Chapter 4. Development Alternatives

Chapter 4. DEVELOPMENT ALTERNATIVES

This chapter identifies and evaluates airport development alternatives to fulfill the facility requirements for the airport as defined in Chapter 3, Demand Capacity and Facility Requirements. The possible combinations of airport development can be endless, so some intuitive judgement must be applied to identify those concepts which have the greatest potential for implementation.

The major functional areas at Dayton International Airport (DAY) must be considered. These include the airfield, passenger terminal area, roadway access, auto parking, air traffic control tower, cargo, and support facilities.

Many of the identified functional areas are interrelated and affect the development potential of each other. All areas are examined both individually and collectively to ensure the final plan is functional, efficient, cost effective, and minimizes environmental impacts. The evaluation process selects the preferred development program for the airport.

The material in this chapter is organized in the following manner:

- Airfield
- Roadways
- Terminal
- Air Traffic Control Tower
- Air Cargo
- Other Support Facilities
- Recommended Airport Development Plan

1. AIRFIELD

Airfield facilities are the focal point of an airport complex. The runway system requires the greatest commitment of land area and often has the greatest impact on identification and development of alternatives for other airport facilities. The physical characteristics of airfield development options directly influence the nature of other system components. Federal Aviation Administration (FAA) design criteria must also be considered. These criteria can also have a significant impact on the viability of alternatives designed to meet airfield needs.

Identification of the runway and taxiway system that best meets these airfield capacity requirements is the primary goal of the airfield alternatives analysis. The runway system must be structured to

correct existing operational deficiencies, improve safety, minimize the environmental and land utilization impacts to the surrounding communities and facilities, comply with noise abatement policies and procedures, provide sufficient land area for collateral development of terminal and airfield support facilities, minimize airfield disruption during construction, and minimize construction costs and airline operating costs.

The identification and evaluation of airfield alternatives was a two-step process. The first step examined 12 runway development alternatives in order to identify a smaller select group of three alternatives. The second step examined these three select alternatives in more detail to identify the preferred runway development alternative.

(1) Summary of Airfield Facility Requirements

The demand/capacity and facility requirements analysis in Chapter 3 determined that additional airfield capacity would be required to be operational by the year 2003. This is based on the forecast operations and the need for Emery Worldwide cargo aircraft to operate within a given time window. The analysis identified seven primary airfield development needs:

- Increase airfield capacity for cargo and commercial operations by providing a second parallel runway with sufficient length (11,000 feet) by 2003.
- Increase airfield capacity by providing an independent full-service crosswind runway (9,500 feet) by year 2008.
- To meet long-term airfield capacity requirements, a third full-length parallel runway (11,000 feet) will be needed by 2018.
- Provide airside service roadways around all runway ends.
- Provide an unobstructed runway visibility zone.
- Provide full-length Runway Safety Areas (RSA) for Runways 24L, 6R, and 36.
- Provide precision ILS approach capability to all runway ends.

(2) Runway Alternatives Description

Exhibit 4-1 shows a “no build” alternative and 11 candidate airfield layout alternatives that will be evaluated to determine their potential to accommodate the projected aviation demand. Each alternative (with the exception of the "no build" alternative, and

Alternatives 6 and 7) provides a minimum of two parallel runways of equal length designed for Group V aircraft operations. Each runway alternative is described below:

- **Alternative 1:** Alternative 1 assumes there is no new development of the airfield throughout the 20 year planning period, nor will there be any changes in air traffic control procedures or technology. This alternative is included to provide a baseline for comparison with the other proposed development alternatives.

- **Alternative 2:** This alternative extends Runway 6R/24L to 11,000 feet. The project consists of a 2,600 foot extension to the 6R end and a 1,400 foot extension to the 24L end. Parallel Taxiways "E" and "F" are extended to correspond with the new runway thresholds. The runway extension requires additional land acquisition east and south of the airport. Also, modifications to North Dixie Drive, Airport Access Road, Terminal Drive, and National Road (US 40) are necessary.

- **Alternative 3:** This alternative includes all of the airfield improvements, land acquisition and roadway modifications described in Alternative 2. Runway 18/36 is extended and relocated to the north. The Runway 36 threshold is relocated 3,100 feet to the north and the Runway 18 threshold is extended 4,100 feet to the north, for a total runway length of 9,500 feet. Parallel Taxiway "A" extends to coincide with the new runway threshold. This alternative requires additional land acquisition north of the airport. Also, modifications to Lightner Road and Ginghamsburg-Frederick Road are necessary.

- **Alternative 4:** This alternative extends the Runway 6R end 4,400 feet and shortens the Runway 24L end by 400 feet, for a total runway length of 11,000 feet. The Runway 24L threshold is displaced to provide for a full length RSA, siting of a localizer for the 6R approach, and to solve the line of sight issue associated with the runway visibility zone. Parallel Taxiway "E" extends to coincide with the new runway threshold. This alternative requires additional land acquisition south of the airport. Also, modifications to US 40, Airport Access Road and Terminal Drive are necessary.

- **Alternative 5:** This alternative includes all improvements described in Alternative 4. Runway 18/36 is extended and relocated as described in Alternative 3. Roadways to the south and north of the airport are realigned as described in Alternative 3.

- **Alternative 6:** This alternative consists of an additional 11,000 foot Runway 18/36 on the west side of the airfield with a lateral separation of 10,700 feet from the current Runway 18/36. Roadway changes on the west and north side of the airport, land acquisition, and additional parallel and connector taxiways are necessary.

- **Alternative 7:** This alternative consists of an additional 11,000 foot Runway 18/36 on the west side of the airfield with a lateral separation of 10,700 feet from the current Runway 18/36. The existing Runway 18/36 is decommissioned as a means of mitigating noise within the city of Vandalia. Adding this runway involves roadway changes on the west and north side of the airport, land acquisition, and additional parallel and connector taxiways.

- **Alternative 8:** This alternative incorporates the new Runway 18/36 as described in Alternatives 6 and 7. Existing Runway 18/36 is extended and relocated to the north. The Runway 36 threshold is relocated 3,100 feet to the north and the Runway 18 threshold is extended 4,100 feet to the north, for a total runway length of 9,500 feet. Parallel Taxiway "A" extends to coincide with the relocated runway thresholds. This alternative requires additional land acquisition north and west of the airport. Also, modifications to Lightner Road, Ginghamsburg-Frederick Road, Dog Leg Road and other minor roadways are necessary.

