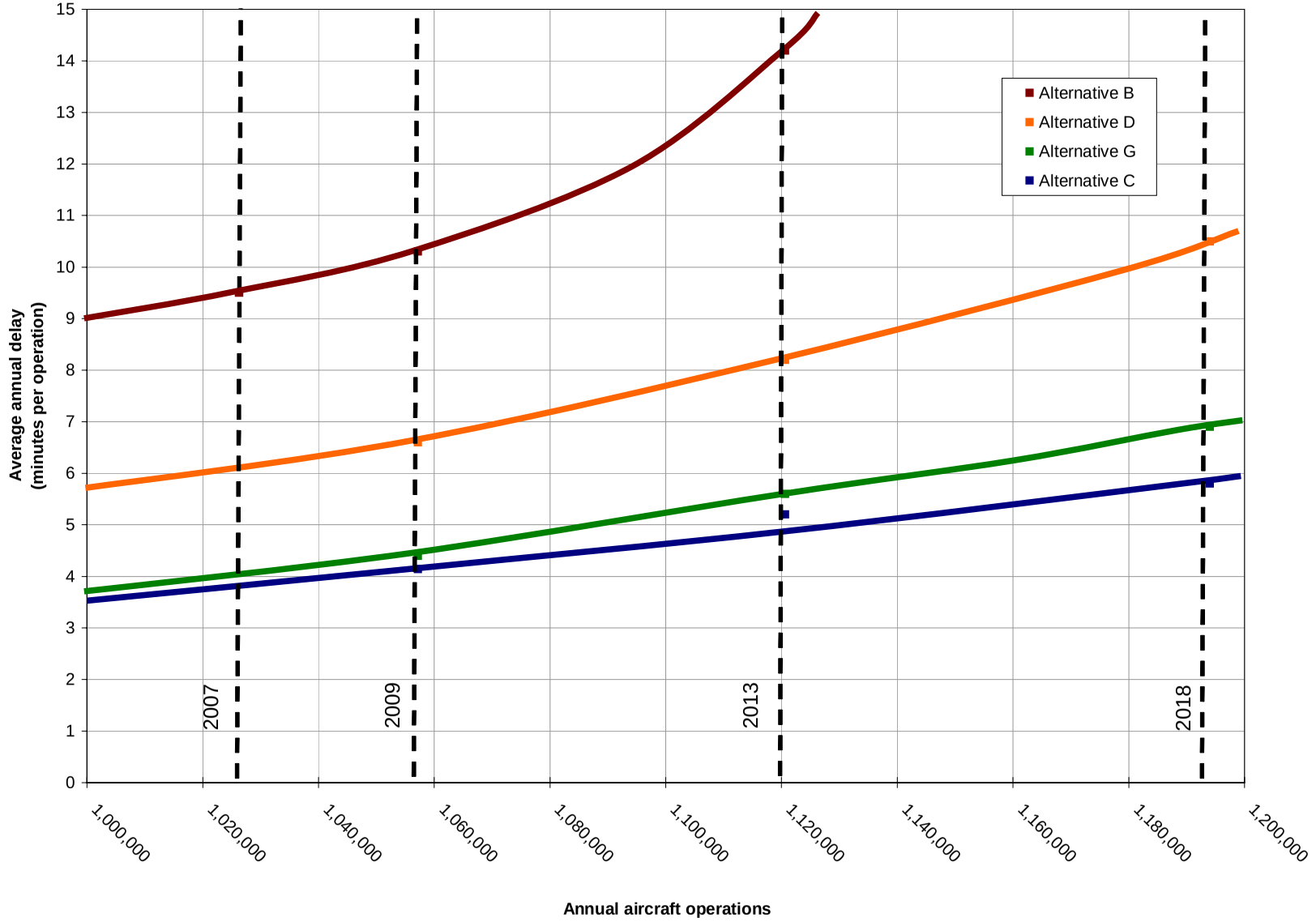
E.1.2.6 Blended Alternative

As discussed in **Chapter 3, Alternatives, Section 3.2.3.3, Alternative Created for Further Consideration-Blended Alternative,** a blended alternative was created for further consideration as part of Secondary Screening. All the build alternatives considered, except for

[31] The following estimates of delay and flight cancellation reductions are not additive.

Alternative B, met the purpose and need on their own; therefore, Alternative B was evaluated as part of a potential blended alternative. Alternative B is a limited development alternative that would not, on its own, provide sufficient capacity to accommodate forecast demand. However, Alternative B does provide some additional capacity, which is estimated to be enough to accommodate about 1,042,000 annual aircraft operations at levels of delay similar to other retained alternatives.

To determine the capacity shortfall of Alternative B, **Exhibit E-1** was developed. **Exhibit E-1** shows that at 10 minutes per operation of average annual delay Alternative B serves approximately 1,042,000 annual operations. To serve the forecast demand in 2018 of 1,194,000 annual operations, Alternative B would require blending with some of the Non-Airfield Development alternatives (i.e. congestion management, use of other airports) to handle an additional 152,000 operations. To translate the annual operation shortfall into enplaned passengers, the estimate of 84 passengers per operation (in 2018) was multiplied by the number of operations (152,000), which yields 12,768,000 total passengers. To get enplaned passengers from total passengers, the number of total passengers was divided by two yielding approximately 6.4 million enplaned passengers. This is the number of enplaned passengers not accommodated by Alternative B alone. As discussed in **Chapter 3, Section 3.2.3.3, Alternative Created for Further Consideration – Blended Alternative,** the number of enplaned passengers that can be accommodated by the combination of Alternative Modes of Transportation and Communication, Use of Other Airports, New Technologies, and Congestion Management is 6.1 million enplaned passengers. This is approximately enough to allow for this blended alternative to meet the purpose and need, and therefore, the blended alternative was carried through for consideration in Secondary Screening.



Source: Leigh Fisher Associates [TPC], September 2004.

Chicago O'Hare International Airport

O'Hare Modernization
Environmental Impact Statement

Relationship Between Demand and Delay
Proposed Build Alternatives

▶ **Exhibit E-1**

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E.1.3 Initial Evaluation of O'Hare Development Alternatives

This section provides background on the initial screening of the O'Hare Development Alternatives including Alternatives A through I, as well as the blended alternative.

Each of the O'Hare development alternatives was assessed individually using an initial screening table format. Comments were noted in the individual tables to support the assessments relative to each of the purpose and need criteria. This analysis was supported by the land use drawings provided in the previous section. A tabular summary of the initial screening assessment for each of the O'Hare development alternatives follows in **Tables E-4** through **E-12.**

TABLE E-4 ALTERNATIVE A - SUMMARY OF INITIAL SCREENING

Purpose and Need		Initial Screening Criteria	Comments
1. Address projected needs of the Chicago region by reducing delays at O'Hare, and thereby enhancing capacity of the NAS.			
1a	Reduce delays, especially under adverse weather conditions	Are average annual delays substantially reduced relative to other alternatives in 2018?	No - Alternative A would perform worst among all O'Hare Development alternatives. Lack of additional runway capacity would result in average annual delays in excess of 25 minutes per average annual operation in 2018.
		Is the disparity between good and adverse weather acceptance and release rates reduced?	No - The current disparity between good and adverse weather acceptance and release rates would continue.
1b	Efficiently accommodate existing and future aviation operating needs	Could forecast aviation demand be accommodated?	No - The lack of increased airfield and/or passenger terminal facilities would constrain activity within the forecast period.
		Could current and future runway length requirements be met?	Yes - Current runway lengths would be maintained.
2. Ensure that existing and future terminal facilities and supporting infrastructure can efficiently accommodate airport users.			
2a	Provide adequate terminal, gate, and apron areas	Are spatial facility requirements met in the terminal area?	No - The lack of air carrier gates and apron areas would constrain activity within the forecast period.
		Does the configuration and proximity of gates and supporting facilities provide flexibility for accommodating new entrants and grouping of alliance partners?	No - The existing terminal complex would remain largely unchanged.
2b	Provide sufficient supporting infrastructure	Are spatial requirements met for support facilities, including cargo area?	Yes - Adequate cargo area to accommodate forecast growth could be provided.
		Is efficient surface access provided?	No - All Airport users would continue to use the same access points.

Source: FAA/TPC Analysis

TABLE E-5 ALTERNATIVE B - SUMMARY OF INITIAL SCREENING

Purpose and Need		Initial Screening Criteria	Comments
1. Address projected needs of the Chicago region by reducing delays at O'Hare, and thereby enhancing capacity of the NAS.			
1a	Reduce delays, especially under adverse weather conditions	Are average annual delays substantially reduced relative to other alternatives in 2018?	No - Alternative B performs worst among all the O'Hare Development alternatives, (excluding Alternative A – No Action). Average annual delays would be in excess of 14 minutes per operation in 2013 and would increase exponentially beyond 2013.
		Is the disparity between good and adverse weather acceptance and release rates reduced?	No - The disparity between good and adverse weather acceptance rates would increase.
1b	Efficiently accommodate existing and future aviation operating needs	Could forecast aviation demand be accommodated?	No - Average annual delays would be in excess of 14 minutes per operation in 2013 and would increase exponentially beyond 2013. Delays at 15 minutes per operation would constrain forecast aviation activity.
		Could current and future runway length requirements be met?	Yes - Maximum runway length is maintained at 13,000 feet.
2. Ensure that existing and future terminal facilities and supporting infrastructure can efficiently accommodate airport users.			
2a	Provide adequate terminal, gate, and apron areas	Are spatial facility requirements met in the terminal area?	Yes - The new terminal area that would be provided (west of Runway 14R-32L), while separated from the existing terminal area, would provide for more space for terminal development.
		Does the configuration and proximity of gates and supporting facilities provide flexibility for accommodating new entrants and grouping of alliance partners?	No - Alternative B requires future terminal facilities to be separated from existing terminal facilities by an active runway (Runway 14R-32L).
2b	Provide sufficient supporting infrastructure	Are spatial requirements met for support facilities, including cargo area?	Yes - Adequate cargo area to accommodate forecast growth could be provided.
		Is efficient surface access provided?	Yes - Additional access point on the west side would be provided.

Source: FAA/TPC Analysis

TABLE E-6 ALTERNATIVE C - SUMMARY OF INITIAL SCREENING

Purpose and Need		Initial Screening Criteria	Comments
1. Address projected needs of the Chicago region by reducing delays at O'Hare, and thereby enhancing capacity of the NAS.			
1a	Reduce delays, especially under adverse weather conditions	Are average annual delays substantially reduced relative to other alternatives in 2018?	Yes - Alternative C performs better than all the O'Hare Development alternatives, excluding Alternative F which performs equally well. Average annual delay would be approximately 6 minutes per operation in 2018.
		Is the disparity between good and adverse weather acceptance and release rates reduced?	Yes - The current disparity between good and adverse weather acceptance rates is reduced.
1b	Efficiently accommodate existing and future aviation operating needs	Could forecast aviation demand be accommodated?	Yes - There would be no constraint on airfield or passenger connecting activity.
		Could current and future runway length requirements be met?	Yes - Maximum runway length is maintained at 13,000 feet.
2. Ensure that existing and future terminal facilities and supporting infrastructure can efficiently accommodate airport users.			
2a	Provide adequate terminal, gate, and apron areas	Are spatial facility requirements met in the terminal area?	Yes - The number of additional air carrier gates and associated apron area on west side would meet spatial facility requirements.
		Does the configuration and proximity of gates and supporting facilities provide flexibility for accommodating new entrants and grouping of alliance partners?	Yes - The number and location of additional air carrier gates and supporting facilities would provide required facilities.
2b	Provide sufficient supporting infrastructure	Are spatial requirements met for support facilities, including cargo area?	Yes - Adequate cargo area to accommodate forecast growth could be provided.
		Is efficient surface access provided?	Yes - Additional access point on the west side would be provided.

Source: FAA/TPC Analysis

TABLE E-7 ALTERNATIVE D - SUMMARY OF INITIAL SCREENING

Purpose and Need		Initial Screening Criteria	Comments
1. Address projected needs of the Chicago region by reducing delays at O'Hare, and thereby enhancing capacity of the NAS.			
1a	Reduce delays, especially under adverse weather conditions	Are average annual delays substantially reduced relative to other alternatives in 2018?	Yes - Alternative D would perform better than Alternatives A, B and E and worse than Alternatives C, F and G. Average annual delays would be approximately 10 minutes per operation in 2018.
		Is the disparity between good and adverse weather acceptance and release rates reduced?	Yes - The current disparity between good and adverse weather acceptance rates is reduced.
1b	Efficiently accommodate existing and future aviation operating needs	Could forecast aviation demand be accommodated?	Yes - There would be no constraint on airfield or passenger connecting activity.
		Could current and future runway length requirements be met?	Yes - Maximum runway length is maintained at 13,000 feet.
2. Ensure that existing and future terminal facilities and supporting infrastructure can efficiently accommodate airport users.			
2a	Provide adequate terminal, gate, and apron areas	Are spatial facility requirements met in the terminal area?	Yes - The number of additional air carrier gates and associated apron area on west side would meet spatial facility requirements.
		Does the configuration and proximity of gates and supporting facilities provide flexibility for accommodating new entrants and grouping of alliance partners?	Yes - The number and location of additional air carrier gates and supporting facilities would provide required facilities.
2b	Provide sufficient supporting infrastructure	Are spatial requirements met for support facilities, including cargo area?	Yes - Adequate cargo area to accommodate forecast growth could be provided.
		Is efficient surface access provided?	Yes - Additional access point on the west side would be provided.

Source: FAA/TPC Analysis

TABLE E-8 ALTERNATIVE E - SUMMARY OF INITIAL SCREENING

Purpose and Need		Initial Screening Criteria	Comments
1. Address projected needs of the Chicago region by reducing delays at O'Hare, and thereby enhancing capacity of the NAS.			
1a	Reduce delays, especially under adverse weather conditions	Are average annual delays substantially reduced relative to other alternatives in 2018?	Yes - Alternative E would perform better than Alternatives A and B and worse than Alternatives C, D, F and G.
		Is the disparity between good and adverse weather acceptance and release rates reduced?	Yes - The current disparity between good and adverse weather acceptance rates is reduced.
1b	Efficiently accommodate existing and future aviation operating needs	Could forecast aviation demand be accommodated?	Yes - There would be no constraint on airfield or passenger connecting activity.
		Could current and future runway length requirements be met?	Yes - Maximum runway length is maintained at 13,000 feet.
2. Ensure that existing and future terminal facilities and supporting infrastructure can efficiently accommodate airport users.			
2a	Provide adequate terminal, gate, and apron areas	Are spatial facility requirements met in the terminal area?	Yes - The number of additional air carrier gates and associated apron area on west side would meet spatial facility requirements.
		Does the configuration and proximity of gates and supporting facilities provide flexibility for accommodating new entrants and grouping of alliance partners?	Yes - The number and location of additional air carrier gates and supporting facilities would provide required facilities.
2b	Provide sufficient supporting infrastructure	Are spatial requirements met for support facilities, including cargo area?	Yes - Adequate cargo area to accommodate forecast growth could be provided.
		Is efficient surface access provided?	Yes - Additional access point on the west side would be provided.

Source: FAA/TPC Analysis

TABLE E-9 ALTERNATIVE F - SUMMARY OF INITIAL SCREENING

Purpose and Need		Initial Screening Criteria	Comments
1. Address projected needs of the Chicago region by reducing delays at O'Hare, and thereby enhancing capacity of the NAS.			
1a	Reduce delays, especially under adverse weather conditions	Are average annual delays substantially reduced relative to other alternatives in 2018?	Yes - Alternative F performs better than all the O'Hare Development alternatives, excluding Alternative C which performs equally well. Average annual delay would be approximately 6 minutes per operation in 2018.
		Is the disparity between good and adverse weather acceptance and release rates reduced?	Yes - The current disparity between good and adverse weather acceptance rates is reduced.
1b	Efficiently accommodate existing and future aviation operating needs	Could forecast aviation demand be accommodated?	Yes - There would be no constraint on airfield or passenger connecting activity.
		Could current and future runway length requirements be met?	Yes - Maximum runway length is maintained at 13,000 feet.
2. Ensure that existing and future terminal facilities and supporting infrastructure can efficiently accommodate airport users.			
2a	Provide adequate terminal, gate, and apron areas	Are spatial facility requirements met in the terminal area?	Yes - The number of additional air carrier gates and associated apron area on west side would meet spatial facility requirements.
		Does the configuration and proximity of gates and supporting facilities provide flexibility for accommodating new entrants and grouping of alliance partners?	Yes - The number and location of additional air carrier gates and supporting facilities would provide required facilities.
2b	Provide sufficient supporting infrastructure	Are spatial requirements met for support facilities, including cargo area?	Yes - Adequate cargo area to accommodate forecast growth could be provided.
		Is efficient surface access provided?	Yes - Additional access point on the west side would be provided.

Source: FAA/TPC Analysis

TABLE E-10 ALTERNATIVE G - SUMMARY OF INITIAL SCREENING

Purpose and Need		Initial Screening Criteria	Comments
1. Address projected needs of the Chicago region by reducing delays at O'Hare, and thereby enhancing capacity of the NAS.			
1a	Reduce delays, especially under adverse weather conditions	Are average annual delays substantially reduced relative to other alternatives in 2018?	Yes - Alternative G performs better than Alternatives A, B, E and D but worse than Alternatives C and F. Average annual delay would be approximately 7 minutes per operation in 2018.
		Is the disparity between good and adverse weather acceptance and release rates reduced?	Yes - The current disparity between good and adverse weather acceptance rates is reduced.
1b	Efficiently accommodate existing and future aviation operating needs	Could forecast aviation demand be accommodated?	Yes - There would be no constraint on airfield or passenger connecting activity.
		Could current and future runway length requirements be met?	Yes - Maximum runway length is maintained at 13,000 feet.
2. Ensure that existing and future terminal facilities and supporting infrastructure can efficiently accommodate airport users.			
2a	Provide adequate terminal, gate, and apron areas	Are spatial facility requirements met in the terminal area?	Yes - The number of additional air carrier gates and associated apron area on west side would meet spatial facility requirements.
		Does the configuration and proximity of gates and supporting facilities provide flexibility for accommodating new entrants and grouping of alliance partners?	Yes - The number and location of additional air carrier gates and supporting facilities would provide required facilities.
2b	Provide sufficient supporting infrastructure	Are spatial requirements met for support facilities, including cargo area?	Yes - Adequate cargo area to accommodate forecast growth could be provided.
		Is efficient surface access provided?	Yes - Additional access point on the west side would be provided.

Source: FAA/TPC Analysis

TABLE E-11 ALTERNATIVE H - SUMMARY OF INITIAL SCREENING

Purpose and Need		Initial Screening Criteria	Comments
1. Address projected needs of the Chicago region by reducing delays at O'Hare, and thereby enhancing capacity of the NAS.			
1a	Reduce delays, especially under adverse weather conditions	Are average annual delays substantially reduced relative to other alternatives in 2018?	Partially - This alternative poses irreconcilable conflicts between efficient use of the proposed runway layout and adequate space for infrastructure development, most specifically terminals. Specifically, parallel Runways 5L/23R and 5C/23C would be restricted to arrivals to the northeast and departures to the southwest for safety reasons in light of the location of the terminal area directly to the northeast of these runways. Therefore, in this case the airfield capacity of this alternative would be significantly reduced relative to the other O'Hare Development alternatives.
		Is the disparity between good and adverse weather acceptance and release rates reduced?	Yes - The current disparity between good and adverse weather acceptance rates is reduced.
1b	Efficiently accommodate existing and future aviation operating needs	Could forecast aviation demand be accommodated efficiently?	Partially - The conflict between the terminals and the runway layout (see above) would restrict the operational flexibility of this airfield layout.
		Could current and future runway length requirements be met?	Yes - Maximum runway length is maintained at 13,000 feet.
2. Ensure that existing and future terminal facilities and supporting infrastructure can efficiently accommodate airport users.			
2a	Provide adequate terminal, gate, and apron areas	Are spatial facility requirements met in the terminal area?	No – the conflict with Runways 5L-23R and 5C-23C mentioned above would involve relocation of the existing Terminal 5 (international terminal).
		Does the configuration and proximity of gates and supporting facilities provide flexibility for accommodating new entrants and grouping of alliance partners?	No - The airfield layout would separate the area for new terminal development (north of Runway 9L-27R) from the existing terminal area.
2b	Provide sufficient supporting infrastructure	Are spatial requirements met for support facilities, including cargo area?	Yes - Adequate cargo area to accommodate forecast growth could be provided.
		Is efficient surface access provided?	No - All airport users would continue to use the same access points.

Source: FAA/TPC Analysis

TABLE E-12 ALTERNATIVE I - SUMMARY OF INITIAL SCREENING

Purpose and Need		Initial Screening Criteria	Comments
1. Address projected needs of the Chicago region by reducing delays at O'Hare, and thereby enhancing capacity of the NAS.			
1a	Reduce delays, especially under adverse weather conditions	Are average annual delays substantially reduced relative to other alternatives in 2018?	Partially - Midway International Airport (MDW) is located 13 miles southeast of O'Hare. Alternative I provides for the addition of four new runways oriented in a southeast-northwest direction, and aircraft routed to and from these runways would utilize airspace currently used by Midway. These adverse airspace impacts would be significant enough to either severely limit Midway's viability as a large air carrier airport or meaningfully reduce the additional potential capacity that O'Hare could otherwise provide.
		Is the disparity between good and adverse weather acceptance and release rates reduced?	Yes - The current disparity between good and adverse weather acceptance rates is reduced.
1b	Efficiently accommodate existing and future aviation operating needs	Could forecast aviation demand be accommodated efficiently?	Partially – The conflict with Midway would not allow the Alternative I airfield layout to perform well enough to accommodate forecast aviation demand without severely limiting Midway's viability.
		Could current and future runway length requirements be met?	Yes - Maximum runway length is maintained at 13,000 feet.
2. Ensure that existing and future terminal facilities and supporting infrastructure can efficiently accommodate airport users.			
2a	Provide adequate terminal, gate, and apron areas	Are spatial facility requirements met in the terminal area?	Yes - The new terminal area that would be provided (north of Runway 9L-27R and between Runways 15L-33R and 14R-32L), while separated from the existing terminal area, would provide for more space for terminal development.
		Does the configuration and proximity of gates and supporting facilities provide flexibility for accommodating new entrants and grouping of alliance partners?	No - The airfield layout would separate the area for new terminal development (north of Runway 9L-27R and between Runways 15L-33R and 14R-32L) from the existing terminal area.
2b	Provide sufficient supporting infrastructure	Are spatial requirements met for support facilities, including cargo area?	Yes - Adequate cargo area to accommodate forecast growth could be provided.
		Is efficient surface access provided?	No - All airport users would continue to use the same access points.

Source: FAA/TPC Analysis

E.2 AIRPORT DEVELOPMENT PARAMETERS

This section describes the airport planning principles that guided development of a range of O'Hare development concepts that might be able to satisfy the purpose and need. The steps used in developing the various parameters follow a typical airport planning process.

- The first step was to establish the runway system because it is the essential requirement of an airport, frequently requires the largest area, and has the most rigorous geometric design/layout standards.

- The second step was to ensure the availability of an adequate passenger terminal area because passenger-handling facilities are also critically important, have relatively demanding spatial requirements, and requires adequate connections to both the airfield and surface access systems.
- The third step was to provide adequate surface access to the terminal and other functional areas.
- The final step involved the need for substantial supporting facilities, and because a number of reasonable locations can usually be found on the airport site, this requirement was addressed last.

Because of the importance of these issues, the consideration of facilities occurred in the following order: Airfield, Terminal, Surface Access, and Support.

E.2.1.1 Airfield

Key issues that influenced the development of airfield concepts for O'Hare development alternatives include the following:

- **Runway Orientation** – Ideally, runways are oriented to allow aircraft to takeoff and land into the wind. Aircraft taking off with a tailwind require a longer ground run to achieve the airspeed required for takeoff. Similarly, aircraft landing with a tailwind will fly at a higher groundspeed to maintain acceptable approach airspeed, again requiring a longer runway. Crosswinds require pilots to correct by steering into the wind, thus approaching the runway at an angle (crabbing), or by using angle of bank and cross correcting with rudder (slipping). In general, larger aircraft are able to operate in higher crosswinds than smaller aircraft. FAA airport design guidelines recommend that runways be aligned so that tailwind and crosswind conditions are within acceptable limits for the aircraft using the airport at least 95 percent of the time. Many airports require runways aligned in at least two directions to provide the recommended wind coverage.
- **Runway Configuration** – The number, orientation, and spacing of runways directly affects the ability of an airport to accommodate demand. If runways are spaced too closely, intersect, or converge, activity on each of the runways must be strictly coordinated and controlled by air traffic control to optimize safety and the potential effect of wake vortices. This dependency among runways can significantly reduce their collective ability to accommodate demand. In general, a runway configuration that relies on concurrent use of intersecting runways will have a lower capacity than a configuration that primarily operates on parallel runways. Additionally, an airport that relies on arrivals to closely spaced runways will have less capacity than arrivals to widely spaced parallels, especially during adverse weather conditions. The FAA's recommended runway spacing for independent IFR approaches is at least 5,000 feet; however, independent IFR arrivals have generally been approved for runways with a centerline spacing of 4,300 feet. Supplementing widely spaced runways with closely spaced parallel runways provide additional benefit in the ability to balance arrival and departure streams. Closely spaced parallel runways can accommodate

independent arrival and departure streams under certain conditions, and are frequently located adjacent to the terminal complex to enhance the efficiency of the airfield.

- **Runway Length** – Aircraft require various runway lengths depending upon a number of factors including: (1) type of operation, takeoff typically requires more runway length than landing; (2) aircraft weight, heavier aircraft typically require more runway length; and (3) weather conditions, high temperature and humidity conditions require additional runway length. At airports like O'Hare, not all runways need to be of the same length; runways intended primarily for landing need not be as long as those intended for takeoff; in addition, not all runways need to be long enough to accommodate all aircraft using an airport. Nevertheless, if too many runways are not long enough to accommodate the mix of aircraft operating at an airport, the need to sequence arriving or departing aircraft to specific runways can increase airspace and/or airfield congestion.
- **Safety Areas and Approach Surfaces** – FAA design guidelines identify runway safety areas (RSAs), runway protection zones (RPZs), and airspace surfaces as well as a number of other safety standards to ensure the safe movement of aircraft on the airfield. Each has very specific FAA criteria that identify what development is acceptable within various areas beyond the end of a runway or adjacent to it.
- **Existing Facilities** – Large capital investments over time have been made in terminal and surface access facilities and their supporting infrastructure at O'Hare. In addition, the existing terminal and surface access system are integrated with the regional surface transportation system. Accordingly, new airfield development alternatives must be compatible with continued use of these facilities.

E.2.1.2 Terminal Location

Key issues that influenced the development of terminal development concepts include the following:

- **Airfield Access** – The location of the terminal facility relative to the runway and taxiway system is a key consideration for locating a new terminal or expansion of existing facilities. Terminals should be located to allow for good access to the airfield for both arriving and departing aircraft. Also, taxi distances should be minimized to reduce the potential for ground delays and provide a similar level of service to all aircraft. For these reasons, the terminal complex should be centrally located with respect to the airfield.
- **Terminal Access** – Where practical, to derive maximum benefit from the existing terminal complex, additional terminal facilities should be close to the existing terminal complex to reduce passenger transfer times and allow for the movement of aircraft and equipment between gates. In certain situations, multiple terminals can exist at large facilities and usually evolve to meet a specific need or purpose.

- **Surface Access** – The existing terminal complex is integrated with surface access facilities linked to the regional surface transportation system. New terminal development must not only be integrated with the existing terminal complex, but also with the regional surface transportation system.
- **Configuration** – In addition to providing adequate space, terminal facilities must be configured to permit efficient transfer of passengers between aircraft, as well as to and from surface access and parking facilities.

E.2.1.3 Surface Transportation Infrastructure

Key issues relating to the location and space of surface access facilities that influenced the development of O'Hare development alternatives include the following:

- **Terminal Area Access** – The terminal roadway must provide sufficient lanes to provide access to and from both enplaning and deplaning curbsides. The terminal roadway system must also provide opportunities for re-circulation. To reduce access congestion, commercial access curbs or staging areas and taxi queuing areas should also be considered. The length of the enplaning and deplaning curbs must permit passenger and baggage unloading and loading without stopping traffic on the circulation roadway.
- **Regional Roadway Access** – Surface access to and from a large airport such as O'Hare should be provided from continuous flow roadways such as highways or expressways. Access to local roadways should be provided via on and off ramps so as to maintain a continuous flow. Ideally, airport surface roadway access system will allow for early segregation of passenger related and non-passenger related traffic into and out of the airport.

E.2.1.4 Support and Other Facilities

Although major modifications to any airport may require relocation or reconfiguration of numerous facilities related to air cargo, aircraft maintenance, and other supplemental uses, it is prudent to continue use of existing facilities when possible. At O'Hare, the existing hangar facilities are located in the northern portion of the Airport, while air cargo facilities are located to the south. It is desirable to maximize use of existing facilities and the surrounding infrastructure that has been developed to support the operation of these facilities over the years.

E.3 FACILITY REQUIREMENT SUMMARY BASED ON THE O'HARE INTERNATIONAL AIRPORT MASTER PLAN

This section briefly summarizes the major findings of the facility requirements within the *O'Hare International Airport Master Plan*[32] published by the City of Chicago in February 2004.

E.3.1.1 Background

Facility requirements detail the key airport infrastructure needed to support either the existing or projected demand levels for an airport. By comparing the infrastructure requirements for future activity levels to those currently available, shortfalls in facilities can be identified. Alternatives for accommodating those shortfalls can then be identified as part of the overall airport development program.

Facility requirements are based on the Federal Aviation Administration planning and design criteria combined with a number of standard industry methodologies. The airfield facilities are usually the most space intensive due to spacing, lengths, configurations and orientation requirements for these facilities, and thus these are typically addressed first. Terminal and gate development is the second key category of requirements, as they must be properly positioned relative to the airfield to provide efficient access to the taxiway and runway system to allow the airfield to function at its projected capacity. Finally, cargo and various support facilities are addressed.

E.3.1.2 Master Plan Facility Requirement Summary

Table E-13 outlines the airfield facility requirements, and **Table E-14** outlines the requirements for the support and ancillary facilities as presented in the *O'Hare International Airport Master Plan*. The airfield components include the runways, taxiways, airfield safety areas and navigational aides. **Table E-13** depicts the criteria for both the largest aircraft serving the airport currently, the Boeing 747, and the largest aircraft anticipated to serve the airport within the planning horizon, the Airbus 380. It is not known exactly when the Airbus 380 will serve the Airport, but it is anticipated to occur during the planning period. See **Appendix B, Aviation Demand Forecast,** for information on the fleet mix assumptions by year.

[32] O'Hare International Airport Master Plan, City of Chicago, February 2004.

TABLE E-13 – AIRFIELD FACILITY REQUIREMENTS

Airfield Facilities/Components	ADG V (B747) (a)	ADG VI (A380)
Runway Requirements		
Minimum Runway Length	7,500 feet	10,300 feet
Runway Width	150 feet	200 feet
Runway Shoulder Width	35 feet	40 feet
Independent Arrival Runway Centerline to:		
- Parallel Independent Arrival Runway Centerline		
Minimum	4,300 feet	4,300 feet
Recommended	5,000 feet	5,000 feet
Departure Runway Centerline to:		
- Parallel Runway Centerline		
Minimum	1,200 feet	1,200 feet
Recommended	2,500 feet	2,500 feet
Runway Centerline to:		
- Aircraft Parking Apron	500 feet	500 feet
- Taxiway Centerline	400 feet	600 feet
Runway Object Free Area Width (ROFA)	800 feet	800 feet
- Length Beyond Runway End	1,000 feet	1,000 feet
Runway Obstacle Free Zone Width (ROFZ)	400 feet	400 feet
- Length Beyond Runway End	200 feet	200 feet
Runway Safety Area Width (RSA)	500 feet	500 feet
- Length Beyond Runway End	1,000 feet	1,000 feet
Taxiway Requirements		
Taxiway Width	75 feet	100 feet
Taxiway Shoulder Width	35 feet	40 feet
Taxiway Centerline to:		
- Parallel Taxiway/Taxilane Centerline	267 feet	324 feet
- Fixed or Movable Object	160 feet	193 feet
Taxiway Object Free Area Width	320 feet	386 feet
Taxiway Safety Area Width	214 feet	262 feet
Navigational Aides		
CAT II/III lighting and equipment for all approaches		

Note: (a) ADG – Aircraft Design Group.
Source: O'Hare International Airport Master Plan, Page IV-24, City of Chicago, February 2004.

Runway Length Requirements Based On O'Hare Master Plan

According to FAA planning criteria, the recommended length for a primary runway must be determined by considering either the family of aircraft having similar performance characteristics or a specific aircraft needing the longest runway. In either case, the choice should be based on aircraft that are forecast to use the runway on a regular basis. Currently, runway lengths at O'Hare vary from 7,500 feet for Runway 4L/22R (the shortest runway at O'Hare) to 13,000 feet for Runway 14R/32L (the longest runway at O'Hare). The remaining runways range from nearly 8,000 feet to 10,500 feet.

According to FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems (NPIAS)*, airport dimensional standards, including runway length, should be selected

which are appropriate for the critical aircraft[33] that will make substantial use[34] of the airport during the planning period.

The *2004 O'Hare Master Plan* analyzed runway length requirements based on the existing fleet operating at the Airport, and the assumption that future operations would include the New Large Aircraft (i.e. A380). Based on analysis conducted for the *O'Hare Master Plan*, including input from airline representatives, a maximum runway length of 13,000 feet was recommended.[35]

A runway length of 7,500 feet meets the requirements for over 85 percent of the departures at O'Hare. This length also meets the wet and dry runway landing length requirements for all aircraft operating at O'Hare, except for large widebody aircraft such as the Boeing 747. About 15 percent of the aircraft departing O'Hare require more than 7,500 feet of runway length. These departures include aircraft such as the MD-82/83, typically destined for the west coast. Also, manufacturer's data indicates that runway lengths greater than 10,300 feet should be provided where practicable to accommodate NLA such as the Airbus 380.

To maximize the operational efficiency and flexibility of the airfield, the need for Air Traffic to segregate aircraft with different runway length requirements should be minimized. Providing more runways with adequate length for all arrivals and departures minimizes this need to segregate the aircraft. Also, it is important to provide runways of adequate length that do not interfere with the use of other runways. For example, during VFR east flow operations (Plan X), a full-length Runway 14R departure requires FAA Air Traffic to create gaps in the arriving aircraft streams for Runways 9L and 9R. This interaction between the departure stream off Runway 14R and the arrival streams of Runways 9L and 9R causes both a departure delay (to the aircraft on 14R) as well as arrival delays (for the aircraft arriving 9R and 9L). For a graphical depiction of Plan X, as well as the other primary runway operating configurations, refer to **Section A.4.2**, **Runway Operating Configurations**, in **Appendix A, Background.**

As illustrated above, the ability to provide adequate runway length to accommodate the needs of the large majority of aircraft without interfering with the use of other runways is essential in maintaining an efficient airfield operation. This issue requires careful consideration relative to the individual runway configurations discussed earlier and the availability of adequate runway length based on the aircraft types that might be on the airfield at any specific time. At present, O'Hare has 4 runways of at least 8,000 feet, and only 1 runway as short as 7,500 feet. To maximize airfield efficiency, runways that would be routinely used for departure should be 8,000 to 10,300 feet in length if possible.

Additionally, at least two and ideally, three runways (at least 10,300 feet in length) should be capable of supporting New Large Aircraft (NLA) and the associated FAA Airport Design Group VI activities. Two runways are the minimum required to provide operational flexibility in the event that a runway is out of service. Three runways would provide better operational flexibility in addressing taxiway flow and runway closure problems. At least one of the

[33] The critical aircraft may be a single aircraft or a composite of the most demanding characteristics of several aircraft.
[34] Substantial use means either 500 or more annual itinerant operations, or scheduled commercial service.
[35] O'Hare International Airport Master Plan, City of Chicago, Page IV-17, February 2004.

runways should be on the alternate side of the terminal area to allow access to a wider range of potential gates.

Table E-14 delineates the anticipated facility requirements for the support and ancillary facilities at O'Hare International Airport. The table compares the existing facility to what is required in the future (2018) and notes the difference.

TABLE E-14
TERMINAL, SUPPORT AND ANCILLARY REQUIREMENTS

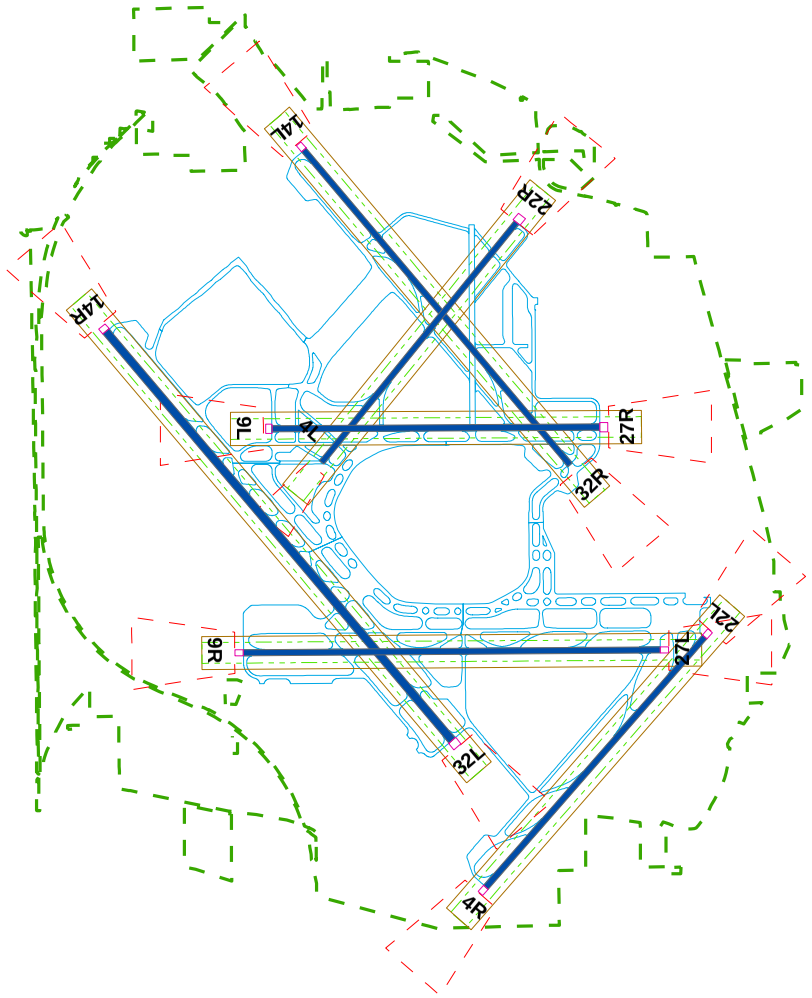
Component	Existing	2018	Difference
Terminal Aircraft Gate Positions (a)	189 gates	232 gates	43 gates
Passenger Terminal Building (b)			
- Total all Terminals (SF)	4,757,000	7,516,000	2,759,000
Cargo Facilities (c)			
- Building Area (SF)	3,118,400	4,391,900	1,273,500
- Airside Apron (SF)	3,254,600	3,243,800	10,800
- Total Site Area (Acres)	261	316	55
Airline Aircraft Maintenance (c)			
- Building Area (SF)	1,215,200	1,419,290	204,090
- Airside Apron (SF)	3,497,200	3,857,200	360,000
- Total Site Area (Acres)	219	240	21
Airline GSE Maintenance (c)			
- Building Area (SF)	256,100	256,100	0
- Total Site Area (Acres)	30	30	0
Flight Kitchens (c)			
- Building Area (SF)	286,400	286,400	0
- Total Site Area (Acres)	17	17	0
Airport Maintenance and DOA (c)			
- Building Area (SF)	631,300	631,300	0
- Total Site Area (Acres)	68	68	0
General Aviation / FBO (c)			
- Building Area (SF)	30,400	30,400	0
- Airside Apron (SF)	574,500	574,500	0
- Total Site Area (Acres)	15	15	0

Notes: (a) O'Hare International Airport Master Plan, Pages II-65 & VI-16, City of Chicago, February 2004.
(b) O'Hare International Airport Master Plan, Page VI-14, City of Chicago, February 2004.
(c) O'Hare International Airport Master Plan, Page IV-28, City of Chicago, February 2004.
(d) SF = square feet
Source: O'Hare International Airport Master Plan, City of Chicago, February 2004.

E.4 O'HARE DEVELOPMENT ALTERNATIVES - LAYOUTS WITH LAND USE DELINEATION

To assist in the initial screening of the O'Hare development alternatives identified in **Chapter 3, Alternatives,** an overall land use plan drawing was developed for each O'Hare Development Alternative. These drawings summarize runway layout and configuration and the general configuration and gross area available for terminal development, cargo development, hangar development and airport support. **Exhibits E-2** through **E-10** present the land use drawings for Alternative A through Alternative I, respectively.

RWY Name	Approx. Lengths
4L-22R	7500'
4R-22L	8075'
9L-27R	7967'
9R-27L	10144'
14L-32R	10005'
14R-32L	13000'



Legend

- Existing Runways
- Runway Object Free Area
- Runway Protection Zone
- Runway Safety Area
- Existing Airport Property Line

Source: Environmental Science Associates [TPC], 2003. Ricondo & Associates, Inc. [CCT], Existing ALP, 2004.

Chicago O'Hare International Airport

O'Hare Modernization
Environmental Impact Statement

Alternative A
No Action

▶ Exhibit E-2

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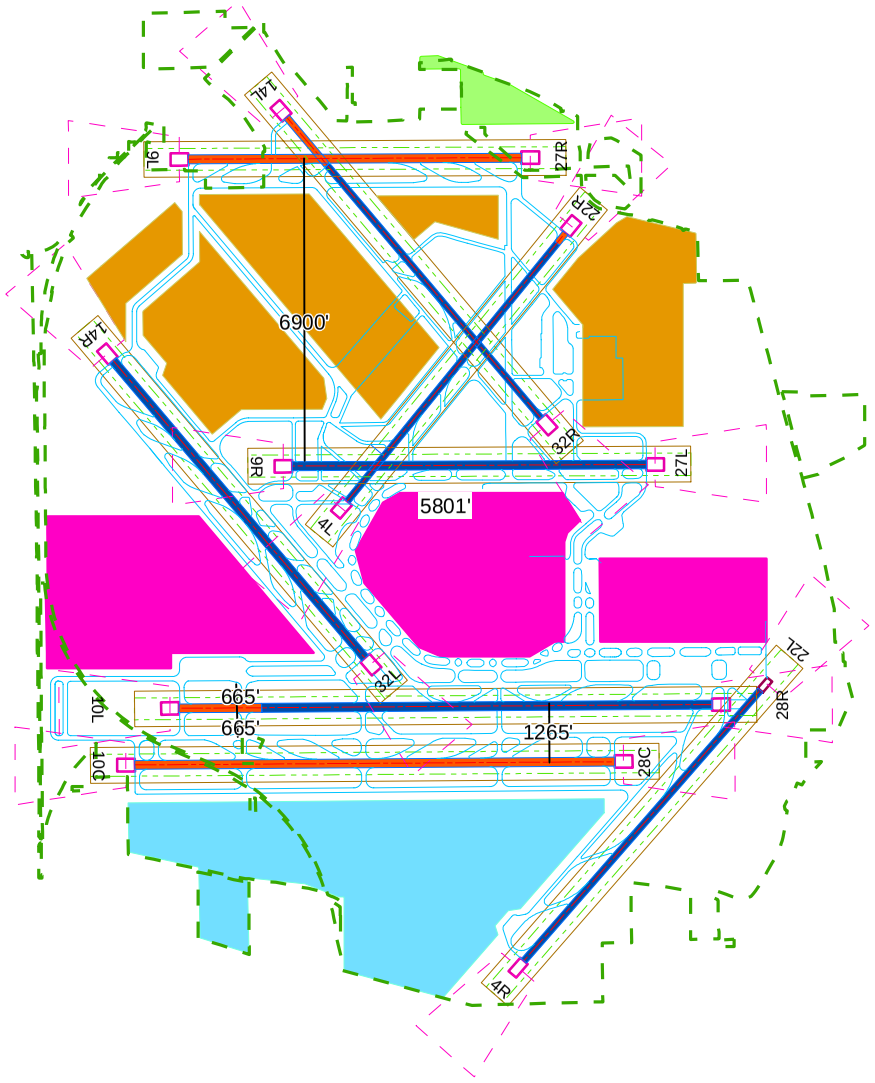
RWY Name	Approx. Lengths
4L-22R	7500'
4R-22L	8075'
9L-27R	7500'
9R-27L	7967'
10L-28R	13000'
10C-28C	10800'
14R-32L	8750'
14L-32R	8850'



Legend

	Approximate Areas
Existing Runways	
New/Relocated Runways	
Proposed Cargo Development Area	630 Acres
Proposed Hangar Development Area	830 Acres
Proposed Other Development Area	50 Acres
Terminal Development Area	850 Acres
Runway Object Free Area	
Runway Protection Zone	
Runway Safety Area	
Existing Airport Property Line	

Note:
Specific elements included in this layout concept are shown for illustration purposes only. Further obstruction and operational analyses are necessary.
Only major land uses are shown. Areas for water detention and required uses to be defined within these areas.

Source: Environmental Science Associates, Inc.[TPC], 2003. Ricondo & Associates[CCT], Existing ALP, 2003.

Chicago O'Hare International Airport

O'Hare Modernization
Environmental Impact Statement

Alternative B
Land Use Concept

▶ Exhibit E-3

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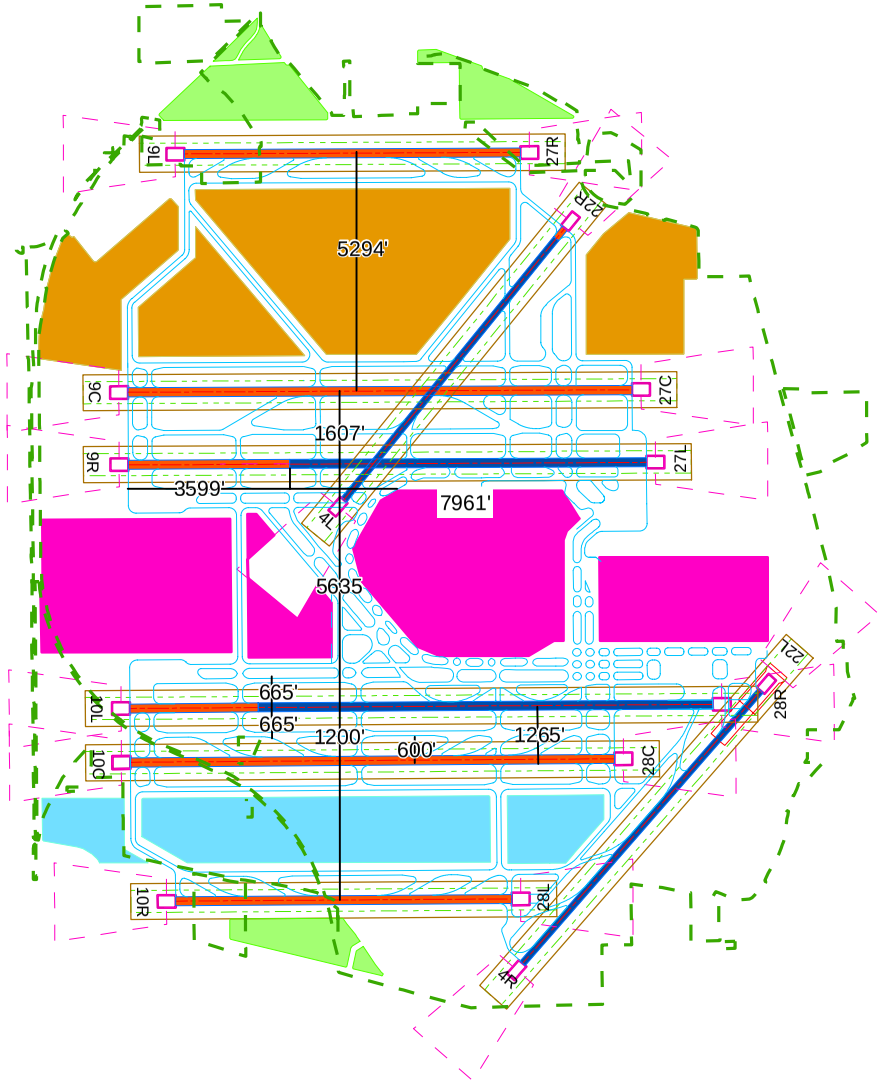
RWY Name	Approx. Lengths
4L-22R	7500'
4R-22L	8075'
9L-27R	7500'
9C-27C	11245'
9R-27L	11260'
10R-28L	7500'
10C-28C	10800'
10L-28R	13000'



Legend

	Approximate Areas
Existing Runways	
New/Relocated Runways	
Proposed Cargo Development Area	370 Acres
Proposed Hangar Development Area	840 Acres
Proposed Other Development Area	190 Acres
Terminal Development Area	900 Acres
Runway Object Free Area	
Runway Protection Zone	
Runway Safety Area	
Existing Airport Property Line	

Source: Environmental Science Associates, Inc.[TPC], 2003. Ricondo & Associates[CCT], Existing ALP, 2003.