- **Alternative 9:** This alternative calls for an additional Runway 6/24 on the northwest side of the airfield with a length of 11,000 feet. The lateral separation between the current Runway 6L/24R and the new Runway 6/24 would be 4,300 feet to meet minimum FAA standards for dual simultaneous precision instrument approaches. This alternative includes a full-length parallel taxiway, exit taxiways, and connector taxiways to access the rest of the airfield and Emery Worldwide cargo complex. Additional land acquisition is required north and west of the airport. Also, modifications to Lightner Road, Old Springfield Road, Dog Leg Road, and a new connector road to tie-in various secondary roadways are necessary.

- **Alternative 10:** This alternative also calls for an additional Runway 6/24 to the northwest of the current Runway 6L/24R with a length of 11,000 feet. This new runway is separated laterally from the existing Runway 6L/24R by 6,000 feet. This separation is required in order to meet Emery Worldwide's potential future expansion needs. This alternative includes a full-length parallel taxiway, exit taxiways, and connector taxiways to access the rest of the airfield. The roadway system needs to be updated to accommodate this future expansion and is similar to Alternative 9.

- **Alternative 11:** This alternative includes the airfield and roadway improvements described in Alternative 10. Runway 18/36 is extended and relocated to the north as described in Alternatives 3, 5 and 8.

- **Alternative 12:** This alternative uncouples Runways 18/36 and 6R/24L by relocating the Runway 24L threshold to the southwest 4,600 feet. The Runway 6R threshold will be extended 8,600 feet for a total Runway 6R/24L length of 11,000 feet. Relocation of Runway 6R/24L will provide a clear runway safety area and visibility zone. US 40, Dog Leg Road and the Airport Access Road require rerouting. Also, Terminal Drive will need to be extended to meet the new US 40 alignment.

(3) First Phase of Runway Alternatives Evaluation

The first phase of the airfield alternative evaluation examines the complete range of the 12 runway development alternatives and their ability to meet projected demand during the 20-year planning period. The conclusions reached in the first phase of analysis are described below.

- **Alternative 1** does not provide additional airfield capacity or runway length to accommodate future growth in air cargo and commercial operations. By 2003 aircraft operational delays will be at unacceptable levels and will result in significant disruption of nighttime cargo operations. These increased delays will force Emery Worldwide to direct any future cargo demand to their other support hubs in Charlotte, NC; Chicago, IL; Dallas, TX; Los Angeles, CA; Orlando, FL; Atlanta, GA; Nashville, TN; Sacramento, CA; and Poughkeepsie, NY. For these reasons, Alternative 1 will not be considered as a viable airfield expansion alternative.

- **Alternative 2** only provides the additional airfield capacity needed through about year 2015. This alternative is similar to the recommended alternative of the August, 1994 Airport Master Plan prepared by Coffman Associates, Inc. An extension on Runway 24L will make the runway visibility zone line-of-sight situation worse and is not acceptable from an operational safety standpoint. This alternative will require modifications to both North Dixie Drive and US 40 (tunnel or by-pass) as described in the previous section. Modification of these roads increases the construction time frame and costs, and requires additional land acquisition. For these reasons, Alternative 2 is not considered a viable solution.

- **Alternative 3** solves the runway visibility zone line-of-sight issue by eliminating the intersection of Runways 6R/24L and 18/36. This alternative also provides additional airfield capacity by extending Runway 6R/24L to 11,000 feet. However, Alternative 3 also has the same roadway impacts as discussed in Alternative 2, increased construction time and cost, additional land acquisition, and therefore, is not considered a viable solution.

- **Alternative 4** provides the additional airfield capacity needed through about year 2015. Displacement of the Runway 24L threshold provides an unobstructed line-of-sight within the runway visibility zone. The required roadway improvements are manageable and can be implemented in time to provide the necessary airfield capacity by 2003. Alternative 4 by itself does not provide sufficient airfield capacity for the twenty-year planning period and therefore, is only part of a viable solution.

- **Alternative 5** is similar to Alternative 4, but also provides additional daytime arrival capacity with the extension and relocation of Runway 18/36. This additional daytime capacity will be needed around the 2015 time period. Alternative 5 provides added capacity and flexibility as the daytime cargo and commercial operations increase, and will provide sufficient capacity to meet forecast demand to year 2018. This alternative also resolves the runway visibility zone issue.

- **Alternatives 6, 7 and 8** provide an additional parallel Runway 18/36 on the west side of the airport. The new runway requires significant land acquisition but does not provide a fundamental increase in airfield capacity that is not already available with the existing 6/24 runways. Parallel runways in the 18/36 orientation do not provide adequate weather coverage and would increase aircraft noise to communities north and south of the airport. Therefore, these three alternatives are not feasible for long-term expansion at DAY.

- **Alternatives 9 and 10** provide sufficient airfield capacity to meet demand to about year 2015, but at a higher cost than the Runway 6R extension due to land acquisition and facility development. A third parallel runway will be necessary for additional operational capacity, but not until after 2015. It is anticipated that the new parallel runway can not be build within the needed time frame (year 2003-2005) to provide the necessary airfield capacity. A third parallel runway will subject new communities northeast and southwest of the airport to aircraft noise. Although both alternatives meet minimum FAA standards for triple simultaneous precision instrument approaches, Alternative 10 has greater runway separation distance. This will provide the necessary land for future expansion of the Emery Worldwide cargo complex. These alternatives do not resolve the existing runway visibility zone line-of-sight issue.

- **Alternative 11** is very similar to Alternative 10, but with the extension and relocation of Runway 18/36 to the north. Elimination of the runway intersection resolves the runway visibility zone issue. In addition, this alternative provides additional daytime arrival capacity, which is needed around the year 2015 time period. This additional capacity will provide sufficient capacity to meet forecast demand to year 2018.

- **Alternative 12** involves an significant relocation and extension of Runway 6R/24L to the southwest by approximately 8,600 feet. Relocation of Runway 6R/24L provides an alternative way of eliminating its intersection with Runway 18/36, thereby providing a clear runway visibility zone and safety area. The necessary roadway changes, land acquisition, and noise mitigation associated with this alternative will be very costly. Therefore, this alternative is not considered a viable airfield development option.

This preliminary analysis results in the selection of two airfield alternatives to be carried forward for further analysis. The shortlist of alternatives based on the first phase of analysis are:

1. Alternative 5: Extend Runway 6R and Extend/Relocate Runway 18/36 North
2. Alternative 11: Third Parallel Runway 6/24 and Extend/Relocate Runway 18/36 North

(4) Second Phase Runway Alternatives Evaluation

The second phase of the airfield evaluation process examined the two shortlisted alternatives in greater detail. The alternatives are shown in ***Exhibit 4-2*** and ***Exhibit 4-3***. Each of the alternatives were evaluated using the following criteria:

- **Additional Airfield Capacity**: Operational issues associated with accommodating the necessary airfield capacity when needed will be compared among the alternatives. The two shortlist alternatives were simulated using SIMMOD to determine their operational performance.

- **Taxi Times**: Aircraft taxi times were compared from the air cargo and commercial aircraft parking areas to the runways during arrival and departure operations. Again, SIMMOD was used to determine aircraft taxi times.

- **Roadway Impacts:** All of the alternatives impact the surrounding roadway system to varying degrees and are compared.

- **Land Acquisition**: The land acquisition (residential, commercial, farm, etc.) required for each alternative is compared.

- **Implementation Time:** The amount of time necessary for implementation of the shortlisted alternatives is compared.

- **Noise Impacts**: Preliminary noise contours were developed with the Integrated Noise Model (INM) based on the 2008 aircraft fleet mix and runway operating configurations used in the simulation modeling exercise.

- **Development Costs**: Preliminary order-of-magnitude construction cost estimates were prepared for the short-list alternatives and compared in the evaluation process. These costs are shown below in **Table 4-1**.

Table 4-1 – Cost of Short-List Alternatives ($ millions)

Item	Alternative 5 6R &18/36 Ext.	Alternative 11 New 6/24 & 18/36 Ext.
Airfield	$106	$131
Roadways	$57	$25
Land Acquisition	$7	$17
Support Facilities	$42	$37
Noise Mitigation	$35	$45
Sub-Total	$247	$255
Engineering/Contingency 1/	$101	$105
Grand Total	**$348**	**$360**

1/ - 41 percent of Sub-Total

- **Risk Factor**: The risk associated with development of each alternative if the air cargo and commercial aviation demand is not realized is assessed.
- **Additional Facilities**: Additional facilities that may be necessary with the implementation of an alternative are considered in the evaluation of alternatives. This includes the Air Traffic Control Tower (ATCT), ARFF facilities, and taxiway bridges.

As shown in **Table 4-2**, an evaluation matrix was used to score the alternatives on each of the above criteria. A score of +1 indicates the highest score and -1 indicates the lowest score. The individual scores were tallied to determine the alternative that ranked the highest. The following is a summary of the performance for each shortlist alternative.

1. Alternative 5 (Score: 5)

Alternative 5 scored the highest of the two short-list alternatives. The main reason for this is that it improves airfield capacity in a quicker and less costly manner than Alternative 11. It also improves airfield safety by eliminating the runway visibility zone obstruction. The noise impact is less than Alternative 11, and it requires less additional facilities. Alternative 5 preserves the option to construct a third full-length parallel runway to serve long-range demand beyond year 2018.

2. Alternative 11 (Score: 2)

Alternative 11 scored the lowest of the two short-list alternatives. The main reason for its lower score is the longer time needed to implement the development program (beyond 2003) and the higher construction cost associated with the third parallel runway. It is also felt that Alternative 11 will be more risky to implement for these reasons, particularly if the aviation demand is not realized in the future. The new third parallel runway provides additional airfield capacity beyond year 2018. Additional airport facilities, such as a new ARFF facility and two taxiway bridges will be necessary. There will also be an increase in noise to the northeast of the airport due to the third parallel runway. The proposed location of the third parallel runway (6,000 feet northwest of existing Runway 6L/24R) provides ample room for Emery Worldwide facility expansion. Alternative 11 preserves the option to extend Runway 6R to 11,000 feet to serve as a third full-length parallel runway, which accommodates long-range demand beyond year 2018.

Table 4-2

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Airfield Evaluation Matrix

Evaluation Criteria	Alternative 5 (6R & 18/36 Ext.)	Alternative 11 (New 6/24&18/36 Ext.)
Additional Airfield Capacity	Provides adequate cargo and air carrier airfield capacity until year 2015. Also provides additional flexibility to serve increased daytime passenger demand until year 2018 with Runway 18 extension. **Score: 0**	Provides adequate cargo and air carrier airfield capacity beyond year 2018. **Score: 1**
Taxi Times	Long taxi time from Emery Worldwide to Runway 6R/24L and for air carrier aircraft to Runway 18/36. **Score: 0**	Shortest distance from Emery Worldwide to new parallel Runway 6/24. Long taxi time for air carrier aircraft to Runway 18/36. **Score: 1**
Roadway Impacts	Runway 6R extension requires relocation of US 40, Terminal Dr., and Airport Access Rd. Runway 18 extension requires relocation of Ginghamsburg-Frederick Rd. **Score: -1**	Minimal secondary roadway impacts. Requires by-pass roadway west of the airport and relocation of Ginghamsburg-Frederick Road. **Score: 1**
Land Acquisition	Requires 653 acres of land acquisition to the south and north. **Score: 1**	Requires 2,396 acres of land acquisition to north and west of the airport. **Score: -1**
Implementation Time	Requires less time to implement than Alternative 11. **Score: 1**	Requires longer time to implement than Alternative 5. **Score: 0**
Development Cost	Lower cost: $348 million **Score: 1**	Higher cost: $360 million **Score: 0**
Risk Factor	Less risky if aviation demand not realized. **Score: 1**	More risky if aviation demand not realized. **Score: 0**
Noise Impacts	Possible increased noise impact on communities southwest and northeast of the airport. **Score: 1**	Possible increased noise impact southwest and northeast of the airport. Communities with minimal noise will have increased impacts due to new runway. **Score: 0**
Additional Facilities	Requires new ATCT. **Score: 1**	Requires new ATCT, ARFF facility, and 2 taxiway bridges. **Score: 0**
Total Score:	**5**	**2**

Source: Landrum & Brown

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3. Recommendation

Based on the above analysis, it is recommended that Alternative 5 be implemented to meet airport development needs. Alternative 5 was selected because extending Runway 6R/24L and relocating and extending Runway 18/36 improves airfield capacity in the quickest and least costly manner, and also improves airfield safety by eliminating the runway visibility zone obstruction. It is also recommended that provisions for the new 3rd parallel runway should be included to preserve the ability to meet long-term aviation demand beyond year 2018.