Chicago O'Hare International Airport

O'Hare Modernization
Environmental Impact Statement

Alternative C
Land Use Concept

▶ Exhibit E-4

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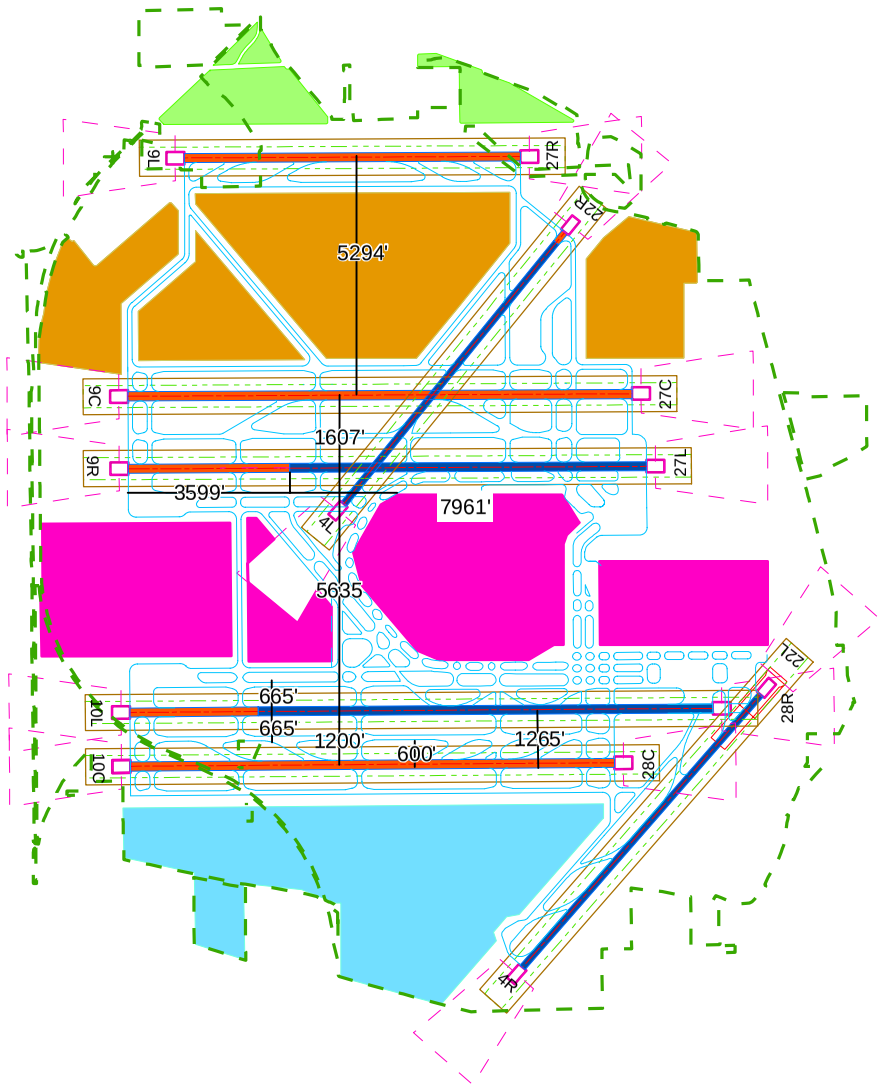
RWY Name	Approx. Lengths
4L-22R	7500'
4R-22L	8075'
9L-27R	7500'
9C-27C	11245'
9R-27L	11260'
10L-28R	13000'
10C-28C	10800'



Legend

	Approximate Areas
Existing Runways	
New/Relocated Runways	
Proposed Cargo Development Area	630 Acres
Proposed Hangar Development Area	840 Acres
Proposed Other Development Area	150 Acres
Terminal Development Area	900 Acres
Runway Object Free Area	
Runway Protection Zone	
Runway Safety Area	
Existing Airport Property Line	

Note:
Specific elements included in this layout concept are shown for illustration purposes only. Further obstruction and operational analyses are necessary.
Only major land uses are shown. Areas for water detention and required uses to be defined within these areas.

Source: Environmental Science Associates [TPC], Inc., 2003. Ricondo & Associates[CCT], Existing ALP, 2003.

Chicago O'Hare International Airport

O'Hare Modernization
Environmental Impact Statement

Alternative D
Land Use Concept

▶ **Exhibit E-5**

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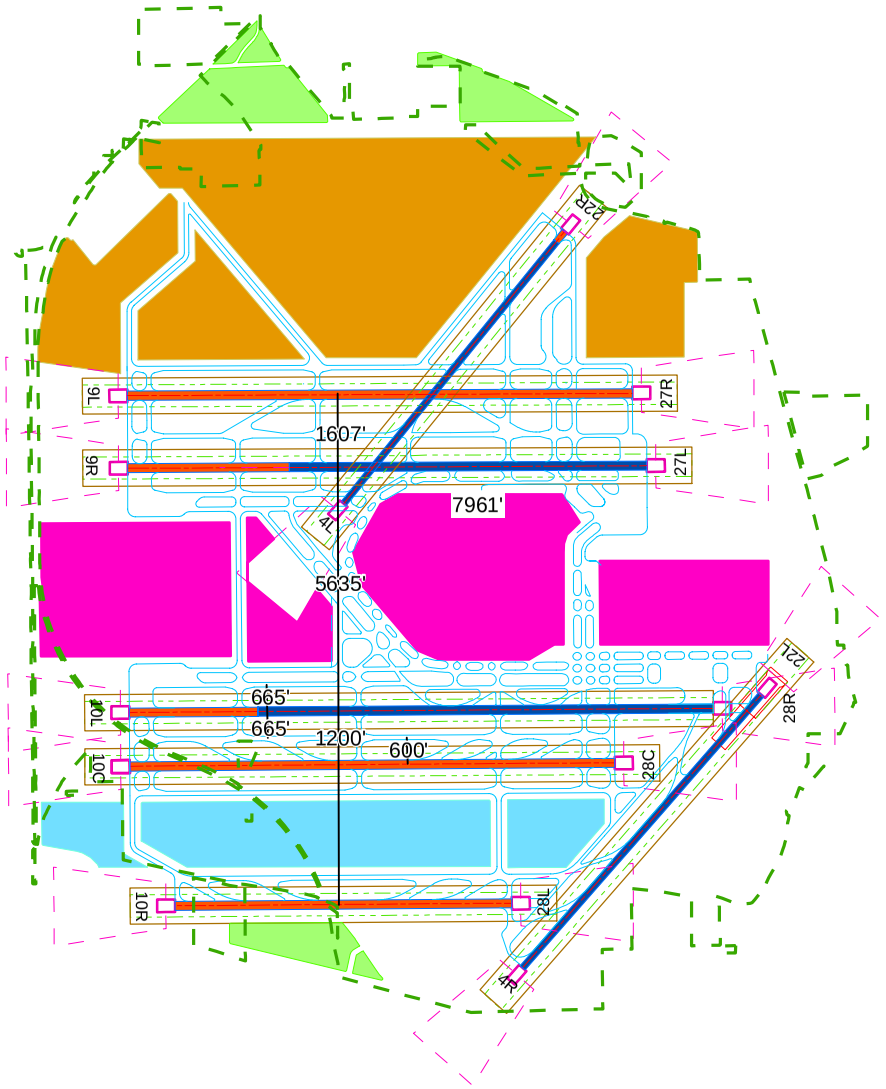
RWY Name	Approx. Lengths
4L-22R	7500'
4R-22L	8075'
9L-27R	11245'
9R-27L	11260'
10L-28R	13000'
10C-28C	10800'
10R-28L	7500'



Legend

	Approximate Areas
Existing Runways	
New/Relocated Runways	
Proposed Cargo Development Area	370 Acres
Proposed Hangar Development Area	1110 Acres
Proposed Other Development Area	200 Acres
Terminal Development Area	900 Acres
Runway Object Free Area	
Runway Protection Zone	
Runway Safety Area	
Existing Airport Property Line	

Note:
Specific elements included in this layout concept are shown for illustration purposes only. Further obstruction and operational analyses are necessary.
Only major land uses are shown. Areas for water detention and required uses to be defined within these areas.

Source: Environmental Science Associates, Inc.[TPC], 2003. Ricondo & Associates[CCT], Existing ALP, 2003.

Chicago O'Hare International Airport

O'Hare Modernization
Environmental Impact Statement

Alternative E
Land Use Concept

▶ Exhibit E-6

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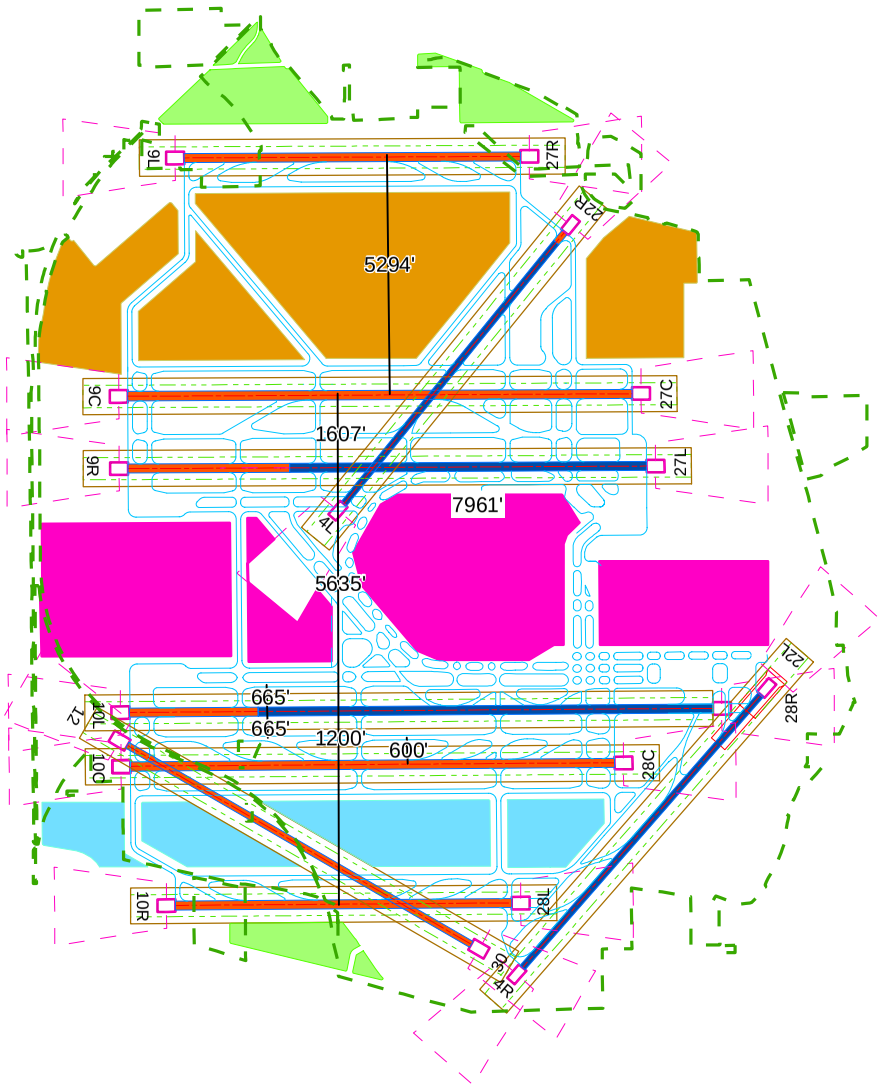
RWY Name	Approx. Lengths
4L-22R	7500'
4R-22L	8075'
9L-27R	7500'
9C-27C	11245'
9R-27L	11560'
10L-28R	13000'
10C-28C	10800'
10R-28L	7500'
12-30	8850'



Legend

	Approximate Areas
Existing Runways	
New/Relocated Runways	
Proposed Cargo Development Area	310 Acres
Proposed Hangar Development Area	840 Acres
Proposed Other Development Area	200 Acres
Terminal Development Area	900 Acres
Runway Object Free Area	
Runway Protection Zone	
Runway Safety Area	
Existing Airport Property Line	

Note:
Specific elements included in this layout concept are shown for illustration purposes only. Further obstruction and operational analyses are necessary.
Only major land uses are shown. Areas for water detention and required uses to be defined within these areas.

Source: Environmental Science Associates, Inc.[TPC], 2003. Ricondo & Associates [CCT], Existing ALP, 2003.

Chicago O'Hare International Airport

O'Hare Modernization
Environmental Impact Statement

Alternative F
Land Use Concept

▶ Exhibit E-7

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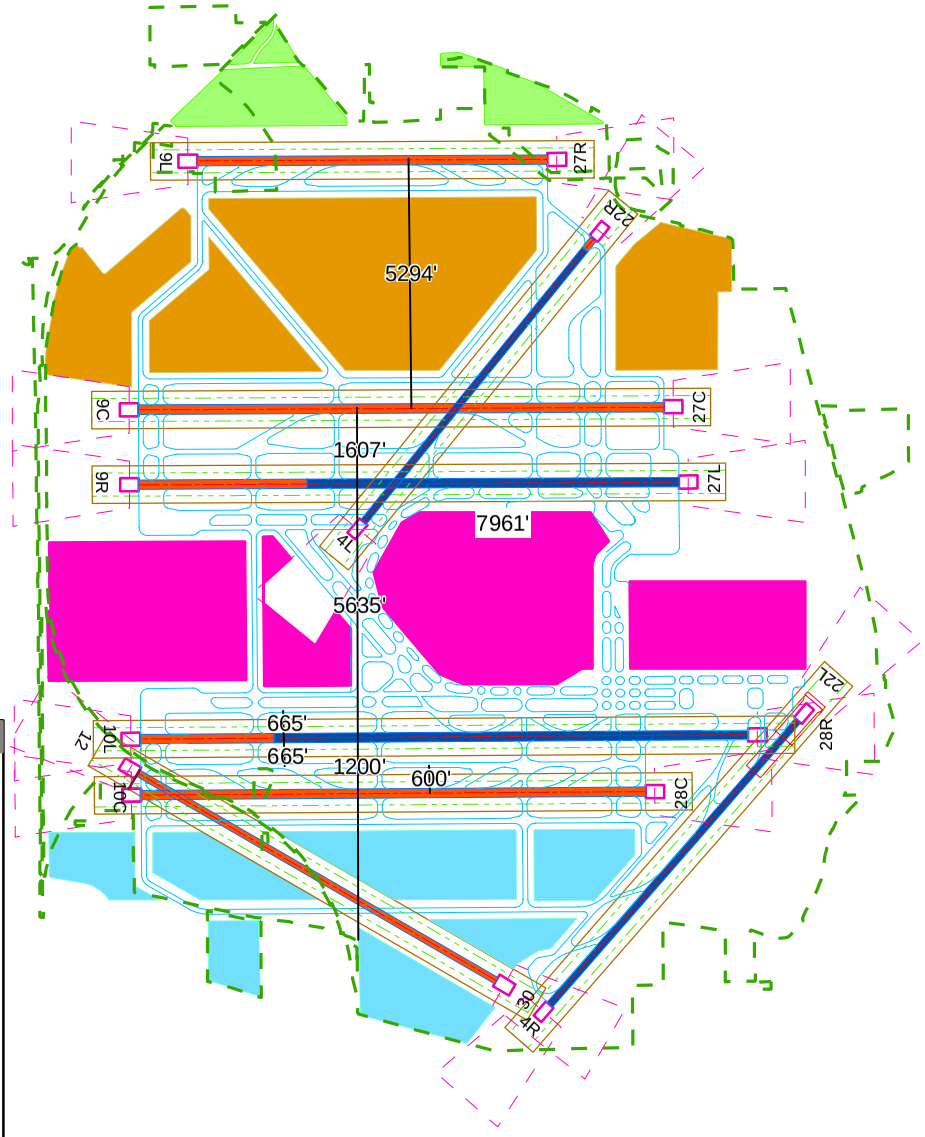
RWY Name	Approx. Lengths
4L-22R	7800'
4R-22L	8075'
9L-27R	7500'
9C-27C	11245'
9R-27L	11260'
10L-28R	13000'
10C-28C	10800'
12-30	8850'



Legend

	Approximate Areas
Existing Runways	
New/Relocated Runways	
Proposed Cargo Development Area	480 Acres
Proposed Hangar Development Area	840 Acres
Proposed Other Development Area	150 Acres
Terminal Development Area	900 Acres
Runway Object Free Area	
Runway Protection Zone	
Runway Safety Area	
Existing Airport Property Line	

Note:
Specific elements included in this layout concept are shown for illustration purposes only. Further obstruction and operational analyses are necessary.
Only major land uses are shown. Areas for water detention and required uses to be defined within these areas.

Source: Environmental Science Associates, Inc.[TPC], 2003. Ricondo & Associates[CCT], Existing ALP, 2003.

Chicago O'Hare International Airport

O'Hare Modernization
Environmental Impact Statement

Alternative G
Land Use Concept

▶ **Exhibit E-8**

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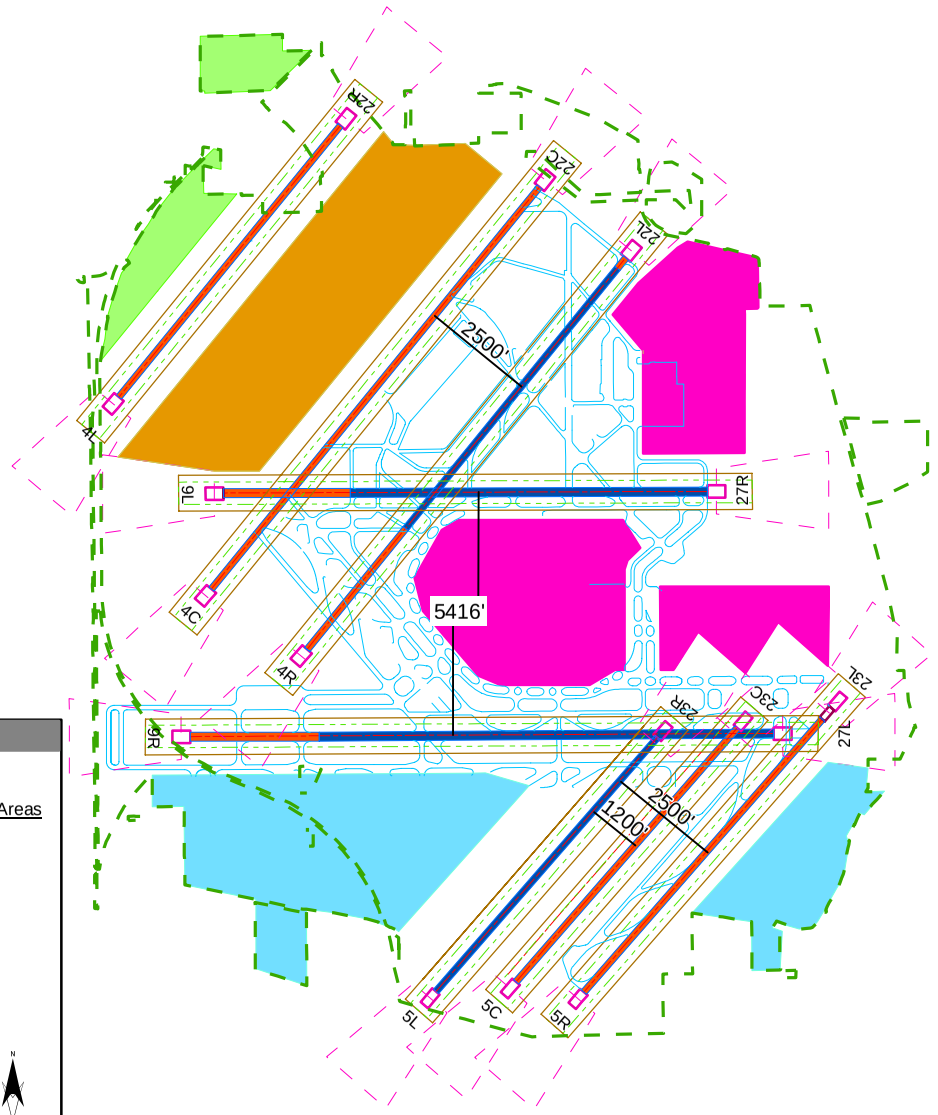

RWY Name	Approx. Lengths
4L-22R	7800'
4C-22C	11560'
4R-22L	11245'
9R-27L	13000'
9L-27R	10800'
5R-23L	8071'
5C-23C	7500'
5L-23R	7500'

Legend

	Approximate Areas
Existing Runways	
New/Relocated Runways	
Proposed Cargo Development Area	650 Acres
Proposed Hangar Development Area	710 Acres
Proposed Other Development Area	50 Acres
Terminal Development Area	590 Acres
Runway Object Free Area	
Runway Protection Zone	
Runway Safety Area	
Existing Airport Property Line	

Note:
Specific elements included in this layout concept are shown for illustration purposes only. Further obstruction and operational analyses are necessary.
Only major land uses are shown. Areas for water detention and required uses to be defined within these areas.

Source: Environmental Science Associates, Inc.[TPC], 2003. Ricondo & Associates[CCT], Existing ALP, 2003.

Chicago O'Hare International Airport

O'Hare Modernization
Environmental Impact Statement

Alternative H
Land Use Concept

▶ Exhibit E-9

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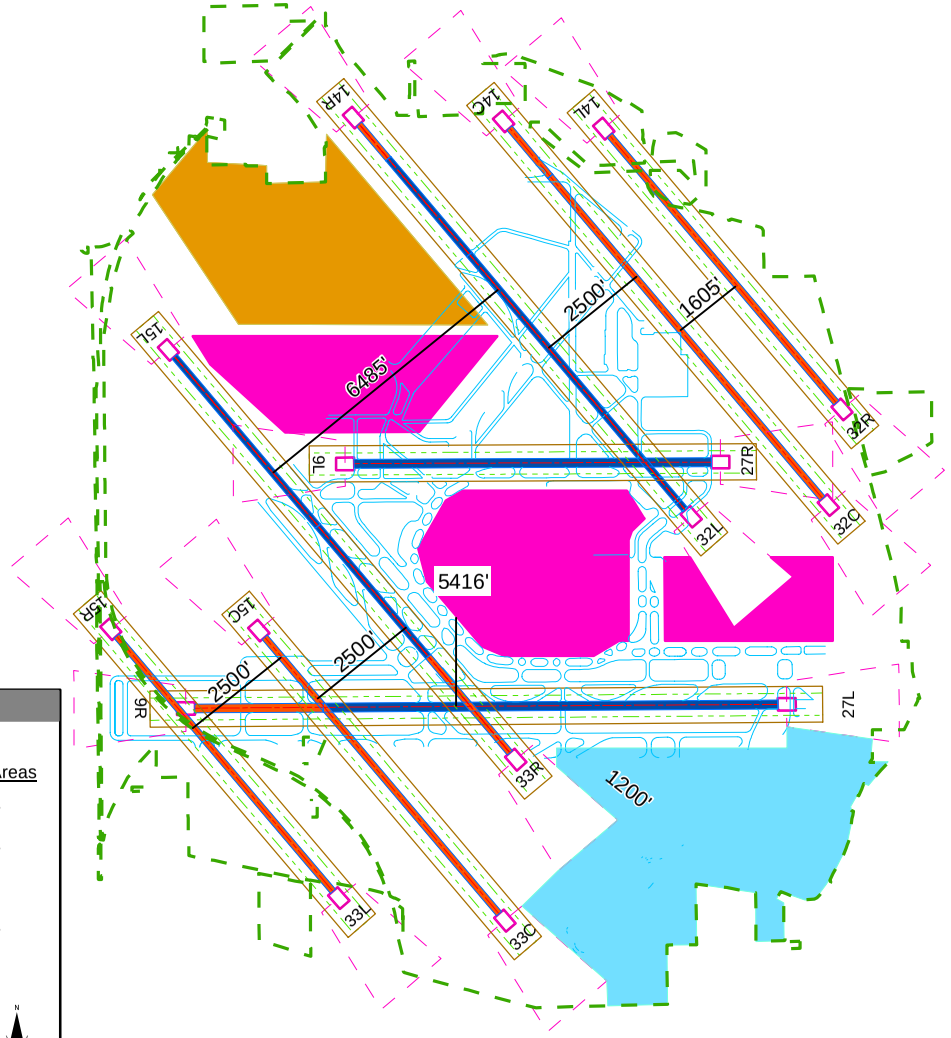
RWY Name	Approx. Lengths
14L-32R	7800'
14C-32C	10800'
14R-32L	11245'
9L-27R	7974'
9R-27L	13000'
15L-33R	11560'
15C-33C	8072'
15R-33L	7451'



Legend

	Approximate Areas
Existing Runways	
New/Relocated Runways	
Proposed Cargo Development Area	570 Acres
Proposed Hangar Development Area	410 Acres
Proposed Other Development Area	0 Acres
Terminal Development Area	700 Acres
Runway Object Free Area	
Runway Protection Zone	
Runway Safety Area	
Existing Airport Property Line	

Note:
Specific elements included in this layout concept are shown for illustration purposes only. Further obstruction and operational analyses are necessary.
Only major land uses are shown. Areas for water detention and required uses to be defined within these areas.