2. ROADWAY ALTERNATIVES

Access to Dayton International Airport is primarily provided via Interstates 70 and 75. Interstate 75 is the main north-south corridor through the state of Ohio and is located just east of the airport. Interstate 70 is the main east-west corridor and is located just south of the airport. National Road (US 40) is an east-west state highway that is on the southern boundary of the airport and is also a main access route to the airport. The Airport Access Road runs north-south between Interstate 70 and US 40, and continues north into the airport. Once north of US 40, the Airport Access Road turns into Terminal Drive which leads directly to the terminal curbfront and public parking areas.

The main airport perimeter roads include National Road (US 40) on the south; Dog Leg Pike, Old Springfield Road and Peters Pike on the west; Lightner Road on the north; and North Dixie Drive (Co. Rd. 25-A) on the east.

There will be various geometry changes to the existing public roadway system surrounding the airport as a result of the proposed runway alternatives and increased passenger and truck traffic resulting from the increased airport operations. This section describes many of the roadway concepts that were evaluated for the proposed runway expansion alternatives. These were used to help determine the preferred airfield expansion program as previously described. Also included are the existing traffic volumes for the surrounding roadway network system.

(1) Existing Roadway Traffic Counts

The collection of existing traffic counts was conducted during the month of September 1999 for the surrounding airport roads and are presented in ***Exhibit 4-4***. These traffic counts represent an average daily volume of truck and passenger vehicles. As shown the major roadway arteries are North Dixie Drive to the east, US 40 to the south, Old

Springfield Road to the north, and Dog Leg Pike to the west. Also, the Airport Access Road and Terminal Road are used heavily by truck and passenger traffic going into the airport support areas and terminal complex.

One of the main goals of this master plan is to provide alternative roadway routes for wider distribution of truck and employee traffic away from highly congested and residential areas. The following sections present such solutions.

(2) National Road (US 40) Relocation

US 40 will require modification for Runway Alternatives 2, 3, 4, 5 and 12, which all include an extension of Runway 6R to the southwest. Seven relocation concepts were evaluated: five by-pass roadway concepts around the runway extension and two tunnel concepts under the runway extension. Relocated US 40 is proposed to be a five-lane road. Runway Alternatives 2, 3, 4, and 5 propose to extend Runway 6R approximately 4,400 feet, while Runway Alternative 12 proposes to extend Runway 6R approximately 8,600 feet. These roadway concepts are presented below:

US 40 By-Pass Concept 1 – ***Exhibit 4-5*** depicts the proposed US 40 By-Pass Concept 1 layout. This concept provides a continuous flow of traffic on all roadway segments by providing various fly-over's, bridges and ramps. Also, Terminal Drive will be extended to the southwest, the Airport Access Road will be relocated to the northwest, and Dog Leg Pike will be relocated to the west.

Dog Leg Road will be realigned in a northeasterly direction at Kershner Road and connect into the proposed US 40 by-pass. The main issue with this concept is that relocated US 40 is not maintained as the main thoroughfare. It becomes segregated and consists of numerous ramps, making it very difficult to sign and keep one's sense of direction.

US 40 By-Pass Concept 2 – ***Exhibit 4-6*** depicts the proposed US 40 By-Pass Concept 2 layout. Also associated with this concept is the realignment of the Airport Access Road in a westerly direction which will connect into the extended Terminal Drive. Dog Leg Pike will be relocated approximately 1,200 feet west of its current alignment and continue in a northerly direction. Dog Leg Road will be realigned in a northeasterly direction at Kershner Road and connect into the proposed US 40 By-Pass.

This concept includes two diamond interchanges along the proposed US 40 By-Pass. The first is an interchange with the new Terminal Drive/Airport Access Road, which will be similar in size and configuration to the existing interchange. The second US 40 interchange will be with the relocated Dog Leg Pike. Concept 2 is a replacement in-kind of the existing US 40 and Terminal Drive interchange, with a slight upgrade to the Dog Leg Pike interchange.

US 40 By-Pass Concept 3 – ***Exhibit 4-7*** depicts the proposed US 40 By-Pass Concept 3 layout. This concept provides a continuous flow of traffic on all roadway segments by providing a series of fly-over's, bridges and ramps. Also, Terminal Drive will be extended to the southwest, and the Airport Access Road will be relocated to the northwest.

A north and south frontage road is provided that will allow Emery Worldwide truck traffic to access Interstate 70 without using US 40. A portion of the existing Airport Access Road will be maintained to provide access for future commercial development south of the airport.

US 40 By-Pass Concept 4 - ***Exhibit 4-8*** depicts the proposed US 40 By-Pass Concept 4 layout. This concept provides a continuous flow of traffic on all roadway segments by providing a series of fly-over's, bridges and ramps. Also, Terminal Drive will be extended to the southwest, and the Airport Access Road will be relocated to the northwest.

Relocated US 40 is not maintained as the main thoroughfare with this concept. It becomes segregated and consists of numerous ramps, making it very difficult to sign and keep one's sense of direction. There will be a series of turns in opposite directions along the proposed US 40 alignment, which do not provide for a smooth transition with this concept.

US 40 Tunnel Concept 5 - ***Exhibit 4-9*** depicts the proposed US 40 Tunnel Concept 5 layout. This concept includes an 1,850 foot long five-lane tunnel under the Runway 6R extension along the existing US 40 roadway alignment. The existing diamond interchange of US 40/Terminal Drive and Airport Access Road will be relocated approximately 1,300 feet west. This concept minimizes the amount of land acquisition needed for roadway.

The Dayton area has a high water table level, which will make it very costly to construct and maintain the roadway tunnel. A roadway tunnel will also result in the loss of potential commercial development along US 40 due to the sloping roadway leading into the tunnel. While the tunnel is under construction, a temporary by-pass roadway would be needed to maintain traffic on US 40.

US 40 Tunnel Concept 6 – ***Exhibit 4-10*** depicts the proposed US 40 Tunnel Concept 6 layout that is associated with the proposed 8,600 foot extension/relocation of Runway 6R. This concept includes a 1,850 foot long five-lane tunnel under the Runway 6R extension along the existing US 40 roadway alignment. The existing diamond interchange of US 40/Terminal Drive and Airport Access Road will be relocated approximately 2,625 feet west.

Also, due to the longer extension of Runway 6R to the southwest, the relocated Airport Access Road is proposed to be tunneled under the runway extension with a tunnel length of approximately 935 feet. Dog Leg Road will be diverted westward beginning at Kershner Road and connecting back at the intersection of Dog Leg Pike and US 40.

US 40 By-Pass/Tunnel Concept 7 - ***Exhibit 4-11*** depicts the proposed US 40 By-Pass/Tunnel Concept 7 layout that is associated with the proposed 8,600 foot extension/relocation of Runway 6R. This roadway geometry is similar to Concept 1 with the exception that a 935 foot portion of US 40 will be tunneled under the runway. This tunnel will help minimize the amount of land acquisition required.

US 40 Relocation Recommendation – **Table 4-3** presents the evaluation criteria and scoring used to determine the preferred US 40 relocation concept. Based on this information, US 40 By-Pass Concept 3 is recommended for the proposed Runway 6R extension Alternatives 2, 3, 4, and 5. Concept 3 provides a continuous flow of traffic along US 40, Terminal Drive and the Airport Access Road. This concept has a frontage road that provides dedicated access from Interstate 70 to the Emery Worldwide complex without traversing US 40. This proposed roadway system can also accommodate long-term traffic increases within the region. Concept 3 also requires minimal amount of land acquisition and residential impact.

(3) North Dixie Drive

Runway Alternatives 2 and 3 propose that Runway End 6R be extended 2,600 feet and Runway End 24L be extended 1,400 feet. The Runway 24L extension will require modification of North Dixie Drive. Two roadway concepts were evaluated; a tunnel under the runway extension and a by-pass roadway around the 24L extension. These roadway concepts are shown in ***Exhibits 4-12*** and ***Exhibits 4-13*** and discussed below.

North Dixie Drive Roadway Tunnel Concept – This concept proposes that an 1,800 foot long tunnel be constructed under the Runway 24L extension along the existing North Dixie Drive alignment. As previously mentioned, the Dayton area has a high water table level which makes it very costly to construct and maintain roadway tunnels. Also, for safety reasons, it may be prudent to restrict the transport of hazardous materials through the tunnel to minimize any impact to airfield operations in the event of a spill or accident inside the roadway tunnel. While the tunnel is under construction, a temporary by-pass roadway would be needed to maintain a continuous flow of traffic on North Dixie Drive. This temporary by-pass will require modification of Northwoods Boulevard and McCauley Drive and their intersections with North Dixie Drive. The North Dixie Drive tunnel is estimated to cost approximately $35-$45 million.

North Dixie Drive By-Pass Concept – This concept proposes that North Dixie Drive be rerouted around the Runway 24L extension. The roadway by-pass will start 800 feet south of Northwoods Blvd. and proceed in a northeast direction for approximately 2,400 feet. At this point the road will turn and go in a northerly direction through the runway approach surface and along the east side of various commercial properties located along North Dixie Drive. The roadway by-pass will ultimately reconnect into North Dixie Drive approximately 1,600 feet north of Old Springfield Road. The Runway 24L extension will require relocation of the Airshow auto parking lot and railroad tracks leading to the Delphi plant. The proposed North

Table 4-3
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National Road (US 40) Concept Evaluation Criteria

	Concept 1	Concept 2	Concept 3	Concept 4	Concept 5	Concept 6	Concept 7
Road Construction Cost	$74,453,640 Includes numerous bridges, fly-overs & ramps.	$49,991,550 Replacement in-kind diamond interchange.	$83,415,600 Includes numerous bridges, fly-overs & ramps.	$62,066,790 Includes numerous bridges, fly-overs & ramps.	$97,377,420 Replacement in-kink diamond interchnage with 1,850 ft. tunnel. High O&M cost of tunnel.	$126,247,170 High O&M costs with two tunnels.	$110,920,470 Numerous bridges, fly-overs & ramps. High O&M cost of tunnel.
Score:	**0**	**1**	**0**	**1**	**0**	**-1**	**-1**
Traffic Flow Pattern	Provides continuous traffic flow on all roadway segments.	Diamond interchange requires stop-n-go traffic on US 40. No upgrade to Dog Leg Pike interchange.	Provides continuous traffic flow on all roadway segments and frontage road for trucks. Upgrade of Dog Leg Pike interchange.	Provides continuous traffic flow on all roadway segments. No upgrade to Dog Leg Pike interchange.	Diamond interchange requires stop-n-go traffic on US 40. No upgrade to Dog Leg Pike interchange.	Diamond interchange requires stop-n-go traffic on US 40. No upgrade to Dog Leg Pike interchange.	Provides continuous traffic flow on all roadway segments.
Score:	**0**	**-1**	**1**	**0**	**-1**	**-1**	**1**
Land Acquisition	372 Acres 10 Homes 10 Commercial Properties	385 Acres 12 Homes 7 Commercial Properties	360 Acres 8 Homes 13 Commercial Properties	197 Acres 5 Homes 1 Commercial Property	186 Acres 4 Homes 0 Commercial Property	371 Acres 32 Homes 1 Commercial Property	561 Acres 35 Homes 10 Commercial Properties
Score:	**0**	**-1**	**0**	**1**	**1**	**-1**	**-1**
Airfield Operational Impacts	Maintains a clear RPZ and Part 77 surfaces. Provides land for possible R/W extension.	Maintains clear Part 77 surfaces. Minimal impact on RPZ. Provides land for possible R/W extension.	Maintains clear Part 77 surfaces. Minimal impact on RPZ. Provides land for possible R/W extension.	Maintains a clear Part 77 surface, but does not clear the full RPZ. Provides land for possible R/W extension.	Maintains a clear Part 77 surface, but does not clear the full RPZ. Provides land for possible R/W extension.	Does not provide a clear RPZ or land for possible R/W extension (Relocated Dog Leg Rd).	Maintains a clear RPZ and Part 77 surfaces. Provides land for possible R/W extension.
Score:	**1**	**1**	**1**	**0**	**0**	**-1**	**1**
TOTAL SCORE:	**1**	**0**	**2**	**2**	**0**	**-3**	**1**

Notes:

1. Concepts 1, 2, 3, 4 and 5 include a 4,400 foot extension of Runway 6R.
2. Concepts 6 and 7 include a 8,600 foot extension of Runway 6R and relocation of the 24L threshold south.
3. Construction costs include roadways, land acquisitiion for the Runway 6R extension, and contingency costs. They do not include costs for the Runway 6R extension.

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Dixie Drive by-pass results in an S-curve and new interchanges with Northwoods Boulevard, McCauley Drive and Old Springfield Road. It is estimated that the North Dixie Drive by-pass will cost approximately $10-$20 million.