Source: Environmental Science Associates, Inc.[TPC], 2003. Ricondo & Associates[CCT], Existing ALP, 2003.

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E.5 FURTHER DESCRIPTION OF ALTERNATIVES RETAINED FOR DETAILED CONSIDERATION

Major improvement projects that would be undertaken in Alternatives A, C, D, and G are listed in **Table E-19** the Project Definition Matrix. **Table E-19,** because of its number of pages, is located in at the end of this appendix starting on page E-79. As presented, Alternative A improvements are intended to replace and/or rehabilitate airport infrastructure to maintain operations throughout the planning period. However, a few of the projects associated with Alternative A would enhance the operational capabilities of the existing airfield. Improvements associated with Alternatives C, D, and G (O'Hare Development Alternatives) are intended to provide facilities to meet the stated purpose and need for the proposed action. In **Section E.6, Operational and Delay Characteristics of Alternatives Retained for Detailed Consideration,** there are detailed exhibits of each alternative with references to **Table E-19.** The exhibits are as follows:

- Alternative A - **Exhibits E-14** and **E-15;**
- Alternative C - **Exhibits E-17** and **E-18;**
- Alternative D - **Exhibits E-20** and **E-21;**
- Alternative G - **Exhibits E-23** and **E-24;**

E.5.1 Airspace Changes Included as a part of Alternative A

There are no changes to the existing airspace reflected in the No Action Alternative (Alternative A).

E.5.2 Airspace Changes Included as a part of Alternatives C, D and G

In conjunction with the airfield improvements proposed in the Alternatives C, D and G, the airspace surrounding O'Hare International Airport (the Airport) would be restructured to facilitate effective use of the airfield improvements. This section summarizes airspace changes that would be part of Alternatives C, D and G.

E.5.3 O'Hare Arrival Route Changes

Three new arrival routes would be provided. These arrival routes—called "high and wide" arrival routes—would provide three independent arrival streams to the Airport in both east flow and west flow conditions. The new arrival routes would originate to the southeast (over the OXI VORTAC), southwest (near BENKY/NEWRK), and northwest (from TEDDY/KRENA) of the Airport. **Exhibit E-11** shows the approximate locations of these new arrival routes. As shown in **Exhibit E-11**, the high and wide arrival route from the southeast would be used in west flow conditions (i.e., when the Runway 27 and Runway 28 systems are in use) whereas the high and wide arrival routes from the southwest and northwest would be used in east flow conditions (i.e., when the Runway 9 and Runway 10 systems are in use). These arrival routes

would provide air traffic controllers with the ability to feed Runway 27C in west flow and Runway 9C in east flow independently of the arrival flows to the Airport's other runways.

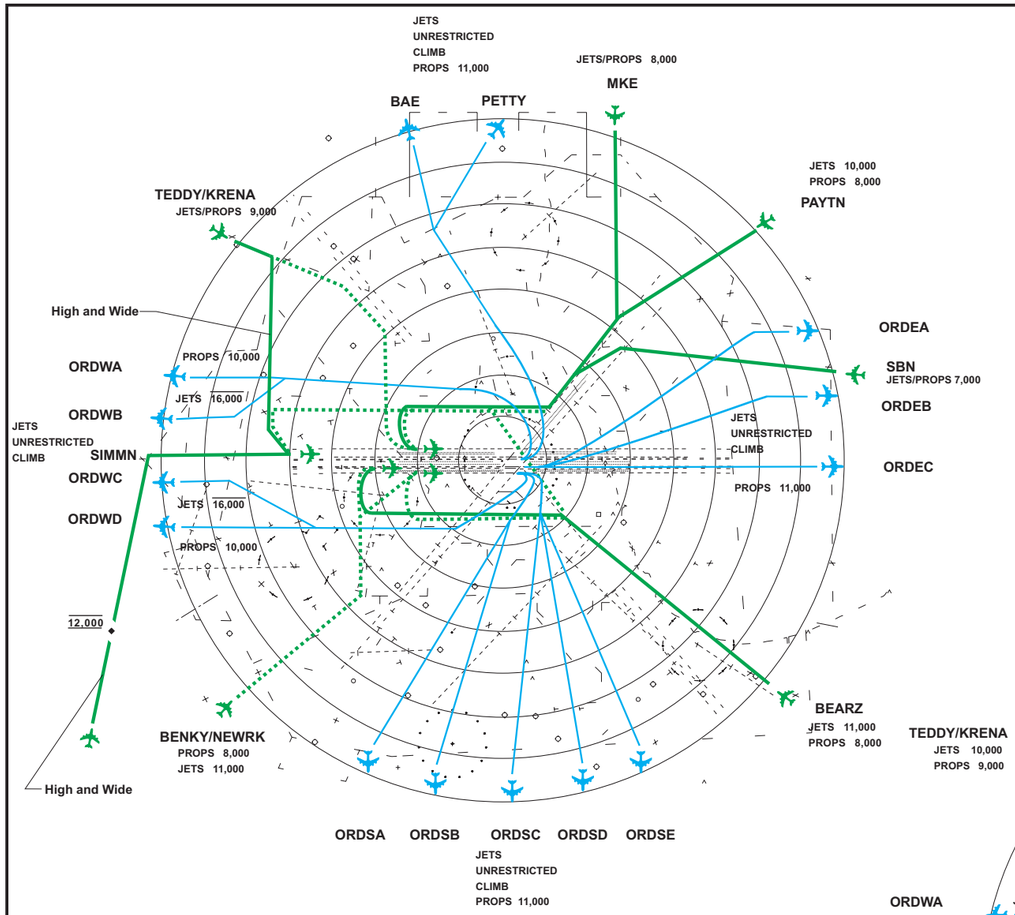
Provision of the high and wide arrival routes will involve redesign of airspace areas managed by the Chicago O'Hare Terminal Radar Approach Control Facility (TRACON) and Chicago Air Route Traffic Control Center (ARTCC). In addition, the arrival routes that currently serve the Airport's other runways will be adjusted slightly to allow for adequate horizontal separation of these routes from proposed departure routes. **Exhibits E-12** and **E-13** show comparisons of the existing airspace route structures with the proposed route structures for east flow and west flow configurations, respectively.

E.5.4 O'Hare Departure Route Changes

With the Build Alternatives, additional departure routes would be provided to accommodate the increased departure flows that the runway system would be able to accommodate. The airspace to the east of the Airport would be restructured to increase the number of eastbound departure routes from the Airport from two—ELX and GIJ—to three—ORDEA, ORDEB, and ORDEC. A fourth eastbound route, primarily for use by Midway Airport departures would also be provided south of ORDEC. The airspace to the south would be similarly restructured, increasing the number of southbound departure routes from three—EON, RBS, and GUIDO—to five—ORDSA, ORDSB, ORDSC, ORDSD, and ORDSE. Finally, the airspace west of the airport would be restructured, increasing the number of westbound departure routes from two—PLL and MZV—to four—ORDWA, ORDWB, ORDWC, and ORDWD. **Exhibits E-12** and **E-13** show these changes.

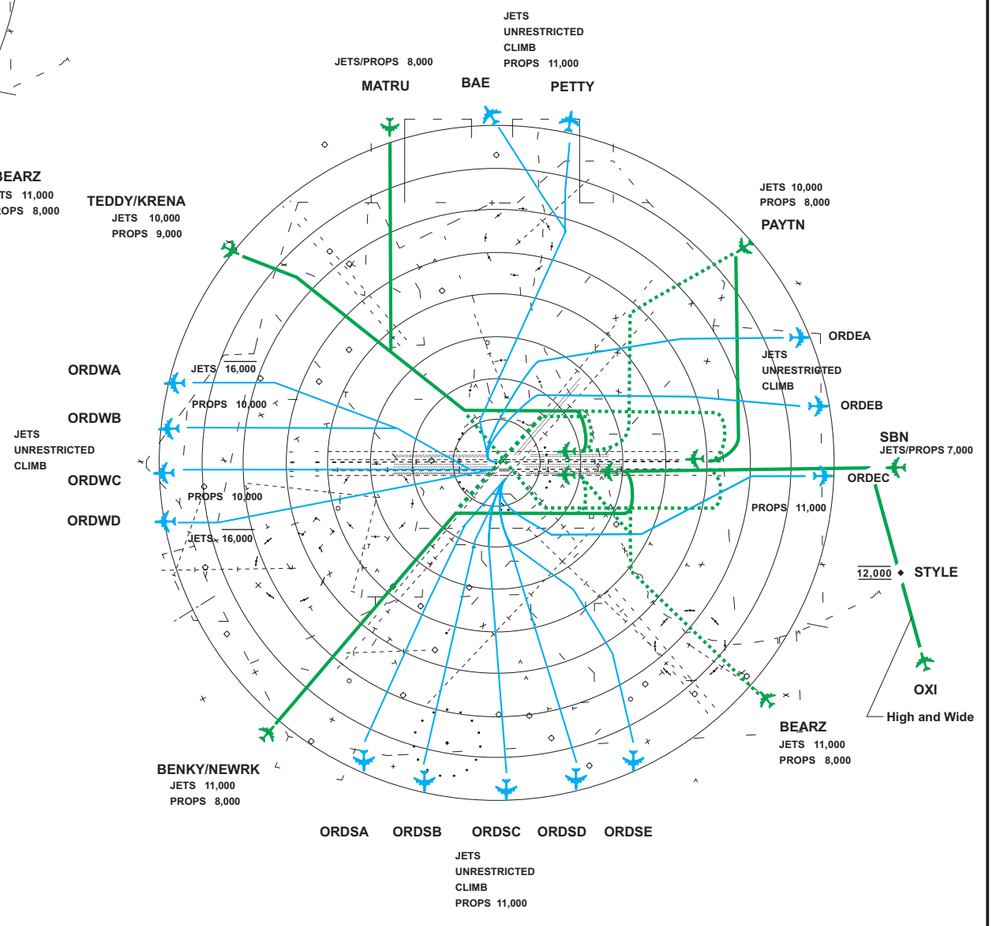
E.5.5 Other Airspace Changes

Implementation of the changes to O'Hare arrival and departure routes described above would require limited modifications to flight procedures for nearby airports in the airspace surrounding O'Hare. These modifications are described in **Appendix F, Noise.**



East Flow

West Flow



Chicago O'Hare International Airport

O'Hare Modernization Environmental Impact Statement

Primary Arrival Route
Secondary Arrival Route
Departure Route

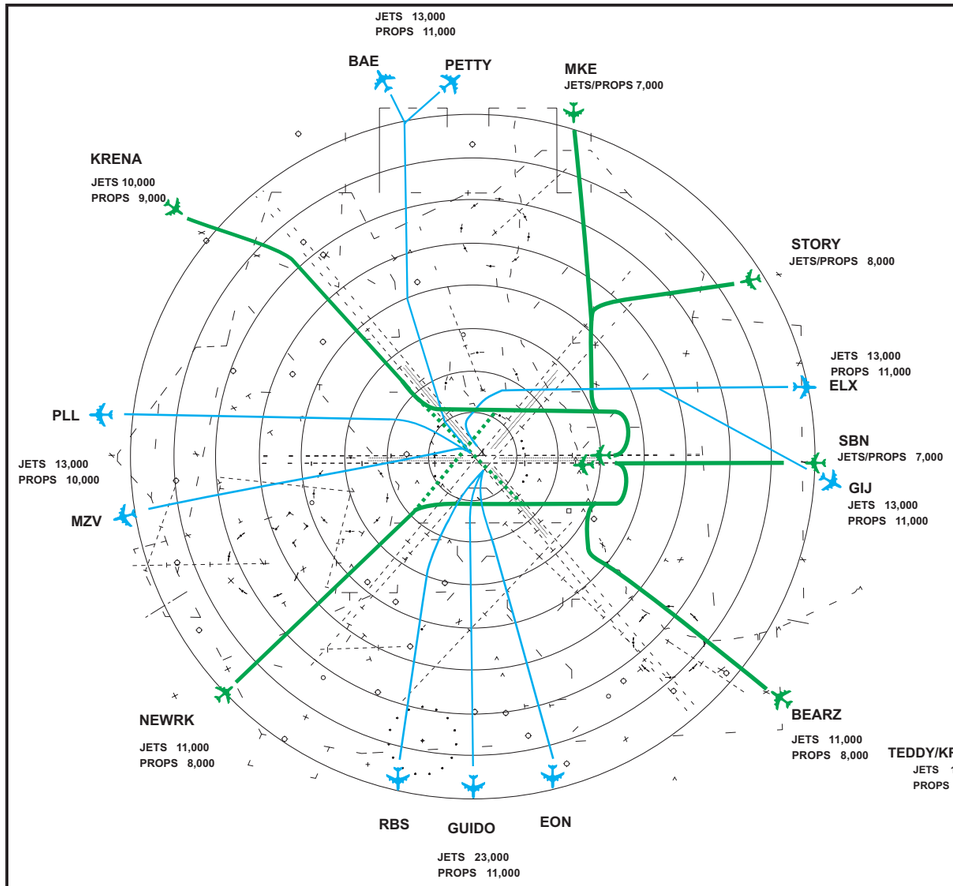
Note: Range Rings are 5 nautical miles apart.

N
S

Proposed Airspace Routes for Alternatives C, D, and G (Build Alternatives)

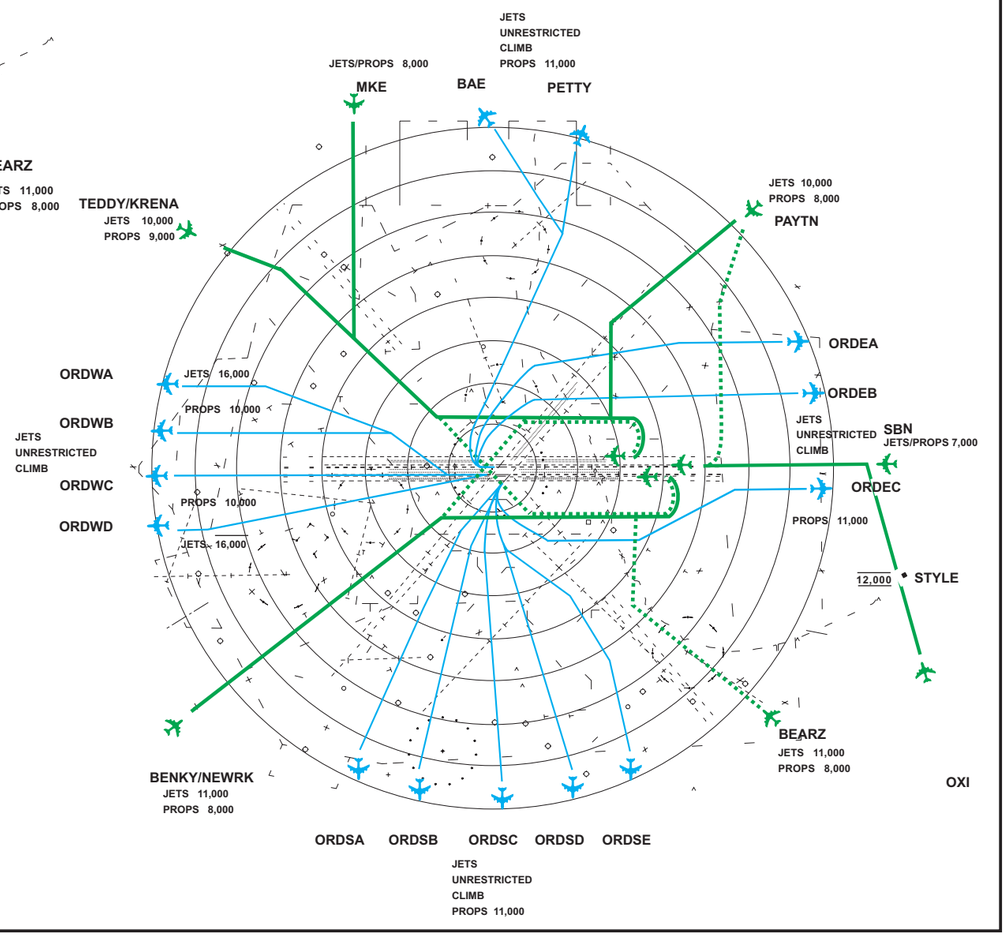
► Exhibit E-11

Comparisson of the airspace structure of Alternative A with that shown for Alternative C indicates the airspace changes that are proposed for the Build Alternatives.



Alternative A
No-Action
Preferred West Flow

Alternative C
Preferred West Flow



Note: Alternative A is equivalent to the existing airspace structure that serves O'Hare.

Chicago O'Hare International Airport

O'Hare Modernization Environmental Impact Statement

Primary Arrival Route
Secondary Arrival Route
Departure Route

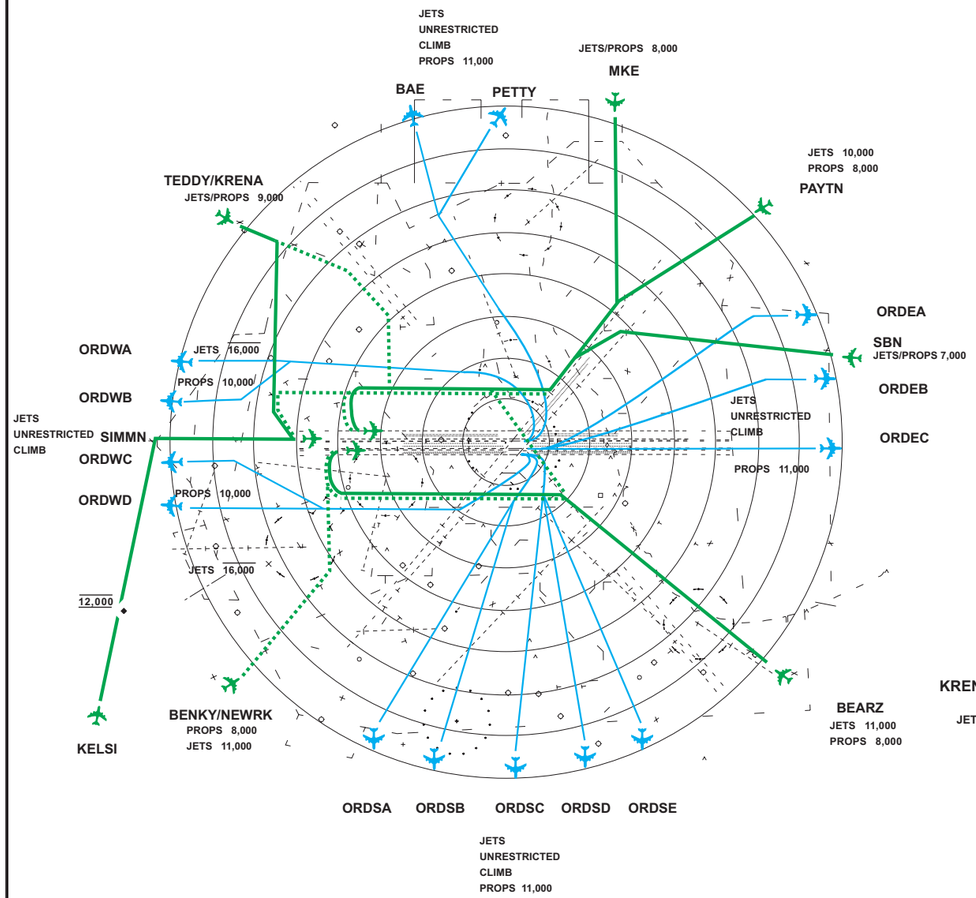
N
S

Note: Range Rings are 5 nautical miles apart.

Airspace Routes for Alternative A vs. Build Alternatives West Flow

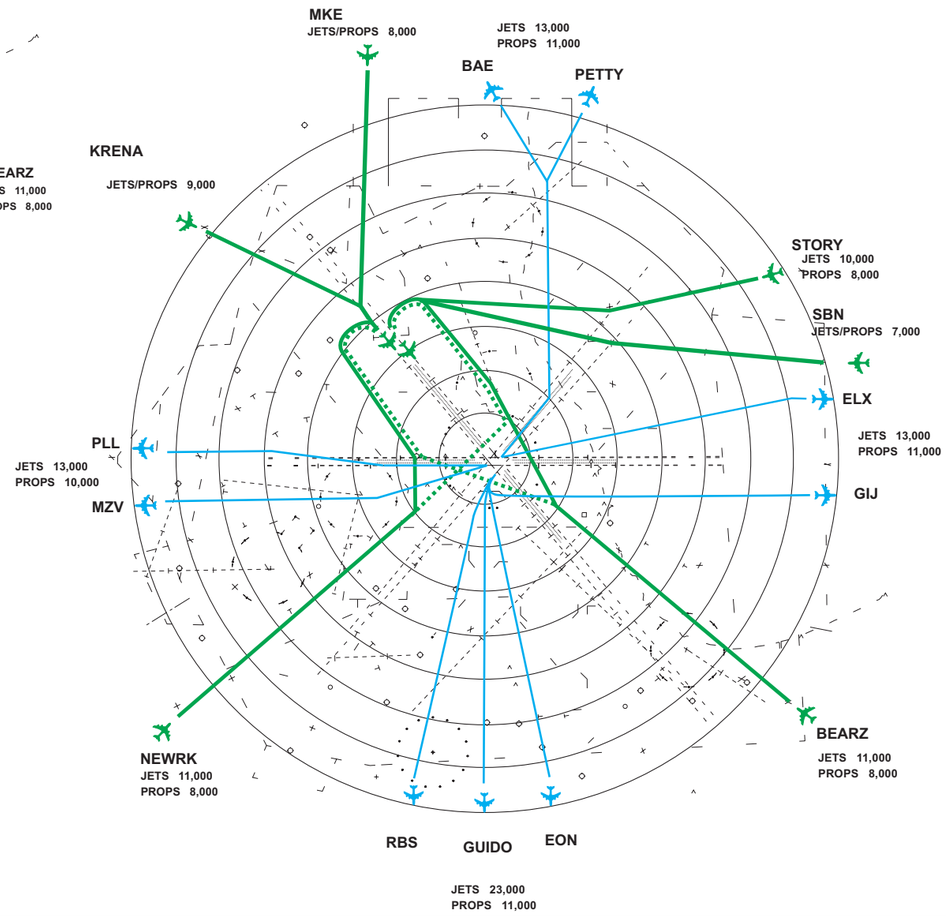
► **Exhibit E-12**

Comparisson of the airspace structure of Alternative A with that shown for Alternative C indicates the airspace changes that are proposed for the Build Alternatives.



Alternative A
No-Action
East Flow

Alternative C
Preferred East Flow



Note: Alternative A is equivalent to the existing airspace structure that serves O'Hare.

Chicago O'Hare International Airport

O'Hare Modernization Environmental Impact Statement

Primary Arrival Route
Secondary Arrival Route
Departure Route

N
S

Note: Range Rings are 5 nautical miles apart.

Airspace Routes for Alternative A vs. Build Alternatives East Flow

► **Exhibit E-13**

E.6 OPERATIONAL AND DELAY CHARACTERISTCS OF ALTERNATIVES RETAINED FOR DETAILED CONSIDERATION

This section summarizes the operational and delay characteristics of the 4 alternatives, Alternatives A, C, D and G that are retained for a detailed consideration in **Chapter 5, Environmental Consequences.** The analysis conducted for this EIS included ten years of historical wind and weather data for the Airport obtained from the National Climatic Data Center. The simulation modeling was conducted using the Total Airspace and Airport Modeller (TAAM). These simulations were conducted by the City of Chicago's Consultant Team (CCT) with direction, oversight, review, and approval by the FAA and FAA's Third Party Contractor (TPC). The FAA review team consisted of personnel from the TPC, FAA Chicago Area Modernization Program Office, the Chicago O'Hare Airport Traffic Control Tower, the Chicago O'Hare Terminal Radar Approach Facility, and the Chicago Air Route Traffic Control Center. For a detailed description of the simulation modeling conducted for the EIS, see **Appendix D, Simulation Modeling.**

E.6.1 Alternative A – No Action

The following summarizes the operational characteristics and delay estimates associated with Alternative A. Alternative A is shown in **Exhibits E-14** and **E-15.**

E.6.1.1 Operational Characteristics – Alternative A

The underlying data, analysis methodology, and results of the No Action Alternative analysis are reported in the following data packages prepared by the CCT with direction, oversight, review, and approval by the FAA:

- *Draft TAAM Simulation Data for Noise and Air Quality Analysis, 2007 No Action,* Ricondo and Associates, Inc. [CCT], July 2004.
- *Draft TAAM Simulation Data for Noise and Air Quality Analysis, 2009 No Action,* Ricondo and Associates, Inc. [CCT], July 2004.
- *Draft TAAM Simulation Data for Noise and Air Quality Analysis, 2013 No Action,* Ricondo and Associates Inc. [CCT], July 2004.
- *Draft TAAM Simulation Data for Noise and Air Quality Analysis, 2018 No Action,* Ricondo and Associates, Inc. [CCT], July 2004.