Recommendation – Based on the information presented above, it is recommended that both Runway 6R and 24L thresholds not be extended as proposed under Airfield Alternatives 2 and 3. Both the tunnel and by-pass roadway concepts do not provide reasonable or economical solutions for North Dixie Drive. Also, the overall construction costs will be much higher since US 40 must also be modified under these airfield alternatives.

(4) Lightner Road and Ginghamsburg-Frederick Road

A 4,100 foot extension of Runway End 18 is proposed for Runway Alternatives 3, 5, 8, and 11. This runway extension will require modification to Lightner Road and Ginghamsburg-Frederick Road. The proposed roadway modification concepts are presented below:

Lightner Road - The Runway 18 extension will cut through Lightner Road approximately 3,800 feet west of North Dixie Drive. It is proposed that the eastern portion of Lightner Road between North Dixie Drive and the runway extension become a dead end cul-de-sac. The western portion between Dog Leg Pike and the runway extension will be closed and diverted onto a new By-Pass Connector Road that will connect into the relocated Ginghamsburg-Fredrick Road as presented below.

Ginghamsburg-Frederick Road Relocation Concept 1 – This roadway relocation concept is shown on ***Exhibit 4-14***. Ginghamsburg-Frederick Road will be relocated around the proposed Runway 18 extension starting approximately 2,050 feet east of Peters Pike. The road will be relocated approximately 1,150 feet north of its current alignment and continue in an easterly direction to a new interchange with Interstate 75. The new Ginghamsburg-Frederick Road will be located such that it does not penetrate the FAR Part 77 surfaces for the Runway 18 extension. The relocated Ginghamsburg-Frederick Road will be upgraded to 4/5-lanes between Peters Pike and Interstate 75. The new Interstate 75 interchange will be located approximately 2.25 miles north of the existing Northwoods Blvd./I-75 interchange and 4.1 miles south of the SR 571/I-75 interchange. The relocated Ginghamsburg-Frederick Road will cross North Dixie Drive with an at-grade signalized interchange.

Ginghamsburg-Frederick Road Relocation Concept 2 – This roadway relocation concept is shown on ***Exhibit 4-15***. Ginghamsburg-Frederick Road will be relocated around the proposed Runway 18 extension starting approximately 2,050 feet east of Peters Pike. The road will be relocated approximately 1,150 feet north of its current alignment and proceed through the runway approach surface. From this point the road will turn to the south and reconnect to its existing roadway alignment approximately 2,200 feet west of North Dixie Drive. The new Ginghamsburg-Frederick Road will be located such that it does not penetrate the FAR Part 77 surfaces for the Runway 18 extension. The relocated Ginghamsburg-Frederick Road will be upgraded to 4/5-lanes between Peters Pike and North Dixie Drive. Also

associated with this concept is the widening of North Dixie Drive to 4/5-lanes between Ginghamsburg-Frederick Road and State Route 571 to provide access to Interstate 75. The widening of North Dixie Drive is currently on the long-range Transportation Improvement Program (TIP).

Ginghamsburg-Frederick Road Relocation Concept 3 - This concept is shown on ***Exhibit 4-16*** and is similar to Concept 2 with the following exceptions. From the west, the relocated roadway will traverse the extended Runway 18 approach surface and then immediately turn to the south for a distance of approximately 2,600 feet. From this point the roadway will turn to the east and cross North Dixie Drive and connect into a new Interstate 75 interchange. The relocated Ginghamsburg-Frederick Road will be upgraded to 4/5-lanes east of Peters Pike and have a signalized interchange with North Dixie Drive.

Ginghamsburg-Frederick Road Relocation Concept 4 -This concept is shown on ***Exhibit 4-17*** and follows a similar alignment as discussed under Concept 3. However, once the road has traversed the extended Runway 18 approach surface, the road will continue in a southerly direction and connect into Lightner Road. The eastern portion of Lightner Road will be upgraded to North Dixie Drive. The portion of North Dixie Drive between Lightner Road and Northwoods Blvd. will also be upgraded to 4/5 lanes to accommodate the projected increased traffic. Vehicular traffic will use Northwoods Blvd. for access to Interstate 75.

Ginghamsburg-Frederick Road Tunnel Concept 1 - This tunnel concept is shown on ***Exhibit 4-18*** and proposes that the roadway be tunneled under the Runway 18 extension. The tunnel will be approximately 1,100 feet wide and remain on the current Ginghamsburg-Frederick Road alignment until approximately 800 feet west of North Dixie Drive. At this point the road will turn to the northeast and connect into a new interchange with Interstate 75 (similar to Ginghamsburg-Frederick Road Relocation Concept 1). The portion of Ginghamsburg-Frederick Road between Peters Pike and Interstate 75 will be upgraded to 4/5-lanes.

Ginghamsburg-Frederick Road Tunnel Concept 2 -This tunnel concept is shown on ***Exhibit 4-19*** and proposes that Ginghamsburg-Frederick Road be widened to 4/5-lanes between Peters Pike and North Dixie Drive. Also, the road is proposed to be tunneled (1,100 feet wide) under the Runway 18 extension. Also associated with this concept is the widening of North Dixie Drive to 4/5-lanes between Ginghamsburg-Frederick Road and State Route 571 to provide access to Interstate 75. The widening of North Dixie Drive is currently on the long-range Transportation Improvement Program (TIP).

Ginghamsburg-Frederick Road Tunnel Concept 3 - This tunnel concept is shown on ***Exhibit 4-20*** and proposes that the road be tunneled (1,100 feet wide) under the Runway 18 extension and connect to a new interchange with Interstate 75 (similar to Ginghamsburg-Frederick Road Relocation Concept 3).

Ginghamsburg-Frederick Road Tunnel Concept 4 - This tunnel concept is shown on ***Exhibit 4-21*** and proposes that Ginghamsburg-Frederick Road be tunneled under the Runway 18 extension and widened to 4/5 lanes between Peters Pike and North Dixie Drive. The portion of North Dixie Drive between Ginghamsburg-Frederick Road and Northwoods Blvd. will also be upgraded to accommodate the projected increased traffic. Vehicular traffic will use Northwoods Blvd. for access to Interstate 75.