The analysis indicated that five runway use configurations could be used over 94 percent of the time at the Airport.[36] These five configurations consist of three visual flight rules (VFR) configurations—Plan W, Plan X, and Plan B—and two instrument flight rules (IFR)

[36] TAAM Simulation Data Package, 2007 No Action, Table I-3, Ricondo and Associates, Inc. [CCT], July 2004.

configurations—Parallel 27s and Parallel 9s.[37] Alternative A runway operating configurations and their estimated annual percent occurrences are shown in **Exhibit E-16.**[38]

Runway use configurations shown in **Exhibit E-16** illustrate one of the major operational issues associated with Alternative A, namely the numerous dependencies that exist between arrival and departure operations that exist either because (1) arrivals and departures share the use of a common runway (e.g., Runway 9L in Plan X, Runway 22L in Plan B); or (2) arrivals and departures to different runways cross one another, either in the air or on the ground (e.g., arrivals to Runway 27L and departures from Runway 22L in Plan W, departures from Runway 4L and departures from Runway 9L in Plan X).

These dependencies reduce the capacity of the Airport's runway system and require air traffic controllers to balance two modes of operation—an arrival priority mode and a departure priority mode—throughout the day. Dependencies and resulting need to balance arrival and departure priority modes of operation cause aircraft delays and increase air traffic control workload. Aircraft delays associated with Alternative A at future demand levels are presented in the following section.

Although not shown explicitly in **Exhibit E-16,** preferential noise abatement runway use configurations would be used between 10:00 p.m. and 6:30 a.m., provided that operational circumstances and weather conditions permit their use. These runway use configurations involve the use of Runways 9L and 9R by arrivals and departures in east flow conditions and Runways 27R and 27L in west flow conditions.

No major changes to the airspace route structure serving the Airport are assumed as a part of Alternative A, including airspace changes proposed by the FAA as part of its National Airspace Redesign (NAR) program. Rather, the airspace route structure that currently serves the Airport would be retained.

[37] VFR conditions occur when the cloud ceiling is at least 1,000 feet above the Airport's elevation and visibility is at least 3 statute miles. IFR conditions occur when the cloud ceiling is less than 1,000 feet above the Airport's elevation or visibility is less than 3 statute miles.

[38] The percent occurrences shown in **Exhibit E-16** have been normalized to sum to 100 percent.

Projects not shown on this Exhibit (III-5, V-2, VI-7, VI-9, VI-12, VI13, VI-14)

Chicago O'Hare International Airport

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- Existing Airport Property Line
- Existing Creeks/Detention Basins
- Phase I Development
- Phase II Development
- Phase III Development
- Existing Airfield Pavement
- Existing Apron Pavement
- Existing Airport Building
- Existing Avigation Easement

Note: For a detailed listing of these projects refer to Table E-19.

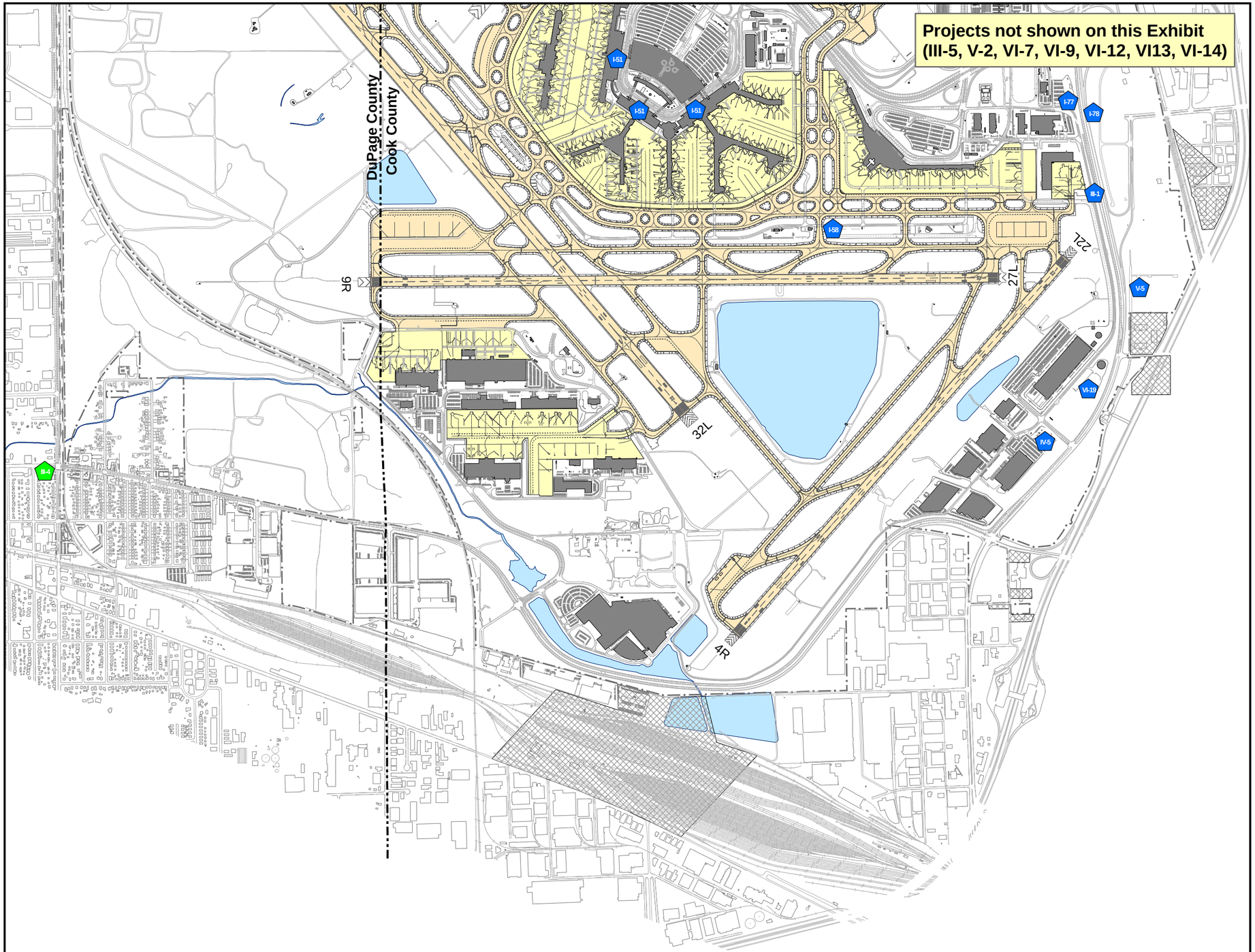
N

S

Alternative A - No Action North Airfield

▶ **Exhibit E-14**

Source: Crawford, Murphy and Tilly, Inc. [TPC] 2004



Chicago O'Hare International Airport

O'Hare Modernization Environmental Impact Statement

- Existing Airport Property Line
- Existing Creeks/Detention Basins
- Phase I Development
- Phase II Development
- Phase III Development
- Existing Airfield Pavement
- Existing Apron Pavement
- Existing Airport Building
- Existing Avigation Easment

Note: For a detailed listing of these projects refer to Table E-19.

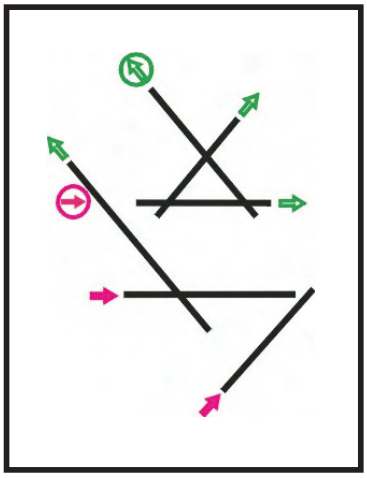
N
S

Alternative A - No Action
South Airfield

Exhibit E-15

Source: Crawford, Murphy and Tilly, Inc. [TPC], 2004.

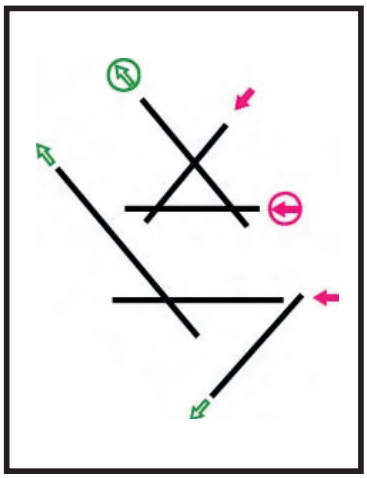
PLAN-X



27.0%

VFR

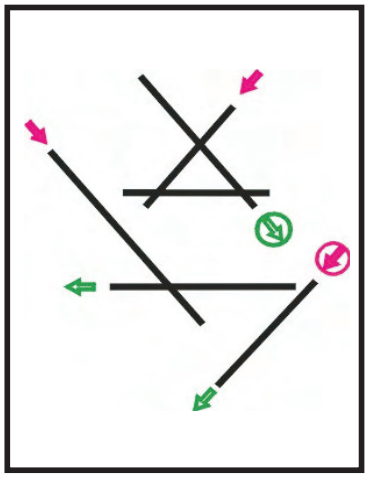
PLAN-W



46.6%

VFR

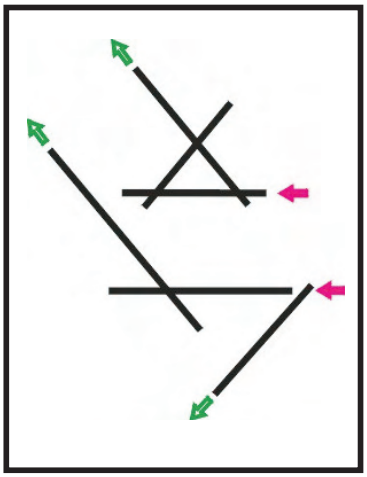
PLAN-B



17.1%

VFR

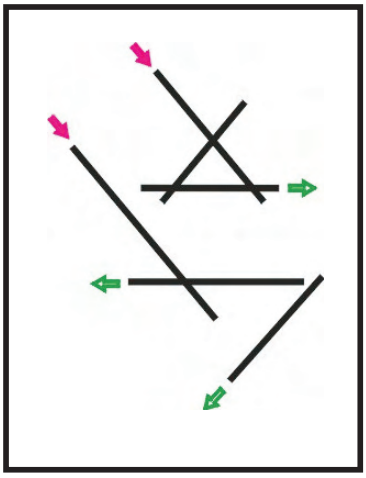
PARALLEL 27s



6.0%

IFR

PARALLEL 14s



3.3%

IFR

Legend

- Primary Arrival Runway
- Primary Departure Runway
- Overflow Arrival Runway
- Overflow Departure Runway

VFR- Visual Flight Rules

IFR- Instrument Flight Rules

Not To Scale

Note: Annual use percentages as modeled for the year 2018.

Source: 2018 No-Action TAAM Results Data Package, Ricondo & Associates, Inc.[CCT], July 2004.

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E.6.1.2 Delay Estimates – Alternative A

Table E-15 presents aircraft delay estimates for Alternative A. The table shows the delay that was estimated using TAAM for average day, peak month activity levels, as well as the weighted average annual delay estimates for Alternative A at the 2007, 2009, 2013, and 2018 demand levels. For more detailed information on the simulation modeling conducted for Alternative A, see **Appendix D, Simulation Modeling.**

It is important to recognize that the delay estimates presented in **Table E-15** were generated using constrained aircraft flight schedules, which reflect the estimated limits on activity that would be scheduled as delays increase under the No Action Alternative (Alternative A). The methodology used to develop the constrained flight schedules is provided in **Appendix B, Aviation Demand Forecast.**

TABLE E-15
ESTIMATED AVERAGE AIRCRAFT DELAYS - ALTERNATIVE A (NO ACTION)

Runway Use Configuration	Weather Condition (a)	Estimated Annual Percent Occurrence	Average delay: Average Day, Peak Month Conditions (minutes per operation)			
			2007	2009	2013	2018
Plan X	VFR	27.0 %	10.4	9.8	10.4	10.2
Plan W	VFR	46.6 %	8.2	8.1	8.9	8.8
Plan B	VFR	17.1 %	27.3	27.1	30.6	31.0
Parallel 27s	IFR	6.0 %	48.2	46.5	48.7	48.9
Parallel 9s	IFR	3.3 %	82.1	83.1	84.3	84.0
Average annual delay (minutes per operation)			16.2	15.9	17.2	17.1
Average day, peak month aircraft operations (b)			2,750	2,750	2,750	2,750

Notes:

(a) VFR conditions occur when the cloud ceiling is at least 1,000 feet above the Airport's elevation and visibility is at least 3 statute miles. IFR conditions occur when the cloud ceiling is less than 1,000 feet above the Airport's elevation or visibility is less than 3 statute miles.

(b) This level of operations was constrained reflecting the inability of Alternative A to accommodate unconstrained demand levels at acceptable levels of delay.

Sources:

Ricondo and Associates, Inc. [CCT] Preliminary Draft TAAM Simulation Data for Noise and Air Quality Analysis – 2007 No Action, July 2004;
Ricondo and Associates, Inc. [CCT] Preliminary Draft TAAM Simulation Data for Noise and Air Quality Analysis – 2009 No Action, July 2004;
Ricondo and Associates, Inc. [CCT] Preliminary Draft TAAM Simulation Data for Noise and Air Quality Analysis – 2013 No Action, July 2004;
Ricondo and Associates, Inc, [CCT] Preliminary Draft TAAM Simulation Data for Noise and Air Quality Analysis – 2018 No Action, July 2004.

E.6.2 Alternative C

The following summarizes the operational characteristics and delay estimates associated with Alternative C. Alternative C is shown in **Exhibits E-17** and **E-18.**

E.6.2.1 Operational Characteristics – Alternative C

Six runway use configurations were evaluated for Alternative C.[39] These six runway use configurations would be used over 99 percent of the time at the Airport,[40] and consist of two flow configurations—Parallel 27s and Parallel 9s—and three weather conditions—VFR-1, VFR-2, and IFR.[41] Alternative C runway operating configurations and their estimated annual percent occurrences are shown in **Exhibit E-19.**[42] This airfield configuration provides for four independent arrival and three independent departure runways in good weather conditions which are expected to exist more than 50 percent of the time as shown on **Exhibit E-19**.

[39] Draft TAAM Simulation Data Package, 2018 With Project, Ricondo and Associates, Inc. [CCT], April 2004.

[40] Draft TAAM Simulation Data Package, 2018 With Project, Table I-2, Ricondo and Associates, Inc. [CCT], April 2004.

[41] VFR-1 conditions occur when the cloud ceiling is at least 5,500 feet above the Airport's elevation and visibility is at least 10 statute miles. VFR-2 conditions occur when the cloud ceiling is less than 5,500 feet above the Airport's elevation but is at least 1,000 feet above the Airport's elevation *or* when visibility is less than 10 statute miles but is at least 3 statute miles. IFR conditions occur when the cloud ceiling is less than 1,000 feet above the Airport's elevation or visibility is less than 3 miles.

[42] The percent occurrences shown in **Exhibit E-19** have been normalized to sum to 100 percent.

Projects not shown in this Exhibit (II-16, III-2, III-3, III-5, V-2, V-6, V-11, VI-7, VI-9, VI-12, VI-13, VI-14, VII-80, VII-85, VII-96, VII-97)

Chicago O'Hare International Airport

O'Hare Modernization
Environmental Impact Statement

- Phase I Development - 2007
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- Existing Airport Property Line
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- Future Creeks/Detention Basins
- Existing Airfield Pavement
- Future Airfield Pavement
- Airfield Pavement Demolition
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- Future Avigation Easement
- Future Tunnel
- Future Service Roadways
- Service Road Upgrade
- Future NAVAID/ARFF Access Roads

Note: For a detailed listing of these projects refer to Table E-19.

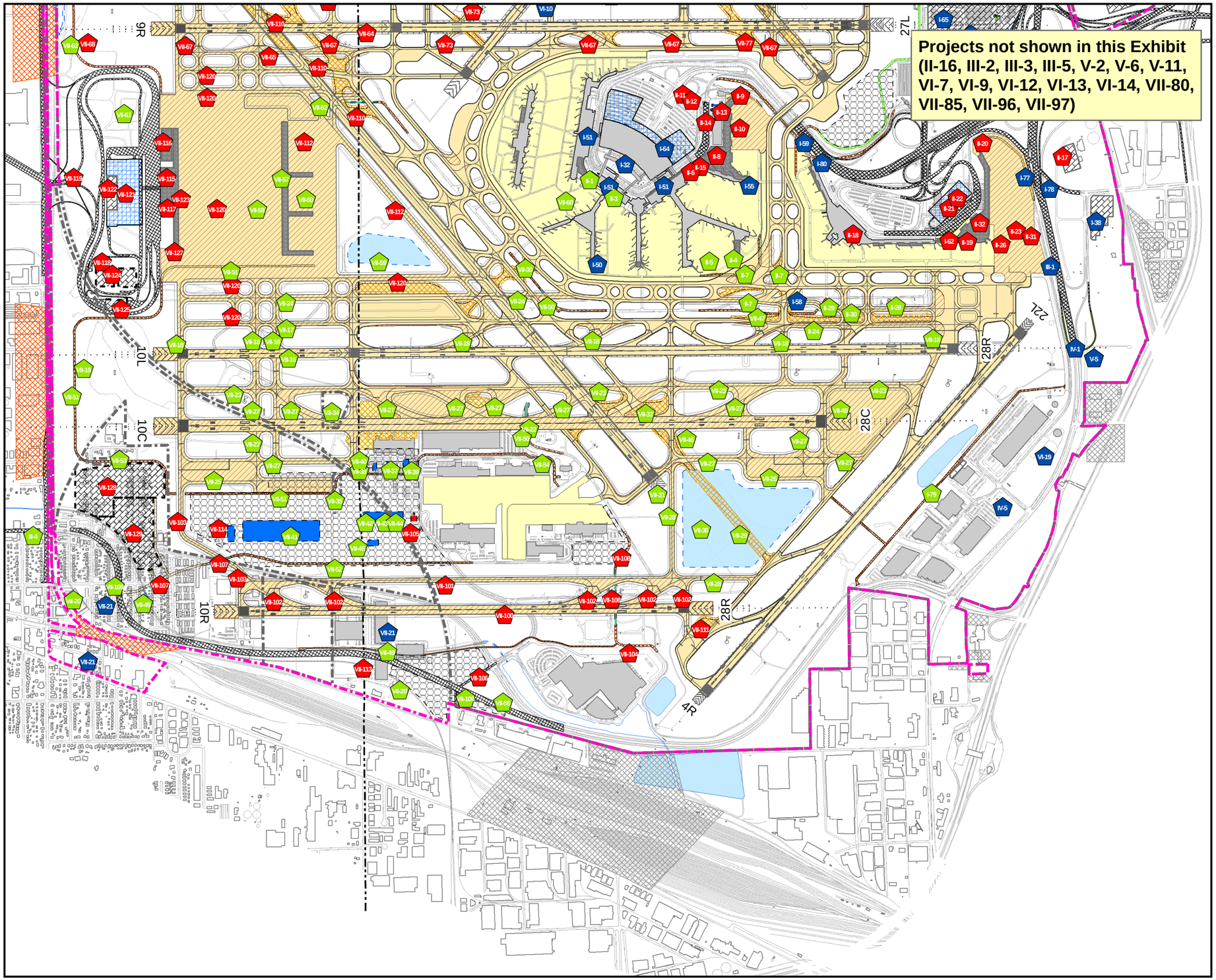
N

S

Alternative C - North Airfield

▶ **Exhibit E-17**

Source: Crawford, Murphy and Tilly, Inc. [TPC] 2004



Chicago O'Hare International Airport

O'Hare Modernization Environmental Impact Statement

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- Future Avigation Easement
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- Future Service Roadways
- Service Road Upgrade
- Future NAVAID/ARFF Access Roads

Note: For a detailed listing of these projects refer to Table E-19.

N

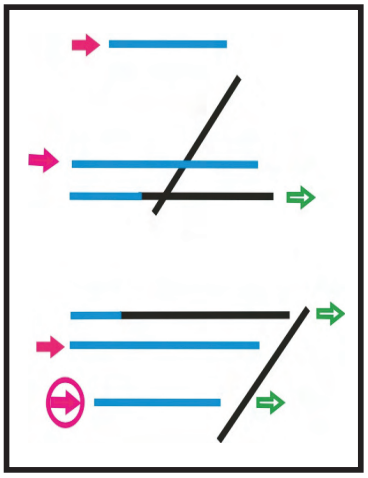
S

Alternative C - South Airfield

▶ Exhibit E-18

Source: Prepared by Crawford, Murphy and Tilly Inc. [TPC] 2004.

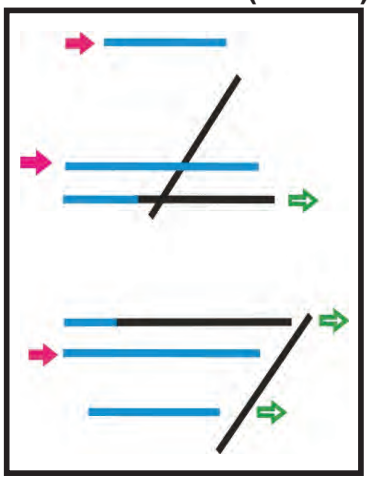
PARALLEL 9s (QUADS)



12.6%

VFR-1

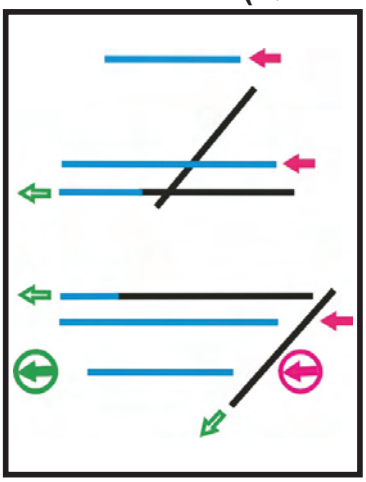
PARALLEL 9s (TRIPS)



10.6%

VFR-2

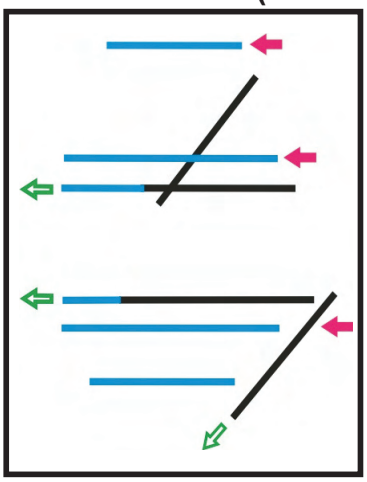
PARALLEL 27s (QUADS)



41.4%

VFR-1

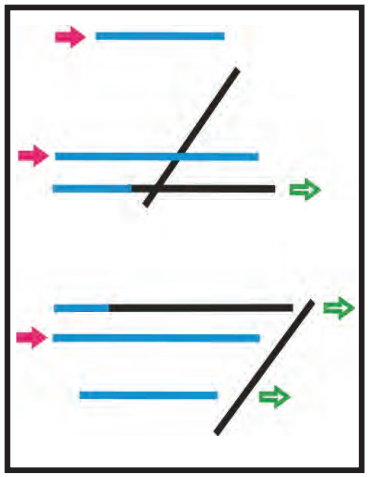
PARALLEL 27s (TRIPS)



26.1%

VFR-2

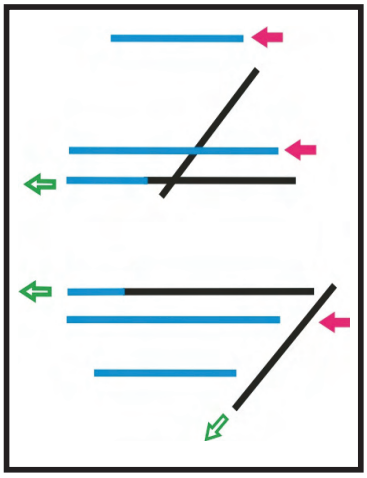
PARALLEL 9s



4.5%

IFR

PARALLEL 27s



4.8%

IFR

Legend

- Primary Arrival Runway
- Primary Departure Runway
- Overflow Arrival Runway
- Overflow Departure Runway

VFR-1 Visual Flight Rules, assume visibility is greater than or equal to 10 statute miles and cloud ceiling is greater than or equal to 5,500 feet

VFR-2 Visual Flight Rules, same as VFR-1, except cloud ceiling is greater than 1,000 feet and less than 5,500 feet

IFR Instrument Flight Rules

- Existing Runways
- Proposed Runways

Not To Scale

Note: Annual use percentages as modeled for the year 2018.