Ginghamsburg-Frederick Relocation Recommendation – **Table 4-4** presents the evaluation criteria and scoring used to determine the preferred Ginghamsburg-Frederick Road relocation concept. Based on this information Concept 3 is recommended for the proposed Runway 18 extension Alternatives 3, 5, 8 and 11. Concept 3 provides a 4/5 lane roadway for truck and employee traffic to existing/future airport and commercial/industrial facilities on the north and west sides of the Airport. This concept can be developed in phases by delaying construction of the new Interstate 75 interchange until traffic demand warrants. Due to its southern alignment, there will be minimal impact to existing residential and commercial development. Concept 3 also requires minimal amount of land acquisition and has a low development cost.

(5) West Roadway System

The proposed third parallel runway and long-term expansion of the Emery Worldwide cargo sortation hub will required modification to various roads on the west side of the airport. These main roads include Dog Leg Pike, Old Springfield Road, Peters Pike, Lightner Road, and Jackson Road. It is proposed that a Cargo Access Road be constructed for access to the Emery and Logistics development areas located between the two parallel runways. Also, a By-Pass Connector Road will be necessary on the west side of the new parallel runway to provide a reconnection of those roads being severed by the runway. The following two roadway concepts were evaluated:

West Roadway System Concept 1 - This concept is shown on ***Exhibit 4-22*** and proposes that the western By-Pass Connector Road begin at an intersection with US 40 and continue around the west side of the airport boundary and connect into the relocated Ginghamsburg-Frederick Road on the north. This will provide a continuous roadway around the airport with connections to Interstates 70 and 75. Old Springfield Road, Lightner Road and Peter Pike will reconnect into the By-Pass Connector Road.

The Cargo Access Road will run between the two parallel runways with intersections on the south and north with the proposed By-Pass Connector Road. This can be used as a dedicated access road to development that occurs between the parallel runways. This road will need to be depressed under the two connector taxiways leading to the new third parallel runway.

Table 4-4
Dayton International Airport
Strategic Master Plan Update Study
Ginghamsburg-Frederick Relocation Concept Evaluation Criteria

	Relocation Concept 1	Relocation Concept 2	Relocation Concept 3	Relocation Concept 4	Tunnel Concept 1	Tunnel Concept 2	Tunnel Concept 3	Tunnel Concept 4
Construction Cost	$31,712,310 4/5 lanes east of Peters Pike to new I-75 interchange.	$34,540,770 4/5 lanes east of Peters Pike and 4/5 lanes on N. Dixie Dr. to SR 571.	$33,615,810 4/5 lanes east of Peters Pike to new I-75 interchange.	$27,638,820 4/5 lanes east of Peters Pike and 4/5 lanes on Lightner Rd. and N. Dixie Dr.	$62,289,570 4/5 lanes east of Peters Pike to new I-75 interchange. High O&M costs of tunnel.	$65,560,770 4/5 lanes east of Peters Pike and on N. Dixie Dr. to SR 571. High O&M costs of tunnel.	$62,801,400 4/5 lanes east of Peters Pike to new I-75 interchange. High O&M costs of tunnel.	$58,698,300 4/5 lanes east of Peters Pike and 4/5 lanes on Lightner Rd. and N. Dixie Dr. High O&M costs of tunnel.
Score:	**1**	**0**	**0**	**1**	**-1**	**-1**	**-1**	**-1**
Traffic Flow Pattern	At grade signalized intersection with N. Dixie Dr. New I-75 interchange to divert traffic off N. Dixie Dr.	At grade signalized intersection with N. Dixie Dr. Increased traffic on N. Dixie Dr. to SR 571.	At grade signalized intersection with N. Dixie Dr. New I-75 interchange to divert traffic off N. Dixie Dr.	At grade signalized intersections at Lightner Rd. and N. Dixie Dr. Increased traffic on N. Dixie Dr. to Northwoods Blvd. Utilize exiting I-75 interchange. Truck traffic will be reluctant to go south if ultimate destination is north.	1,100 ft. tunnel under R/W 18 extension. At grade signalized intersection with N. Dixie Dr. New I-75 ,interchange to divert traffic off N. Dixie Dr.	Maintain existing roadway alignment with 1,100 ft. tunnel under R/W 18 extension. At grade signalized intersection with N. Dixie Dr. Increased traffic on N. Dixie Dr. to SR 571.	1,100 ft. tunnel under R/W 18 extension. At grade signalized intersection with N. Dixie Dr. New I-75 interchange to divert traffic off N. Dixie Dr.	1,100 ft. tunnel under R/W 18 extension. At grade signalized intersection with Lightner Rd. and N. Dixie Dr. Utilize existing I-75 interchange at Northwoods Blvd. Truck traffic will be reluctant to go south if ultimate destination is north.
Score:	**0**	**-1**	**1**	**-1**	**0**	**-1**	**1**	**-1**
Land Acquisition	293 Acres 25 Homes 1 Commercial Property Will isolate residence on Meadow Dr. and N. Dixie Dr. from remainder of Miami Co.	271 Acres 16 Homes 1 Commercial Property Minimal land acquisition impact on residential and commercial properties.	299 Acres 18 Homes 1 Commercial Property Minimal land acquisition impact on residential and commercial properties.	286 Acres 17 Homes 1 Commercial Property Minimal land acquisition impact on residential and commercial properties.	271 Acres 24 Homes 1 Commercial Property Minimal land acquisition impact on residential and commercial properties.	271 Acres 16 Homes 1 Commercial Property Minimal land acquisition impact on residential and commercial properties.	300 Acres 18 Homes 1 Commercial Property Minimal land acquisition impact on residential and commercial properties.	290 Acres 17 Homes 1 Commercial Property Minimal land acquisition impact on residential and commercial properties.
Score:	**-1**	**1**	**0**	**1**	**0**	**1**	**0**	**1**
Airfield Operational Impacts	Maintains clear Part 77 surfaces, but does not clear the full RPZ.	Maintains clear Part 77 surfaces, but does not clear the full RPZ.	Maintains clear Part 77 surfaces, but does not clear the full RPZ.	Maintains clear Part 77 surfaces, but does not clear the full RPZ.	Maintains clear Part 77 surfaces and full RPZ.	Maintains clear Part 77 surfaces and full RPZ.	Maintains clear Part 77 surfaces and full RPZ.	Maintains clear Part 77 surfaces and full RPZ.
Score:	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**
Environmental Impacts	Additional vehicular noise to residence on Kent Rd. and Kim Circle (north & south).	Additional vehicular noise to residence on Ginghamsburg-Frederick Rd. and N. Dixie Dr.	Minimal vehicular noise impact on residential property.	Minimal vehicular noise impact on residential property.	Additional vehicular noise to residence on Ginghamsburg-Frederick Rd.	Additional vehicular noise to residence on Ginghamsburg-Frederick Rd. and N. Dixie Dr.	Minimal vehicular noise impact on residential property.	Minimal vehicular noise impact on residential property.
	-1	**0**	**1**	**1**	**0**	**-1**	**1**	**1**
TOTAL SCORE:	**0**	**1**	**3**	**2**	**0**	**-1**	**2**	**1**

Notes:

1. Construction costs include roadways, land acquisition for the Runway 18 extension, and contingency costs. They do not include costs for the Runway 18 extension.