Source: OMP Simulation Data Package, Ricondo and Associates, Inc.[CCT], April 2004.

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The runway use configurations shown in **Exhibit E-19** show how Alternative C would address some of operational shortcomings associated with Alternative A. As shown in **Exhibit E-19,** in most cases, arrivals and departures would take place on separate runways, reducing arrival/departure dependencies and increasing capacity. Alternative C runway use configurations makes it easier to balance arrival and departure demand by providing three primary arrival and three primary departure runways, enabling air traffic controllers to maintain relatively constant arrival and departure flow rates without alternating between arrival and departure priority modes of operation. In addition, in VFR-1 weather conditions, up to four runways would be available for simultaneous use by arrivals, providing air traffic controllers with additional flexibility and capacity to accommodate peak period arrival demands.

The value of these operational advantages is evidenced by the aircraft delays associated with Alternative C at future demand levels and is presented in the following section.

Although not shown explicitly in **Exhibit E-19**, preferential noise abatement runway use configurations would be used between 10:00 p.m. and 6:30 a.m., provided that operational circumstances and weather conditions permit their use. These runway use configurations are identical to the noise abatement runway use configurations associated with Alternative A. These procedures involve the use of Runways 9L and 9R by arrivals and departures in east flow conditions and the use of Runways 27R and 27L by arrivals and departures in west flow conditions.

E.6.2.2 Delay Estimates– Alternative C

Table E-16 presents aircraft delay estimates for Alternative C. The table shows the delay that was estimated using TAAM for average day, peak month activity levels, as well as the weighted average annual delay estimates for Alternative C at 2009, 2013, and 2018 demand levels assuming the complete build out of Alternative C (complete build-out would not occur until 2013). Based on TAAM simulation results, Alternative C would accommodate the unconstrained 2009, 2013, and 2018 flight schedules at reasonable delay levels. For reference, **Table E-16** shows the number of average day, peak month aircraft operations associated with the delay estimates. For more detailed information on the simulation modeling conducted for Alternative C, see **Appendix D, Simulation Modeling.**

TABLE E-16
ESTIMATED AVERAGE AIRCRAFT DELAYS - ALTERNATIVE C (FULL BUILD)

Runway Use Configuration	Weather Condition (a)	Estimated Annual Percent Occurrence	Average delay: Average Day Peak Month Conditions: (minutes per operation) (b)		
			2009 (c)	2013	2018
Parallel 27s	VFR-1	41.4 %	3.8	4.1	4.7
Parallel 9s	VFR-1	12.6 %	3.3	3.7	4.2
Parallel 27s	VFR-2	26.1 %	3.7	4.2	5.0
Parallel 9s	VFR-2	10.6 %	3.5	4.2	4.6
Parallel 27s	IFR	4.8 %	9.5	16.0	18.8
Parallel 9s	IFR	4.5 %	11.9	17.2	20.8
Average annual delay (minutes per operation)			4.1	5.0	5.8
Average day, peak month aircraft operations accommodated			2,987	3,169	3,374

Notes:

(a) VFR-1 conditions occur when the cloud ceiling is at least 5,500 feet above the Airport's elevation and visibility is at least 10 statute miles. VFR-2 conditions occur when the cloud ceiling is less than 5,500 feet above the Airport's elevation but is at least 1,000 feet above the Airport's elevation or when visibility is less than 10 statute miles but is at least 3 statute miles. IFR conditions occur when the cloud ceiling is less than 1,000 feet above the Airport's elevation or visibility is less than 3 statute miles.

(b) These delay estimates presume that the full build out of the eight-runway Alternative C airfield is completed.

(c) Hypothetical results assuming that Alternative C could be built out by 2009.

Sources:

Ricondo and Associates, Inc.[CCT] Preliminary Draft TAAM Simulation Data for Noise and Air Quality Analysis – 2013 With Project, April 2004;

Ricondo and Associates, Inc, [CCT] Preliminary Draft TAAM Simulation Data for Noise and Air Quality Analysis – 2018 With Project, April 2004;

Revisions OMP EIS—Need for Additional TAAM Experiments, Transmittal Memorandum Ricondo and Associates, Inc. [TPC], August 27, 2004.

E.6.3 Alternative D

The following summarizes the operational characteristics and delay estimates associated with Alternative D. Alternative D is shown in **Exhibits E-20** and **E-21.**

E.6.3.1 Operational Characteristics – Alternative D

Four runway use configurations were evaluated for Alternative D.[43] These four runway use configurations would be used over 99 percent of the time at the Airport,[44] and consist of two flow configurations—Parallel 27s and Parallel 9s—and two weather conditions—VFR and IFR.[45] Alternative D runway operating configurations and their estimated annual percent occurrences are shown in **Exhibit E-22.**[46]

[43] Draft TAAM Simulation Data Package, 2018 Alternative X, Ricondo and Associates, Inc. [CCT], May 2004.

[44] Draft TAAM Simulation Data Package, 2018 Alternative X, Table I-2, Ricondo and Associates, Inc. [CCT], May 2004.

[45] VFR conditions occur when the cloud ceiling is at least 1,000 feet above the Airport's elevation and visibility is at least 3 statute miles. IFR conditions occur when the cloud ceiling is less than 1,000 feet above the Airport's elevation or visibility is less than 3 statute miles.

[46] The percent occurrences shown in **Exhibit E-22** have been normalized to sum to 100 percent.

Runway use configurations shown in **Exhibit E-22** show how Alternative D would address some of operational shortcomings associated with Alternative A. As shown in **Exhibit E-22,** in most cases, arrivals and departures would take place on separate runways, reducing arrival/departure dependencies and increasing capacity.

In west flow configurations, Alternative D would also make it easier to balance arrival and departure demand by providing three primary arrival and three primary departure runways. In west flow, Alternative D would perform very similarly to Alternative C, except for the fact that quadruple visual approach procedures would not be available. This will enable air traffic controllers to maintain relatively constant arrival and departure flow rates at the airport, without having to alternate between arrival priority and departure priority modes of operation.

In east flow, however, only two runways would be available for departure, creating the potential for imbalanced arrival and departure flow rates at the Airport. The effects of this imbalance are particularly severe in IFR weather conditions, when low ceiling and visibility conditions make departures from Runways 9R and 10L dependent on arrivals to Runways 9C and 10R, respectively.

Through TAAM simulation analyses performed for the EIS, it was determined that air traffic controllers would need to regularly increase the spacing between arrivals to Runway 10R from about 3 nautical miles to about 4.5 nautical miles in order to balance between Airport arrival flows and departure flows throughout the day. Increasing the spacing between arrivals in this manner, coupled with the inherent limitations in the departure capacity associated with Alternative D (i.e., the availability of two rather than three departure runways), cause Alternative D to perform poorly in west flow conditions, particularly west flow, IFR conditions, relative to Alternative C.

An additional limitation associated with Alternative D is that, unlike Alternative C, Alternative D cannot accommodate quadruple arrival operations in VFR conditions during peak arrival periods.

Although not shown explicitly in **Exhibit E-22,** preferential noise abatement runway use configurations would be used between 10:00 p.m. and 6:30 a.m., provided that operational circumstances and weather conditions permit their use. These runway use configurations are identical to the noise abatement runway use configurations associated with Alternative C. These procedures involve the use of Runways 9L and 9R by arrivals and departures in east flow conditions and Runways 27R and 27L by arrivals and departures in west flow conditions.

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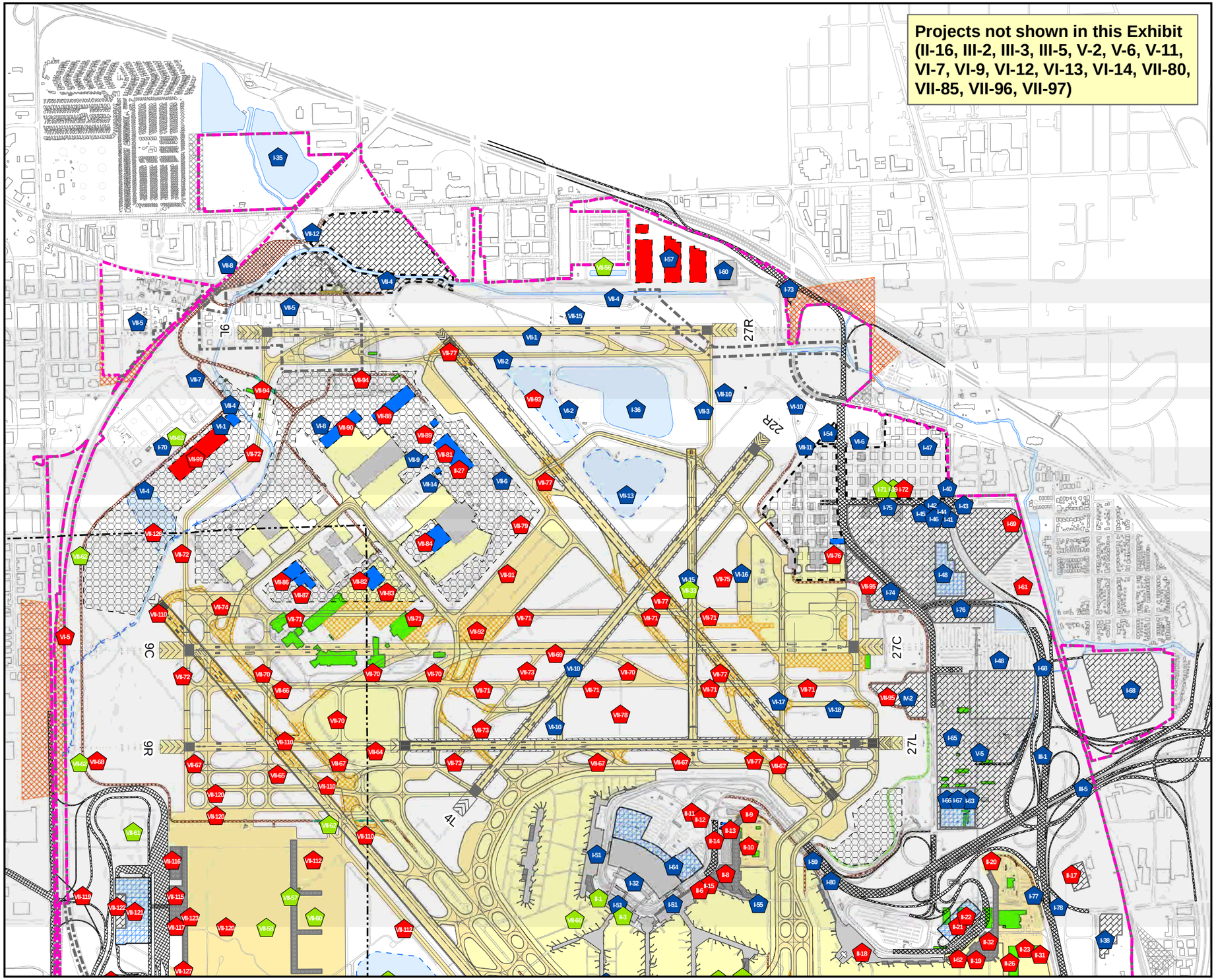

Source: Crawford, Murphy and Tilly, Inc. [TPC] 2004

Chicago O'Hare International Airport

O'Hare Modernization Environmental Impact Statement

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- Future Creeks/Detention Basins
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- Future Airfield Pavement
- Airfield Pavement Demolition
- Existing Apron Pavement
- Existing Airport Building
- Future Terminal Building
- Existing Airport Building in AOA to be Relocated
- Relocated Airport Buildings Previously in AOA
- Future Airport Buildings
- Future Aviation Development Areas
- Future Collateral Development
- Future Roadways
- Future Structured Parking
- Future Surface Parking
- Existing Avigation Easment
- Future Avigation Easement
- Future Tunnel
- Future Service Roadways
- Service Road Upgrade
- Future NAVAID/ARFF Access Roads

Note: For a detailed listing of these projects refer to Table E-19.

N

S

Alternative D - North Airfield

▶ Exhibit E-20

Projects not shown in this Exhibit (II-16, III-2, III-3, III-5, V-2, V-6, V-11, VI-7, VI-9, VI-12, VI-13, VI-14, VII-80, VII-85, VII-96, VII-97)

Chicago O'Hare International Airport

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- Future Roadways
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- Future Surface Parking
- Existing Avigation Easment
- Future Avigation Easement
- Future Tunnel
- Future Service Roadways
- Service Road Upgrade
- Future NAVAID/ARFF Access Roads

Note: For a detailed listing of these projects refer to Table E-19.

N

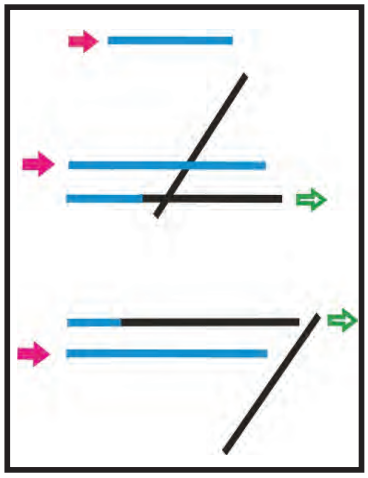
S

Alternative D - South Airfield

▶ **Exhibit E-21**

Source: Crawford, Murphy and Tilly, Inc. [TPC] 2004.

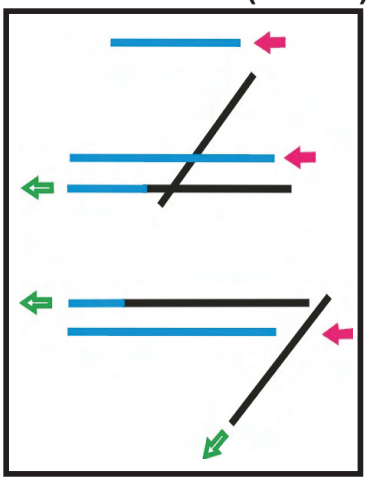
PARALLEL 9s



23.2%

VFR

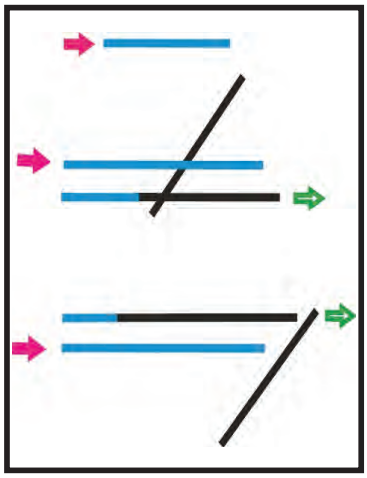
PARALLEL 27 (TRIPS)



67.5%

VFR

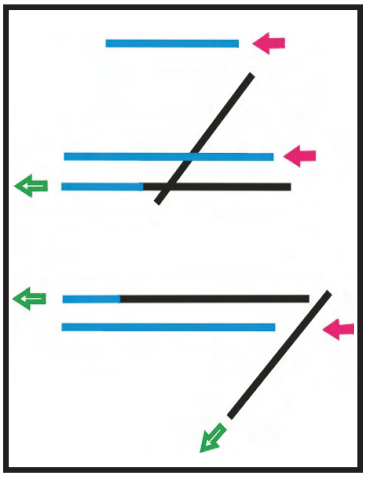
PARALLEL 9S



4.5%

IFR

PARALLEL 27S



4.8%

IFR

Legend

- Primary Arrival Runway
- Primary Departure Runway
- Overflow Arrival Runway
- Overflow Departure Runway
- Existing Runways
- Proposed Runways
- VFR - Visual Flight Rules
- IFR - Instrument Flight Rules

Not To Scale

Note: Annual use percentages as modeled for the year 2018.

Source: OMP Simulation Data Package, Ricondo and Associates, Inc. [CCT], May 2004.

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E.6.3.2 Delay Estimates– Alternative D

Table E-17 presents comparative aircraft delay estimates for Alternative D. The table shows the delay that was estimated using TAAM for average day, peak month activity levels, as well as the weighted average annual delay estimates for Alternative D at 2009, 2013 and 2018 demand levels assuming the complete build out of Alternative D (complete build-out would not occur until 2013). Based on TAAM simulation results, Alternative D would be able to accommodate the unconstrained 2009, 2013, and 2018 flight schedules without reaching unacceptable levels of delay. For reference, **Table E-17** shows the number of average day, peak month aircraft operations associated with the delay estimates. For more detailed information on the simulation modeling conducted for Alternative D, see **Appendix D, Simulation Modeling.**

TABLE E-17
ESTIMATED AVERAGE AIRCRAFT DELAYS - ALTERNATIVE D (FULL BUILD)

Runway Use Configuration	Weather Condition (a)	Estimated Annual Percent Occurrence	Average delay: Average Day Peak Month Conditions: (minutes per operation) (b)		
			2009 (c)	2013	2018
Parallel 27s	VFR	67.5 %	3.7	4.2	5.0
Parallel 9s	VFR	23.2 %	4.6	4.9	7.8
Parallel 27s	IFR	4.8 %	9.5	16.0	18.8
Parallel 9s	IFR	4.5 %	62.9	84.6	108.4
Average annual delay (minutes per operation)			6.6	8.2	10.5
Average day, peak month aircraft operations accommodated			2,987	3,169	3,374

Notes:

(a) VFR conditions occur when the cloud ceiling is at least 1,000 feet above the Airport's elevation and visibility is at least 3 statute miles. IFR conditions occur when the cloud ceiling is less than 1,000 feet above the Airport's elevation or visibility is less than 3 statute miles.

(b) These delay estimates presume that the full build-out of the seven-runway Alternative D airfield is completed.

(c) Hypothetical results assuming that Alternative D could be built out by 2009.

Sources:

Transmittal Memorandum, "Revisions OMP EIS – Need for Additional TAAM Experiments", Ricondo and Associates, Inc. [CCT], May 14, 2004.

Ricondo and Associates, Inc. [CCT] Preliminary Draft TAAM Simulation Data for Noise and Air Quality Analysis – 2013 Alternative X, May 2004;

Ricondo and Associates, Inc, [CCT] Preliminary Draft TAAM Simulation Data for Noise and Air Quality Analysis – 2018 Alternative X, May 2004.

E.6.4 Alternative G

The following summarizes the operational characteristics and delay estimates associated with Alternative G. Alternative G is shown in **Exhibits E-23** and **E-24.**

E.6.4.1 Operational Characteristics – Alternative G

Five runway use configurations were evaluated for Alternative G.[47] These five runway use configurations would be used over 99 percent of the time at the Airport,[48] and consist of two flow configurations—Parallel 27s and Parallel 9s—and three weather conditions—VFR, IFR-1 and IFR-2.[49] Alternative G runway operating configurations and their estimated annual percent occurrences are shown in **Exhibit E-25.**[50]

The runway use configurations shown in **Exhibit E-25** show how Alternative G would address some of the operational shortcomings associated with Alternative A. As shown in **Exhibit E-25,** in most cases, arrivals and departures would take place on separate runways, reducing arrival/departure dependencies and increasing capacity.

[47] Draft TAAM Simulation Data Package, 2018 Alternative Y, Ricondo and Associates, Inc. [CCT], May 2004.
[48] Draft TAAM Simulation Data Package, 2018 Alternative Y, Table I-2, Ricondo and Associates, Inc. [CCT], May 2004.
[49] VFR conditions occur when the cloud ceiling is at least 1,000 feet above the Airport's elevation and visibility is at least 3 statute miles. IFR-1 conditions occur when the cloud ceiling is less than 1,000 feet above the Airport's elevation but at least 800 feet above the Airport's elevation *or* visibility is less than 3 statute miles but at least 2 statute miles. IFR-2 conditions occur when the cloud ceiling is less than 800 feet above the Airport's elevation or visibility is less than 2 statute miles.
[50] The percent occurrences shown in **Exhibit E-25** have been normalized to sum to 100 percent.

Projects not shown in this Exhibit (II-16, III-2, III-3, III-5, V-2, V-6, V-11, VI-7, VI-9, VI-12, VI-13, VI-14, VII-80, VII-85, VII-96, VII-97)

Source:

Source: Crawford, Murphy and Tilly, Inc. [TPC] 2004.

Chicago O'Hare International Airport

O'Hare Modernization Environmental Impact Statement

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- Future Avigation Easement
- Future Tunnel
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- Service Road Upgrade
- Future NAVAID/ARFF Access Roads

Note: For a detailed listing of these projects refer to Table E-19.

N

S

Alternative G - North Airfield

▶ **Exhibit E-23**

Projects not shown in this Exhibit (II-16, III-2, III-3, III-5, V-2, V-6, V-11, VI-7, VI-9, VI-12, VI-13, VI-14, VII-80, VII-85, VII-96, VII-97)

10R
10L
10C
28R
28C
22L
4R
30

Chicago O'Hare International Airport

O'Hare Modernization Environmental Impact Statement

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- Future Airfield Pavement
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- Future Avigation Easement
- Future Tunnel
- Future Service Roadways
- Service Road Upgrade
- Future NAVAID/ARFF Access Roads

Note: For a detailed listing of these projects refer to Table E-19.

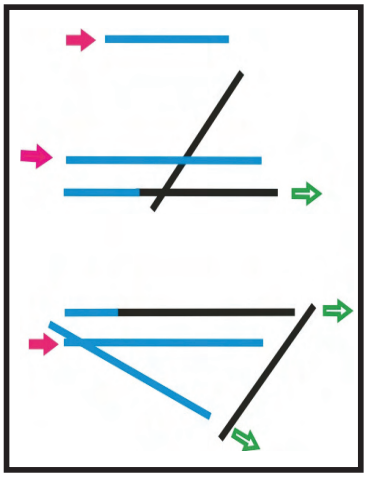
N
S

Alternative G - South Airfield

▶ **Exhibit E-24**

Source: Crawford, Murphy and Tilly, Inc. [TPC] 2004.

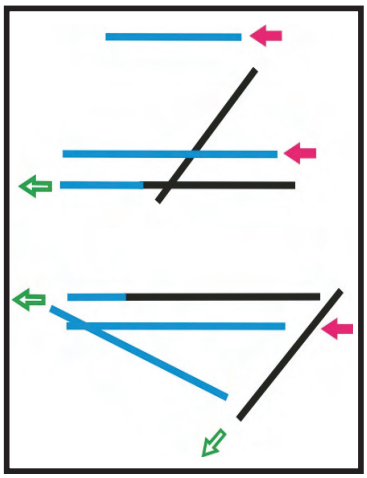
PARALLEL 9s



23.2%

VFR-1

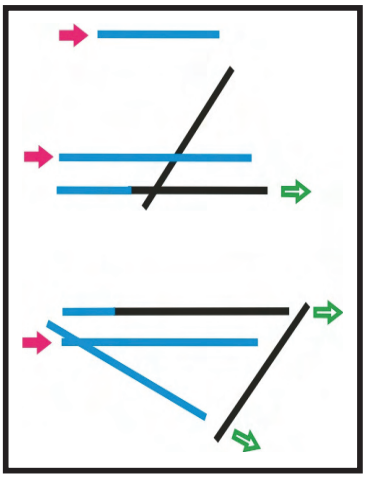
PARALLEL 27s



67.5%

VFR

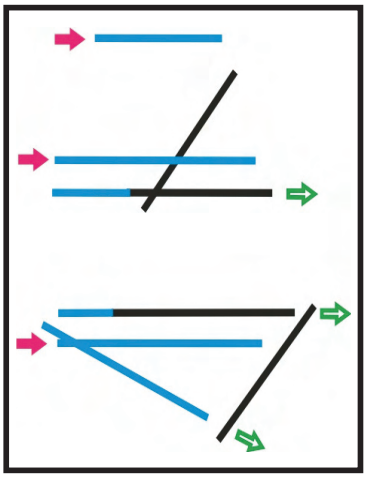
PARALLEL 9s



1.1%

IFR-1

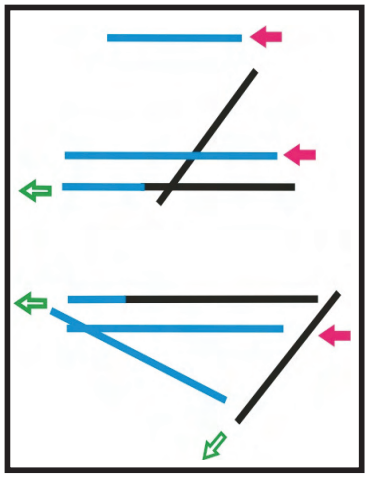
PARALLEL 9s



3.4%

IFR-2

PARALLEL 27s



4.8%

IFR

Legend

- Primary Arrival Runway
- Primary Departure Runway
- Overflow Arrival Runway
- Overflow Departure Runway

IFR-1 Instrument Flight Rules, assume visibility is greater than 2 statute miles and less than 3 statute miles and cloud ceiling is greater than 800 feet and less than 1,000 feet.

IFR-2 Instrument Flight Rules, assume visibility is less than 2 statute miles and cloud ceiling is less than 800 feet.

- Existing Runways
- Proposed Runways

VFR - Visual Flight Rules

IFR - Instrument Flight Rules

Not To Scale

Note: Annual use percentages as modeled for the year 2018.

Source: OMP Simulation Data Package, Ricondo & Associates, Inc.[CCT], May 2004.

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In west flow configurations, Alternative G would also make it easier to balance arrival and departure demand by providing three primary arrival and three primary departure runways. In west flow, Alternative G would perform very similarly to Alternative C, except for the fact that quadruple visual approach procedures would not be available due to the lack of the south parallel runway. This will enable air traffic controllers to maintain relatively constant arrival and departure flow rates at the airport, without having to alternate between arrival priority and departure priority modes of operation.

In east flow, the addition of Runway 12-30, which would be used exclusively as a departure runway in east flow, would enable air traffic controllers to provide three arrival runways and three departure runways in all weather conditions. However, due to the intersection between Runway 12 and Runway 9R, there would be dependencies between these two runways, especially in IFR-2 conditions, that would limit the arrival rates and departure rates that could be sustained on these two runways.

Due to the availability of the third departure stream, Alternative G would outperform Alternative D. However, because of the dependencies between Runway 12 departures and Runway 9R arrivals, Alternative G would perform worse than Alternative C.

An additional limitation associated with Alternative G is that, unlike Alternative C, Alternative G cannot accommodate quadruple arrival operations in VFR conditions during peak arrival periods.

Although not shown explicitly in **Exhibit E-25**, preferential noise abatement runway use configurations would be used between 10:00 p.m. and 6:30 a.m., provided that operational circumstances and weather conditions permit their use. These runway use configurations are identical to the noise abatement runway use configurations associated with Alternative G. These procedures involve the use of Runways 9L and 9R by arrivals and departures in east flow conditions and Runways 27R and 27L by arrivals and departures in west flow conditions.

E.6.4.2 Delay Estimates– Alternative G

Table E-18 presents comparative aircraft delay estimates for Alternative G. The table shows the delay that was estimated using TAAM for average day, peak month activity levels, as well as the weighted average annual delay estimates for Alternative G at 2009, 2013 and 2018 demand levels assuming the complete build out of Alternative G (complete build-out would not occur until 2013). Based on TAAM simulation results, Alternative G would accommodate the unconstrained 2009, 2013, and 2018 flight schedules at reasonable delay levels. For reference, **Table E-18** shows the number of average day, peak month aircraft operations associated with the delay estimates. For more detailed information on the simulation modeling conducted for Alternative G, see **Appendix D, Simulation Modeling.**

TABLE E-18
ESTIMATED AVERAGE AIRCRAFT DELAYS – ALTERNATIVE G (FULL BUILD)

Runway Use Configuration	Weather Condition (a)	Estimated Annual Percent Occurrence	Average delay: Average Day Peak Month Conditions: (minutes per operation) (b)		
			2009 (c)	2013	2018
Parallel 27s	VFR	67.5 %	3.7	4.2	5.0
Parallel 9s	VFR	23.2 %	3.4	4.1	5.2
Parallel 27s	IFR-1 / 2	4.8 %	9.5	16.0	18.8
Parallel 9s	IFR-1	1.1 %	12.0	15.5	20.3
Parallel 9s	IFR-2	3.4 %	22.6	31.0	42.6
Average annual delay (minutes per operation)			4.4	5.6	6.9
Average day, peak month aircraft operations accommodated			2,987	3,169	3,374

Notes:

(a) VFR-1 conditions occur when the cloud ceiling is at least 5,500 feet above the Airport's elevation and visibility is at least 10 statute miles. VFR-2 conditions occur when the cloud ceiling is less than 5,500 feet above the Airport's elevation but is at least 1,000 feet above the Airport's elevation or when visibility is less than 10 statute miles but is at least 3 statute miles. IFR conditions occur when the cloud ceiling is less than 1,000 feet above the Airport's elevation or visibility is less than 3 statute miles.

(b) These delay estimates presume that the full build-out of the eight-runway Alternative G airfield is completed.

(c) Hypothetical results assuming that Alternative G could be built out by 2009.

Sources:

Ricondo and Associates, Inc. [CCT] Preliminary Draft TAAM Simulation Data for Noise and Air Quality Analysis – 2013 Alternative Y, May 2004;

Ricondo and Associates, Inc. [CCT] Preliminary Draft TAAM Simulation Data for Noise and Air Quality Analysis – 2018 Alternative Y, May 2004;

Revisions OMP EIS—Need for Additional TAAM Experiments, Transmittal Memorandum Ricondo and Associates, Inc. [TPC], August 27, 2004.

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	● All Alternatives	○ Alt A	■ Alt C, D, G	■ Alt C	▲ Alt D	▼ Alt G	◆ Alt D, G	▲ Alt C, D	▼ Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
A	Existing airfield and support facilities (not on exhibit)	○	○	○	○	○
B	Existing Terminal, parking, and roadway facilities (Terminals 1, 2, 3, 5) (not on exhibit)(a)	●	●	●	●	●
I.	**PREVIOUSLY APPROVED PROJECTS AT O'HARE (late 1980's through 2002)**					
I-1	Terminal 1 Reconfiguration (late 1980s)	●	●	●	●	●
I-2	Post Office Facility along Irving Park Road	●	●	●	●	●
I-3	CTA Blue Line Station in the terminal core	●	●	●	●	●
I-4	Terminal 5 Development (See also ID II-18)	●	●	●	●	●
I-5	Terminal 5 surface parking Lot D and access roadway	●	●	●	●	●
I-6	Terminal 5 Upper Level Roadway Rehabilitation (completed in 2002)	●	●	●	●	●

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	● All Alternatives	○ Alt A	■ Alt C, D, G	■ Alt C	▲ Alt D	▼ Alt G	◆ Alt D, G	▲ Alt C, D	▼ Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
I-7	Airport Transit System (ATS from Lot E to terminal core) (2 labels on exhibit)	●	●	●	●	●
I-8	Commercial Vehicle Hold Area (See also ID I-25)	●	●	●	●	●
I-9	Scenic Hold Pad (modified with the Build Alternatives) (See also ID VII-92)	●	●	●	●	●
I-10	Runway 9R Hold Pad (modified with the Build Alternatives)	●	●	●	●	●
I-11	Runway 27L Hold Pad (modified with the Build Alternatives)	●	●	●	●	●
I-12	Runway 4R Angled Taxiway T (See also ID VII-29)	○	○	○	○	○
I-13	Aircraft Rescue and Firefighting Training Facility (ARFF) (Bldgs #703 & 704) (See also ID VI-2)	●	●	●	●	●
I-14	Helipad Commissioning / Operation (See also ID I-56)	○	●	●	●	●
I-15	UAL Reservation Center / Credit Union (Bldg #912)	●	●	●	●	●

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	● All Alternatives	○ Alt A	■ Alt C, D, G	■ Alt C	▲ Alt D	▼ Alt G	◆ Alt D, G	▲ Alt C, D	▼ Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
I-16	Long-term Parking Lot E Surface Parking Expansion	●	●	●	●	●
I-17	North Airfield drainage improvements winter basins (See also ID VII-13 & VII-93)	○	○	○	○	○
I-18	Runway Deicing Fluid Facility Improvements (Bldg #505)	●	●	●	●	●
I-19	Aircraft Ground Run-Up Enclosure (GRE)(Bldg #761) (See also ID VII-91)	●	●	●	○	○
I-20	Existing Metra Station (Bldg #581)	●	●	●	●	●
I-21	Expansion of AMC building, north side (Bldg #502)	●	●	●	●	●
I-22	Bessie Coleman Widening (See also ID I-74)	●	●	●	●	●
I-23	O'Hare Express Center (southeast) (Bldgs #504, 513, 515, 517, 516, 514, 506)	●	●	●	●	●
I-24	RPZ Wetland Management Plan (modified with the Build Alternatives) (5 labels on exhibit) (b)	●	●	●	●	●

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
I-25	Commercial Vehicle Holding Area Improvements / Limo Holding Area Relocation (See also ID I-8)	●	●	●	●	●
I-26	Service Road Upgrades (various locations - not shown on exhibit)	●	●	●	●	●
I-27	Northwest Airlines Cargo Building Expansion (Bldg #613)	●	●	●	●	●
I-28	Salt Dome (Bldg #501)	●	●	●	●	●
I-29	UAL GSE Building / GEM (Ground Equipment Maintenance) (Bldg #744) (See also ID VII-88)	●	●	●	○	○
I-30	GPS Antenna (See also ID VII-75)	●	●	●	○	○
I-31	UAL Mail-Sort Relocation (Bldg #610) (See also ID VII-41)	●	●	○	○	○
I-32	360 degree SGI Based Tower Simulator		■	■	■	■
I-33	Pumping Station (Bldg #998) (completed in 2002)	●	●	●	●	●

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	● All Alternatives	○ Alt A	■ Alt C, D, G	■ Alt C	▲ Alt D	▼ Alt G	◆ Alt D, G	▲ Alt C, D	▼ Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
I-34	Relocate General Aviation (GA) Terminal Building - Signature Flight Services (Bldg #521 relocated to Bldg #800) (completed in 2003) (See also ID VII-76) (c)	●	●	●	○	○
I-35	Touhy Detention Basin(d)		●	●	●	●
I-36	Structure 140/Relocation of Willow-Higgins Creek(e)		●	●	●	●
I-37	Balmoral Ave. Extension (completed in 2001)	●	●	●	●	●
I-38	Truck Staging Area (P8)		■	■	■	■
I-39	UAL Headquarters (Phase I) and associated roadway improvements: (See also ID I-71 & I-72)			■	■	■
I-40	Mannheim Road: Continuous SB through and right turn lane from Higgins to Zemke		■	■	■	■
I-41	Mannheim Road: Extension of NB left turn lane at Zemke		■	■	■	■
I-42	Zemke Road: Addition of 2nd left turn lane on EB Zemke onto NB Mannheim		■	■	■	■

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing				
		Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
I-43	Zemke Road: Addition of WB through lane on Zemke at Mannheim Road		■	■	■	■
I-44	Zemke Road: Right turn-only from EB Zemke to SB Mannheim Road		■	■	■	■
I-45	Zemke Road: Right turn-only from EB Zemke to SB Bessie Coleman		■	■	■	■
I-46	Bessie Coleman Drive: Addition of right turn lane onto EB Zemke Road		■	■	■	■
I-47	Johnson Road: Extension to the east with a right turn only to SB Mannheim Road		■	■	■	■
I-48	Lot E Long-Term Remote Parking Structure (2 locations - previously approved and relocated) (P2 as designated on the Airport Layout Plan) (f)		■	■	■	■
I-49	Temporary Lot G Long-Term Parking (existing as of Spring 2002) (g)	●	●	●	●	●
I-50	Extension of Concourse F / Terminal 2 (Bldg #215) (h)		●	●	●	●
I-51	Terminals T1, T2, T3 Face Improvements (Bldgs #121, 200, & 300) and Roadway Canopy (3 labels on exhibit) (i)		●	●	●	●

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	● All Alternatives	○ Alt A	■ Alt C, D, G	■ Alt C	▲ Alt D	▼ Alt G	◆ Alt D, G	▲ Alt C, D	▼ Alt C, G

Project ID Number	Description	Construction Phasing				
		Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
I-52	Various Terminal Improvement Projects / Rehabilitation (not shown on exhibit)	●	●	●	●	●
I-53	Various Runway / Taxiway Re-surfacing / Rehabilitation Projects (not shown on exhibit)	●	●	●	●	●
I-54	Police Facility (Bldg #519) -Relocated to just south of Higgins Road and west of Realigned Bessie Coleman Drive		■	■	■	■
I-55	Concourse L Hold Room Expansion (Bldg #320) (See also ID II-8)(j)		(j)	(j)	(j)	(j)
I-56	Helipad Decommissioning (See also ID I-14)	○	●	●	●	●
I-57	O'Hare Express North / Willow-Higgins – Centerpoint Development (See also ID I-60)(k)		●	●	●	●
I-58	Direct Fuel Feed System Upgrade / Super Satellite Station Removal (Bldg #989)		●	●	●	●
I-59	Airside Vehicle Access Road & Bridge Project		■	■	■	■
I-60	City Warehouse and Trades Building (Bldg #891) (See also ID I-57)(k)		●	●	●	●

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing				
		Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
I-61	ATS Maintenance & Storage Yard Development (Bldg #522 relocated to Lot F) (A1 as designated on the Airport Layout Plan)				■	■
I-62	ATS Realignment & New Station at Terminal 6				■	■
I-63	New ATS Station at Consolidated Rental Car Facility (P3 as designated on the Airport Layout Plan)		■	■	■	■
I-64	Expansion of Terminal Core Elevated Parking Structure (EPS) (P4 as designated on the Airport Layout Plan) (Bldg #410)		■	■	■	■
I-65	Lot E Parking Reallocation (modified with the Build Alternatives)		■	■	■	■
I-66	Consolidated Rental Car Facility (P3 as designated on the Airport Layout Plan) (See also ID I-67)		■	■	■	■
I-67	Relocate the following facilities to Consolidated Rental Car Facility (P3 as designated on the Airport Layout Plan): Bldg #'s: 560, 562, 564, 565, 566, 567, 568, 569, 570, 572, 574, 580 (See also ID I-66)		■	■	■	■
I-68	Rental Car Storage and Maintenance Facility and Bridge over Mannheim Road (P3 as designated on the Airport Layout Plan) (2 labels on exhibit)		■	■	■	■
I-69	Lot F Parking ATS Station and Intermodal Connection (Bldg #581) (l)				■	■

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
I-70	Additional 2 Fuel Tanks Developed in Northwest Airfield at Fuel Farm (Bldg #795) (See also ID VII-63)		■	■	■	■
	Eastside Collateral Development, I-71 through I-72 (See also ID I-39) (m)					
I-71	50 percent build-out(m)			■	■	■
I-72	Remaining 50 percent build-out(m)				■	■
	O'Hare Roadway Improvements, I-73 through I-80					
I-73	Lee Street/ Northwest Tollway Interchange (addition of Lee St. on-ramp to WB I-90 and EB I-90 off-ramp to Lee St.)		■	■	■	■
I-74	Westerly relocation and widening of the northern portion of Bessie Coleman Drive to Higgins Road (See also ID I-22) (n)		■	■	■	■
I-75	Zemke Road Extension (o)		■	■	■	■
I-76	Mannheim Fly-over ramp from Bessie Coleman Drive to SB Mannheim Road (p)		●	●	●	●

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
I-77	Balmoral Avenue Ramps at SB Mannheim (p)		●	●	●	●
I-78	Balmoral Extension over Mannheim Road (p)		●	●	●	●
I-79	Southeast Service Road and Spine Road Conversion			■	■	■
I-80	Commercial Vehicle Tunnel (p)		●	●	●	●
O'Hare Noise Abatement Procedures, I-81 through I-82						
I-81	Residential and School Sound Insulation Program (not shown on exhibits)(q)	●	(q)	(q)	(q)	(q)
I-82	Fly Quiet Program – Nighttime Preferential Runway and Flight Track Program (not shown on exhibits) (r)	●	●	●	●	●
II.	**PREVIOUSLY APPROVED WORLD GATEWAY PROGRAM PROJECTS**					
II-1	***Terminal 2 Redevelopment***(s)			■	■	■

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	● All Alternatives	○ Alt A	■ Alt C, D, G	■ Alt C	▲ Alt D	▼ Alt G	◆ Alt D, G	▲ Alt C, D	▼ Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
II-2	Co-location of FIS Facilities (not included in the Build Alternatives and not shown on exhibit)	None	None	None	None	None
II-3	Infrastructure Relocation / Improvement			■	■	■
II-4	***Terminal 3 / Concourse K Extension (T3)***			■	■	■
II-5	Apron Reconfiguration			■	■	■
II-6	Co-location of FIS Facilities (associated with Terminal 4)				■	■
II-7	Taxiway A and B Reconfiguration (3 labels on exhibit)			■	■	■
II-8	***Terminal 4 Development (T2)*** (See also ID I-55)				■	■
II-9	Relocate Post #10 Guardhouse North of Terminal 4 (Bldg #330 relocated to GP10 as designated on the Airport Layout Plan)				■	■
II-10	Construct / Reconfigure Necessary Taxilanes & Apron				■	■

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
H&R and Support Facility Relocations, II-11 through II-14						
II-11	ComEd Switchyard D177 (R30 as designated on the Airport Layout Plan)				■	■
II-12	City Substation RB40 Relocation (Bldg #472) (R30 as designated on the Airport Layout Plan)				■	■
II-13	Cooling Towers Relocation (R22 as designated on the Airport Layout Plan)				■	■
II-14	Chicago Transit Authority Substation Relocation (R30 as designated on the Airport Layout Plan)				■	■
II-15	Co-location of FIS Facilities (associated with Terminals 3 and 4)				■	■
II-16	Ameritech Switch Relocation (not shown on exhibit) (t)				■	■
II-17	ComEd Switchyard D179 Relocation (S1 as designated on the Airport Layout Plan)				■	■
II-18	***Terminal 5 Reconfiguration*** (Bldg #325) (See also ID I-4)				■	■

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
II-19	***Terminal 6 Development (T1)***				■	■
II-20	Relocate Post #11 Guardhouse (Bldg #561 relocated to GP11 as designated on the Airport Layout Plan)				■	■
II-21	Public Surface Parking (P4 as designated on the Airport Layout Plan)				■	■
II-22	Construct Terminal 6 Ground Access Roadway and Parking Garage (P4 as designated on the Airport Layout Plan)				■	■
II-23	Construct Necessary Taxilanes & Apron				■	■
II-24	Southern Relocation of Taxiway M between M5 and M7 (See also ID II-30) (u)			■	■	■
II-25	Delta Cargo Facility (Bldg #527) Relocated to south airfield off of Runway 32L (See also ID VII-114)(v)				■	■
II-26	Demolish Building #510 (Former LYNX / Chicago Air Cargo) (w)				■	■
II-27	Sky Chefs Flight Kitchen Relocation (Bldg #511) Relocated to Northwest Maintenance Area (R7 as designated on the Airport Layout Plan)				■	■

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
II-28	Lockheed Maintenance Facility (Bldg #987)			■	■	■
II-29	Truck Fuel Stand & Airline Glycol Facility (Bldg #988)			■	■	■
II-30	Taxiway (N) Reconfiguration and Service Road Alignment (See also ID II-24)			■	■	■
II-31	Triturator Relocated (Bldg #525)				■	■
II-32	Relocation of Electrical, FAA, Communication, & ATS Duct Banks in Terminal 6 Complex Area				■	■
III.	**ADDITIONAL ROADWAY IMPROVEMENTS BY OTHERS**					
III-1	Mannheim Road: Widening of Mannheim Road to 3 lanes each direction between Higgins and Irving Park - Illinois Department of Transportation (IDOT) (2 labels on exhibit) (p)		●	●	●	●
III-2	Addition of Partial Interchange on I-294 at Devon Avenue (add SB off-ramp to Devon) - Illinois State Toll Highway Authority (ISTHA) (not shown on exhibit)			■	■	■
III-3	Expansion of I-90 Interchange at Elmhurst Road (add Elmhurst Road on-ramps to WB I-90 and EB I-90 off-ramps to Elmhurst Road) (ISTHA) (not shown on exhibit)			■	■	■

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	 All Alternatives	 Alt A	 Alt C, D, G	 Alt C	 Alt D	 Alt G	 Alt D, G	 Alt C, D	 Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
III-4	Irving Park Road and York Road Intersection Improvements (IDOT)(x)			●	●	●
III-5	I-190 Improvements (IDOT)(p)		●	●	●	●
III-6	I-90 add lanes from I-294 to Illinois Route 53			●	●	●
III-7	York / Thorndale grade separation and interchange improvements including 'off-airport' improvements all of which will be within the existing York / Thorndale right-of-way				■	■
IV.	**PROJECTS BY OTHERS**					
IV-1	Balmoral Avenue SB Tunnel		■	■	■	■
IV-2	Limo Service Center (P6 as designated on the Airport Layout Plan) (See also ID VII-95)(y)		●	●	●	●
IV-3	Phase-out of Stage 2 Aircraft (not shown on exhibit)	●	●	●	●	●
IV-4	Military Base Relocation to Scott AFB (not shown on exhibit)	●	●	●	●	●

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	● All Alternatives	○ Alt A	■ Alt C, D, G	■ Alt C	▲ Alt D	▼ Alt G	◆ Alt D, G	▲ Alt C, D	▼ Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
IV-5	Demolition of AMC Annex (AMB -Bldg #506) (Redevelopment of area is anticipated some time next year as a comparable use)		●	●	●	●
V.	**AIR TRAFFIC CONTROL PROCEDURES**					
V-1	New Airport Traffic Control Tower (ATCT) – completed 1996	●	●	●	●	●
V-2	Chicago Terminal Airspace Project (CTAP) (not shown on exhibit)(z)		●	●	●	●
V-3	High Density Rule (not shown on exhibit)	None	None	None	None	None
V-4	LAHSO (not shown on exhibit)(aa)	●	●	●	●	●
V-5	Upgrade Runways 27L and 27R to Cat II/III Capability (2 labels on exhibit)		●	●	●	●
V-6	National Airspace Redesign (NAR)(not shown on exhibit)(bb)		■	■	■	■
V-7	Airspace changes related to redevelopment of airfield, see **Section E.5.2,** (not shown on exhibit)		■	■	■	■

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	● All Alternatives	○ Alt A	■ Alt C, D, G	■ Alt C	▲ Alt D	▼ Alt G	◆ Alt D, G	▲ Alt C, D	▼ Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
VI.	**CAPITAL IMPROVEMENT PROJECTS**					
VI-1	Storage & Multi-Waste Management Facility at Airport Repair and Construction (ARC) Complex (Bldg #798) (R31 as designated on the Airport Layout Plan) (cc)		●	●	●	●
VI-2	Fire Fighter Training and Simulator Building - ARFF (Bldgs #703 & 704) (completed in February 2003) (See also ID I-13)		●	●	●	●
VI-3	South Airfield Drainage Improvements (completed in February 2003) (modified with the Build Alternatives) (5 labels on exhibit) (dd)		●	●	●	●
VI-4	Fuel Farm Sewage Lift Station Replacement(ee)		●	●	●	●
VI-5	West Perimeter Service/Security Road at O'Hare(ff)		(ff)	(ff)	(ff)	(ff)
VI-6	Improvements to Building 8500/Relocate Central Field Office (Bldg #508) to existing 8500 (completed in September 2003) (See also ID VI-19)		●	●	●	●
VI-7	Military Site Utilities (Including Fiber Optic Installation) (not shown on exhibit)		●	●	●	●
VI-8	Snow Dump 1A Reconstruction		●	●	●	●

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing				
		Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
VI-9	Various Runway / Taxiway Re-surfacing / Rehabilitation Projects (not shown on exhibit)		●	●	●	●
VI-10	Runway 4L / 22R Rehabilitation, Taxiway C Reconstruction, and Realignment of Service Road around the Runway 22R Safety Area (3 labels on exhibit)		●	●	●	●
VI-11	Various H&R Improvements (not shown on exhibit)		●	●	●	●
VI-12	Various Terminal Improvements (not shown on exhibit)		●	●	●	●
VI-13	Security Enhancements (not shown on exhibit)		●	●	●	●
VI-14	AVI System for Ground Transportation (not shown on exhibit)		●	●	●	●
VI-15	Temporary Conversion of Runway 18 / 36 to Taxiway GG		●	●	●	●
VI-16	Reconstruct / Rename Taxiway KK (Previously the West Ramp)		●	●	●	●
VI-17	Rename Taxiway LL (Previously Taxiway V1)		●	●	●	●

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
VI-18	Rename Taxiway MM (Previously Taxiway V2)		●	●	●	●
VI-19	Former Central Field Office Trailer Site - Currently being used as Snow Removal Staging Area (See also ID VI-6)		●	●	●	●
VII.	**O'HARE MODERNIZATION PROGRAM PROJECTS**					
	***PHASE 1A*-New North Runway 9L/27R and Associated Taxiway Improvements**					
VII-1	Construct Runway 9L/27R (7,500 x 150 feet)		■	■	■	■
VII-2	Construct Associated Partial Parallel Taxiway South of New Runway		■	■	■	■
VII-3	Construct Associated East Taxiway Connector		■	■	■	■
VII-4	Willow-Higgins Creek Culvert/Relocation (3 labels on exhibit)		■	■	■	■
VII-5	Northwest Area Land Acquisition - (See also ID VII-21 & VII-53) (2 labels on exhibit)		■	■	■	■

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
VII-6	North Airfield Lighting Vault Expansion (#721)		■	■	■	■
VII-7	Construct Post #1A Guardhouse to South of Runway end 9L (GP1A as designated on the Airport Layout Plan)		■	■	■	■
Relocate Following North Airport Facilities, VII-8 through VII-10						
VII-8	Relocate Post #1 Guardhouse to North of Runway End 9L (Bldg #700 relocated to GP1 as designated on the Airport Layout Plan)		■	■	■	■
VII-9	Relocate DOA Communications Center to South of Existing Location (Bldg #701 relocated to R4 as designated on the Airport Layout Plan)		■	■	■	■
VII-10	Relocate Explosive Chamber to East of Structure 140 (Bldg #706 relocated to R1 as designated on the Airport Layout Plan)		■	■	■	■
VII-11	Construct Post #6 Guardhouse off Runway End 22R (GP6 as designated on the Airport Layout Plan)		■	■	■	■
VII-12	Relocate Mt. Prospect Road (See also ID VII-62 & VII-94)		■	■	■	■
VII-13	Combine Existing North Detention Basins in North Airfield (680 acre-feet) (See also ID I-17 & VII-93)		■	■	■	■

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
VII-14	Construct North Air Traffic Control Tower (ATCT)		■	■	■	■
VII-15	Relocate / Reroute JAWA Water Main		■	■	■	■
	***PHASE 1B*-Extension to Existing Runway 9R/27L (New Runway 10L/28R) and Associated Improvements**					
VII-16	Construct 2,856 x 150 ft Extension West of Existing Runway 9R / 27L (new 10L / 28R) for Overall 13,000 x 150 ft			■	■	■
VII-17	Construct Associated North Parallel Taxiway (Taxiway M Extension)			■	■	■
VII-18	Construct New Cross-overs and High Speed Taxiway Exits (7 labels on exhibit)			■	■	■
VII-19	Relocate NAVAIDS and Approach Light Systems			■	■	■
VII-20	Union Pacific Railroad Relocation (2 labels on exhibit)			■	■	■

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
VII-21	Partial Southwest Area Land Acquisition(See also ID VII-5 & VII-53) (3 labels on exhibit)		■	■	■	■
	***PHASE 1C*-New Closely-Spaced South Runway 10C/28C and Associated Improvements**					
VII-22	Construct New Runway 10C / 28C (10,800 x 200 ft)			■	■	■
VII-23	Construct Associated North Parallel Taxiway (Taxiway L Extension) (4 labels on exhibit)			■	■	■
VII-24	Construct Parallel Taxiway North of Taxiway M (2 labels on exhibit)			■	■	■
VII-25	Construct Runway 10C Pad			■	■	■
VII-26	Construct Runway 28C Pad			■	■	■
VII-27	Construct Associated Taxiway Connectors and High Speed Exits (12 labels on exhibit)			■	■	■

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing				
		Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
VII-28	Construct Associated East End Taxiway Connector (Taxiway F Extension) (2 labels on exhibit)			■	■	■
VII-29	Closure of Taxiway T South of Runway 10C / 28C (See also ID I-12)			■	■	■
VII-30	Closure of Taxiway T10 between Taxiways B and T			■	■	■
VII-31	Relocate NAVAIDS and Approach Light Systems for Runway 14R / 32L			■	■	■
VII-32	Closure of Runway 32L Pad			■	■	■
VII-33	Runway 18 / 36 Decommissioning			■	■	■
VII-34	St. Johannes Cemetery Relocation			■	■	■
VII-35	Resthaven Cemetery Relocation			■	■	■
VII-36	South Detention Basin Reconfiguration (1,700 acre-feet)			■	■	■

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
Relocate Following South Airport Facilities to West of Existing Buildings within South Cargo Area, VII-37 through VII-54						
VII-37	Relocate Air Cargo Simulation Building (Bldg #603 relocated to R18 as designated on the Airport Layout Plan)(jj)			■	■	■
VII-38	Relocate Lighting Utility Building (Bldg #604 relocated to R17 as designated on the Airport Layout Plan) (jj)			■	■	■
VII-39	Relocate Fueling Utility (Bldg #606 relocated to R19 as designated on the Airport Layout Plan) (jj)			■	■	■
VII-40	Relocate Electrical Utility (Bldg #608 relocated to R17 as designated on the Airport Layout Plan) (jj)			■	■	■
VII-41	Relocate United Airlines Cargo (Bldg #610 relocated to R14 as designated on the Airport Layout Plan) (See also ID I-31) (jj)			■	■	■
VII-42	Relocate Federal Express Metroplex (Bldg #611 relocated to R16 as designated on the Airport Layout Plan) (jj)			■	■	■
VII-43	Relocate Federal Express Guardhouse (Bldg #619 relocated to R16 as designated on the Airport Layout Plan) (jj)			■	■	■
VII-44	Relocate Federal Express Fueling System (Bldg #620 relocated to R16 as designated on the Airport Layout Plan) (jj)			■	■	■

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing				
		Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
VII-45	Relocate Federal Express Maintenance (Bldg #621 relocated to R15 as designated on the Airport Layout Plan) (jj)			■	■	■
VII-46	Oil-Water Separator #1 (Bldg #971) (Relocation to be determined)			■	■	■
VII-47	Relocate Oil-Water Separator #2 (Bldg #973) (Relocation to be determined)			■	■	■
VII-48	Relocate Oil-Water Separator #3 (Bldg #980) (Relocation to be determined)			■	■	■
VII-49	Bensenville Ditch Relocation / Reconfiguration (2 labels on exhibit)			■	■	■
VII-50	Secure Service Roads and Tunnels (Tunnel extension underneath Runway 10C / 28C and new parallel Taxiway North of Taxiway M) (2 labels on exhibit)			■	■	■
VII-51	Secure Service Roads Connecting Future West Terminal to the South Airfield (3 labels on exhibit)			■	■	■
VII-52	Construct South Access Road Extension West of Main Cargo Road			■	■	■
VII-53	Remainder of SW Land Acquisition - (See also ID VII-5 & VII-21)			■	■	■

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
VII-54	Relocate Post #12 Guardhouse South of New Runway 10C/28C (Bldg #601 relocated to GP12 as designated on the Airport Layout Plan)			■	■	■
	***PHASE 1*-West Terminal - West Satellite**					
VII-55	Construct New South Airport Surveillance Radar (ASR-9) (R26 as designated on the Airport Layout Plan)			■	■	■
VII-56	Relocate ASR-9 (Bldg #936 Relocate to North Airfield Near UAL Reservation Center) (R26 as designated on the Airport Layout Plan)			■	■	■
VII-57	West Terminal - West Satellite Concourse (T4)			■	■	■
VII-58	Taxilanes & Apron			■	■	■
VII-59	West Terminal Detention Basin Reconfiguration (300 acre-feet)			■	■	■
VII-60	Automated People Mover (APM) - Construct APM Track, First 2 Stations and Underground Tunnels from Terminals 1 & 2 (2 labels on exhibit)			■	■	■

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
VII-61	APM Maintenance Yard / Storage Area (A2 as designated on the Airport Layout Plan)			■	■	■
VII-62	Secure Service Road &Tunnel Connecting North Airfield from Relocated Mt. Prospect Rd (See also ID VII-12 & VII-94) (3 labels on exhibit)			■	■	■
VII-63	Fuel Farm Improvements (Construct Additional Fuel Tanks adjacent to existing fuel farm) (See also ID I-70)			■	■	■
	***PHASE 2A*-Extension to Existing Runway 9L/27R (New Runway 9R/27L) and Associated Improvements**					
VII-64	Construct 3,293 x 150 ft Extension to West of Existing Runway 9L / 27R for Overall 11,260 x 150 ft				■	■
VII-65	Construct Associated South Parallel Taxiway (Taxiway H Extension)				■	■
VII-66	Construct Associated North Taxiway (West Taxiway Z Extension)				■	■
VII-67	Construct New Cross-overs and Highspeed Taxiway Exits (5 labels on exhibit)				■	■
VII-68	Relocate NAVAIDS and Approach Light Systems				■	■

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
	***PHASE 2B*-New Closely-Spaced North Runway 9C/27C and Associated Improvements**					
VII-69	Construct New Runway 9C / 27C (11,245 x 200 ft)				■	■
VII-70	Construct New Cross-overs and High-speed Taxiway Exits (5 labels on exhibit)				■	■
VII-71	Construct Associated North and South Parallel Taxiways (9 labels on exhibit)				■	■
VII-72	Construct Associated West Taxiway Connector (3 labels on exhibit)				■	■
VII-73	Construct Associated Parallel Taxiway to Runway 4L / 22R (3 labels on exhibit)				■	■
VII-74	Construct Runway 9C Pad				■	■
VII-75	GPS Antenna Relocation (R28) (See also ID I-30)				■	■
VII-76	Relocate GA Terminal Bldg - Signature Flight Services (Bldg #800 Relocated to R21 as designated on the Airport Layout Plan) and Northeast Cargo Aprons (See also ID I-34)				■	■

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
VII-77	Demolish Sections of Runway 14L/32R and Associated Taxiway Sections (Runway 14L/32R Decommissioning) (5 labels on exhibit)				■	■
VII-78	VORTAC Relocation (Bldg #922) To South of Existing Location (R27 as designated on the Airport Layout Plan)				■	■
	Relocate Following North Airport Facilities in the Northwest Maintenance Area, VII-79 through VII-91					
VII-79	Relocate ARFF Station #2 to North of Existing Location (Bldg #702 relocated to R12 as designated on the Airport Layout Plan)				■	■
VII-80	Relocate Post #2 Guardhouse as Necessary (Bldg #705) (not shown on exhibit)				■	■
VII-81	Relocate Sky Chef Flight Kitchen (Bldg #511 relocated to R7 as designated on the Airport Layout Plan)				■	■
VII-82	Relocate AAL Ground Equipment Maintenance (GEM) to North of Existing Location (Bldg #723 relocate to R9 as designated on the Airport Layout Plan)				■	■
VII-83	Relocate AAL Fire Pump House to North of Existing Location Adjacent to #723 (Bldg #732 relocated to R24 as designated on the Airport Layout Plan)				■	■
VII-84	Relocate AAL Hangar #2 to North of Existing Location (Bldg #725 relocated to R8 as designated on the Airport Layout Plan)				■	■

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
VII-85	Relocation of Sanitary Unit (Bldg #728) (To be determined) (not shown on exhibit)				■	■
VII-86	Relocate Dobbs Flight Kitchen #1 to North of Existing Location (Bldg #741 relocated to R10 as designated on the Airport Layout Plan)				■	■
VII-87	Relocate Dobbs Flight Kitchen #2 to North of Existing Location (Bldg #742 relocated to R11 as designated on the Airport Layout Plan)				■	■
VII-88	Relocate UAL Ground Equipment Maintenance (GEM) to North of Existing Location (Bldg #744 relocated to R3 as designated on the Airport Layout Plan) (See also ID I-29)				■	■
VII-89	Relocate UAL Office & Medical Personnel Bldg to Northeast of Existing Location (Bldg #746 relocated to R5 as designated on the Airport Layout Plan)				■	■
VII-90	Relocate UAL Hangar 5/5A to North of Existing Location (Bldg #750 relocated to R2 as designated on the Airport Layout Plan)				■	■
VII-91	Relocate Aircraft Ground Run-Up Enclosure (Bldg #761 Relocated to R23 as designated on the Airport Layout Plan) to Northeast of Existing Location Along Scenic Hold Pad (See also ID I-19)				■	■
VII-92	Scenic Hold Pad Reconfiguration (Pavement Removal) (See also ID I-9)				■	■
VII-93	New North Detention Basin (335 acre-feet) (See also ID I-17 & VII-13)				■	■

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
VII-94	Secure Service Roads and Tunnel in Northwest Maintenance Area (See also ID VII-12 & VII-62) (2 labels on exhibit)				■	■
VII-95	East-side Commercial Vehicle Staging (P6 & P7 as designated on the Airport Layout Plan) (See also ID IV-2) (2 labels on exhibit)				■	■
VII-96	Employee Parking Relocated Outside Aircraft Operations Area- North of Runway 9L (P1 as designated on the Airport Layout Plan) (2 labels on exhibit)				(hh)	(hh)
VII-97	Northwest Bus Station at Employee Parking - North of Runway 9L (P10 as designated on the Airport Layout Plan)				(hh)	(hh)
VII-98	Northwest Security Checkpoint at Employee Parking - North of Runway 9L (P10 as designated on the Airport Layout Plan)				(hh)	(hh)
VII-99	Future Airport Building(ii)				■	■
	***ALTERNATE PHASE 2C*-New Crosswind Runway 12/30 and Associated Improvements (Alt 'G' Only)**					
VII-130	Construct New Runway 12 / 30 (9,946 x 150 ft)				▼	▼
V-131	Construct New Associated North Parallel Taxiway				▼	▼

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	 All Alternatives	 Alt A	 Alt C, D, G	 Alt C	 Alt D	 Alt G	 Alt D, G	 Alt C, D	 Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
V-132	Construct New Associated South Parallel Taxiway and Cargo Ramp					
V-133	Construct New Cross-over Taxiway Exits on the North					
V-134	Construct Associated Taxiway Connector from Terminal Area south to Runway 12/30					
Relocate Following Facilities in the South Cargo Area to the Southwest Area (to the west of Runway 12/30), VII-37 through VII-104						
VII-37	Relocate Air Cargo Simulation Building (Bldg #603 relocated to R18 as designated on the Airport Layout Plan) (jj)					
VII-38	Relocate Lighting Utility Building (Bldg #604 relocated to R17 as designated on the Airport Layout Plan) (jj)					
VII-39	Relocate Fueling Utility (Bldg #606 relocated to R19 as designated on the Airport Layout Plan) (jj)					
VII-40	Relocate Electrical Utility (Bldg #608 relocated to R17 as designated on the Airport Layout Plan) (jj)					
VII-41	Relocate United Airlines Cargo Building (Bldg #610) (jj)					

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing				
		Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
VII-42	Relocate Federal Express Metroplex Building (Bldg #611) (jj)			▼	▼	▼
VII-43	Relocate Federal Express Guard Houses (Bldg #619) (jj)			▼	▼	▼
VII-44	Relocate Federal Express Fueling System (Bldg #620) (jj)			▼	▼	▼
VII-45	Relocate Federal Express Maintenance Building (Bldg #621)(jj)			▼	▼	▼
VII-104	Relocate Post #5 Guardhouse South of New Runway 12/30 (Bldg #605 relocated to GP6 as designated on the Airport Layout Plan)				▼	▼
VII-105	South Air Traffic Control Tower West of Existing Cargo Area and South of New Runway 12/30				▼	▼
VII-106	Construct Public Access Road to USPS Complex				▼	▼
VII-107	Construct Public Access Road and Tunnel in Southwest Cargo Area (2 labels on exhibit)				▼	▼
VII-108	Secure Service Roads and Tunnel Construction in South Airfield (2 labels on exhibit)				▼	▼

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	 All Alternatives	 Alt A	 Alt C, D, G	 Alt C	 Alt D	 Alt G	 Alt D, G	 Alt C, D	 Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
VII-109	Irving Park Road Relocation (2 labels) (kk)			▼	▼	▼
VII-113	Rotating Beacon Relocation (R25 as designated on the Airport Layout Plan)				▼	▼
VII-114	Delta Cargo Facility Relocated to south of Runway 12/30 (R20 as designated on the Airport Layout Plan) (See also ID II-25)				▼	▼
VII-135	Relocate KLM Royal Dutch Cargo Building (Bldg #618)				▼	▼
VII-136	Relocate USPS facility (Bldg #600)				▼	▼
VII-137	Relocate Federal Express Freight Building (Bldg #612)				▼	▼
VII-138	Relocate Northwest Cargo Building (Bldg #613)				▼	▼
VII-139	Relocate Delta Air Freight (Bldg #527)				▼	▼
VII-140	Relocate American Airlines Cargo Building (Bldg #609)				▼	▼

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
VII-141	Relocate United Parcel Services Building (Bldg #614)				▼	▼
VII-142	Relocate Lufthansa Cargo Building (Bldg #616)				▼	▼
VII-143	Relocate Air France Cargo Building (Bldg #617)				▼	▼
	***ALTERNATE PHASE 2C*-New South Runway 10R/28L and Associated Improvements (Alt 'C' Only)**					
VII-100	Construct New Runway 10R/28L (7,500 x 150 ft)				■	■
VII-101	Construct New Associated North Parallel Taxiway				■	■
VII-102	Construct New Cross-over and Highspeed Taxiway Exits (5 labels on exhibit)				■	■
VII-103	Construct Associated West Taxiway Connector to 10C Pad (2 labels on exhibit)				■	■
VII-104	Relocate Post #5 Guardhouse South of New Runway 10R/28L (Bldg #605 relocated to GP6 as designated on the Airport Layout Plan)				■	■

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
VII-105	South Air Traffic Control Tower West of Existing Cargo Area				■	■
VII-106	Construct Public Access Road to USPS Complex				■	■
VII-107	Construct Public Access Road and Tunnel in Southwest Cargo Area (2 labels on exhibit)				■	■
VII-108	Secure Service Roads and Tunnel Construction in South Airfield (2 labels on exhibit)				■	■
VII-109	Irving Park Road Relocation (2 labels on exhibit)(kk)			■	■	■
VII-110	Demolish Sections of Runway 14R/32L and Associated Taxiway Sections (Decommissioning 14R/32L) (4 labels on exhibit)				■	■
VII-111	Demolish Section of 4R Pad				■	■
VII-112	Construct Necessary West Taxiways, Taxilanes, and Apron (2 labels on exhibit)				■	■
VII-113	Rotating Beacon Relocation (R25 as designated on the Airport Layout Plan)				■	■

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
VII-114	Delta Cargo Facility Relocated to south of Runway end 10C (R20 as designated on the Airport Layout Plan) (See also ID II-25)				■	■
	***PHASE 2*-West Terminal**					
VII-115	Main West Terminal & Concourse (T5)				■	■
VII-116	Heating and Refrigeration Plant (S2 as designated on the Airport Layout Plan)				■	■
VII-117	Federal Inspection Services Facility				■	■
VII-118	Commercial Vehicle Staging Area Return Roadway				■	■
VII-119	West Terminal Ground Access Roadways (on Airport only) in conjunction with York/Thorndale interchange roadways. (See III-7)				■	■
VII-120	Construct Necessary Taxiways, Taxilanes & Apron (6 labels on exhibit)				■	■
VII-121	West Terminal Short Term Public Parking/Rental Car Structure (P4 as designated on the Airport Layout Plan)				■	■

TABLE E- 19
PROJECT DEFINITION MATRIX

KEY	All Alternatives	Alt A	Alt C, D, G	Alt C	Alt D	Alt G	Alt D, G	Alt C, D	Alt C, G

Project ID Number	Description	Construction Phasing: Existing Conditions	Construction Phase I	Construction Phase II	Build-Out	Build-Out +5
VII-122	West Terminal Rental Car Quick Turn Around (P9 as designated on the Airport Layout Plan)				■	■
VII-123	Automated People Mover (APM) Station - Construct Final Third Station				■	■
VII-124	West Terminal Limo/Bus Staging Area (P6 as designated on the Airport Layout Plan)				■	■
VII-125	West Terminal Future Taxi Staging Area (P7 as designated on the Airport Layout Plan)				■	■
VII-126	New West Terminal Landside Stormwater Detention Basin (170 acre-feet)				■	■
VII-127	Construct Post #12 Guardhouse South of Terminal 7 (GP12 as designated on the Airport Layout Plan)				■	■
VII-128	Future Employee Parking (P1 as designated on the Airport Layout Plan)				■	■
VII-129	Future Long-Term Parking (P2 as designated on the Airport Layout Plan)				■	■

TABLE E-19

Footnotes:

(a) With project, some existing facilities, i.e. parking, roadways, will be modified as noted in this table.
(b) All or part of nine wetlands located within the approach Runway Protection Zones to Runways 14L, 22R, 22L and 27L (wetlands NE20, NE40, NE41, SE72, SE73, SE75, SE79, and MA54) are proposed to be filled and mitigated offsite. Wetland NW52 (not shown on exhibit) has been filled.
(c) The relocated General Aviation Terminal Building was completed in 2003. With the Build Alternatives, the General Aviation Terminal Building would be relocated further to the north.
(d) Touhy Avenue Detention Basin will be operational in 2004.
(e) Structure 140 Detention Basin will be operational in 2004.
(f) The Lot E Long-Term Parking Structure (approved May 3, 2000) would be relocated with the Build Alternatives.
(g) Portions of Lot G are expected to remain as included within long-term Lot E with the Build Alternatives. Portions of the lot are lost due to the relocation of Bessie Coleman Drive (See also ID I-74), collateral development, and the taxi/limo staging area (P6 and P7 as designated on the Airport Layout Plan) (See also ID VII-95).
(h) The Extension of Concourse F/Terminal 2 was completed in April 2003.
(i) Terminals T1, T2, T3 Face Improvements (Bldgs #121, 200, & 300) and Roadway Canopy projects are currently underway.
(j) There are no current plans for the development of the Concourse L Hold Room Expansion.
(k) Construction of Building 4 (Bldg #891), the City Warehouse and Trades Building, was completed in July 2003. The construction of O'Hare Express North started in 2002, with the most eastern part of the development. The City Warehouse and Trades Building is the first of 4 buildings to be developed in the area.
(l) Lot F was modified to accommodate employee parking as of September 2002.
(m) With the Build Alternatives, there will be less area available for Eastside Collateral Development; the developable area decreases by 50 percent because of Runway 9C-27C approach and safety requirements.
(n) The alignment of Bessie Coleman Drive in the area of the Mannheim Road fly-over ramp intersection has been refined under the Build Alternatives to prevent penetration of proposed Runway 9C-27C Part 77 surfaces.
(o) The Zemke Road Extension includes intersection improvements to Zemke and Mannheim Roads.
(p) Project development and funding included within improvements to I-190 (Illinois Department of Transportation).
(q) With the Build Alternatives, the O'Hare Residential and School Sound Insulation Program could potentially include different or newly impacted residences. The Residential Sound Insulation Program is undefined for the future years. Currently, there is no funding commitment beyond the current year.
(r) The Fly-Quiet Program is anticipated to continue with the Build Alternatives, consistent with available runways. See **Chapter 7, Mitigation.**
(s) Terminal 2 Redevelopment will not be included as part of the Build Alternatives.
(t) Ameritech/SBC plans to relocate the switch building and garage to their existing facility in Schiller Park (off-Airport/not shown on exhibit).
(u) The southern relocation of Taxiway M is needed for the construction of Taxiway N, and Taxiway N is needed for aircraft arriving on Runway 10C to get to the terminal core area.
(v) Delta Cargo Facility - original site proposed by the World Gateway Program; relocation site changes with the Build Alternatives (see also ID VII-114) to south of Runway end 10C from east of Post Office Road and north of Old Irving Park Road in the south cargo area.
(w) Building #510 (former LYNX/Chicago Air Cargo) is currently vacant and will not be relocated. LYNX Cargo no longer operates at the Airport.
(x) The project is anticipated to be funded by the Illinois Department of Transportation.
(y) The Limo Service Center has been proposed by a private developer. Construction was stopped in 2004.
(z) The Chicago Terminal Airspace Project (CTAP) was approved by the FAA in August of 2001.
(aa) Portions of LAHSO were not used or available in 2001. Full use and availability of LAHSO procedures is assumed to occur over time.
(bb) The FAA is currently developing enroute procedures associated with the National Airspace Redesign (NAR).
(cc) The Airport Repair Construction (ARC) Complex will be relocated southwest of the current location adjacent to the Fuel Farm Facility. The Complex includes the ARC and the Multi-Waste Facility (See also ID VI-1). With the Build Alternatives, Building #798 will be relocated to the Multi-Waste Complex.
(dd) The South Airfield Drainage Improvements entail on-going infrastructure improvements to the storm water collection process and subsequent discharge of storm water runoff into the South Detention Basin for eventual discharge to the Metropolitan Water Reclamation District of Greater Chicago Deep Tunnel Drop Shaft. The project includes: construction of a 24-inch force main from the South Detention Basin to the Deep Tunnel Interceptor (near Irving Park Road and River Road); construction of a pump station at the southeast corner of the South Detention Basin; installation of a sediment basin on the bottom of the South Detention Basin; drainage improvements at Snow Dump D-3; and installation of slotted drains along Runway 4R/22L and Taxiway S and along the west ends of Runway 9R, Taxiway M, and Taxiway L.
(ee) Design and construction for the Fuel Farm Sewage Lift Station was completed in 2003.

TABLE E-19

(ff) This project is not part of the City's Capital Improvement Projects.
(gg) Footnote deleted.
(hh) In the early years, construction of the employee parking/staging area will be determined as needed and as Runway 14L/32R is closed. In the later years, as the northwest hangar area becomes more congested due to employee parking needs or as security requirements change it is expected that there will be a need to move employee parking to these areas.
(ii) The use of the future building, located in the Northwest Hangar area, is to be determined.
(jj) Final location varies depending on the alternative chosen.
(kk) Irving Park Road location depends on extent of land purchased by the airport and alternative chosen.