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West Roadway System Concept 2 - This concept is shown on ***Exhibit 4-23*** and proposes that the Cargo Access Road connect into relocated US 40 and continue between the parallel runways and connect into the relocated Ginghamsburg-Frederick Road on the north. This provides a continuous roadway between the two parallel runways with connections to Interstates 70 and 75. The road will need to be depressed under the two connector taxiways leading to the new third parallel runway.

The By-Pass Connector Road will run along the west side of the new parallel runway and connect into Ginghamsburg-Frederick Road to the north and Frederick Pike to the west. Also, Old Springfield Road and Lightner Road will connect into this road to provide for continuous traffic flow.

West Roadway Recommendation - Based on the information above, it is recommended that Concept 1 be developed when the third parallel runway is constructed in Phase 3. This concept will provide the ability to tie in the By-Pass Connector Road and Cargo Access Road to US 40 via Dog Leg Pike.

(6) Roadway Impacts from New West Parallel Runway 18/36

The roadway impacts of a new west parallel Runway 18/36 will not be studied since it has been determined that a new Runway 18/36 does not provide the needed airfield capacity to meet future demand.

3. TERMINAL

The land area for the passenger terminal has sufficient size to handle forecast growth in enplaned passenger and aircraft operations. DAY has initiated a separate detailed Passenger Terminal Area Study that will examine the specific configuration of expanded facilities that will accommodate both forecast growth and long-term needs.

4. AIR TRAFFIC CONTROL TOWER

(1) Existing Air Traffic Control Tower

The existing Air Traffic Control Tower (ATCT) is located within the Dayton terminal building. It is a six-story structure containing FAA, airport administration, and airline offices; in addition, there is a TRACON facility and tower cab. The ATCT is classified as a Terminal Level IV facility. It has an eye-level elevation of 1,088.5 feet Mean Sea Level (MSL) or 83.5 feet above ground.

(2) Future Air Traffic Control Tower Site Study

The master plan will evaluate the relocation or raising of the existing ATCT due to inadequate line-of-sight to future runway and taxiway movement areas. There is also a

current need for additional controller workspace, which will need to increase in conjunction with the growth of aircraft operations at DAY. A new ATCT siting study was conducted in conjunction with the siting of a new ASR-9 facility and Emery Worldwide aircraft maintenance hangar. The existing site and five future sites were evaluated as shown on ***Exhibit 4-24***. These future ATCT sites were evaluated according to FAA mandatory and non-mandatory criteria. FAA mandatory criteria, as described in FAA Order 6480.4, "Air Traffic Control Tower Siting Criteria," are as follows:

- Maximum visibility of airborne traffic patterns must be available. A clear, unobstructed, and direct view of the approach to the end of the primary instrument runway and all other active runways and landing areas should be available.

- Complete visibility must be available to all airport surface areas utilized for movement of aircraft, which are under the control of the ATCT. This includes all aircraft aprons, taxiways, and runways.

- The ATCT site must provide sufficient area to accommodate the initial building of any planned future extensions, personnel and facility vehicle parking, fuel storage tanks, exterior transformers, etc., as dictated by location requirements.

- Federal Aviation Regulations, Part 77, Objects Affecting Navigable Airspace, including all amendments, must be complied with unless deviations are absolutely necessary to meet the other requirements given above.

- The ATCT must not be sited where it will derogate the performance of existing or planned electronic facilities.

In addition, the following non-mandatory items were considered:

- The tower cab should be oriented to face north or alternatively east, south, or west, in that order of preference. A southern orientation should be avoided in areas where snow may accumulate on the ground surface. The ATCT should be oriented to avoid placing a runway approach view in line with a rising or setting sun.

- Visibility should not be impaired by direct or indirect external light sources such as ramp light, parking lot lights, or reflective surfaces. Also, visibility should be available for all ground operations of aircraft and to airport ground vehicles on ramps, apron and tiedown areas, and test areas.

- Exterior noise should be at a minimum.

- Access to the ATCT site should avoid crossing areas of active aircraft operations.

- Consideration should be given to planned airport expansion, particularly construction of buildings and new or extended runways and taxiways.

- The tower should be sited in an area which is relatively free of jet exhaust fumes and impairments to visibility such as industrial smoke, dust, and fumes.

An adequate eye-level elevation should be provided so the controllers have an unobstructed line of sight to all runways, taxiways, and other movement areas on the airfield. Using the FAA siting criteria, this eye-level elevation requirement was calculated for the existing and future ATCT sites. The results are shown in **Table 4-5**. The shaded elevation indicates the necessary eye-level ATCT height for each tower site to see the most restrictive existing or future runway end. These elevations were calculated using an equation from FAA Order 6480.4 "Air Traffic Control Tower Siting Criteria" that requires a minimum line of sight angle of 35 minutes to the surface in question. After determining the eye level required to maintain this visual line of sight, the proposed Emery Worldwide maintenance hangar and existing Emery Worldwide ramp control tower were considered. Incorporation of these facilities required an increase in the ATCT eye-level elevation, which were used in this analysis.

Along with the calculated eye-level heights, other factors such as cost, timing, and operational issues were considered in the ATCT analysis. The pros/cons, and overall ranking for each of the ATCT sites were determined and are presented on **Table 4-6**.

The existing ATCT is located in the terminal building and should not require new site utilities. However, it may not be structurally feasible to raise the tower and continue to keep it in operation. Also, construction would have an adverse impact on the Department of Aviation offices, terminal space, and aircraft gate areas. This site requires the third highest tower elevation (1,370 MSL) in order to see the new parallel Runway 6 threshold.

Proposed ATCT Site 1 is located south of the U.S. Post Office facility along Concorde Drive. This site has immediate access for development with good utility access. Site 1 is centrally located and should have no impact on future long-range airport development. This ATCT site has the second lowest eye-level elevation requirement of 1,324 MSL.

Proposed ATCT Site 2 is located southwest of the Emery Worldwide complex and may impact future expansion. This site requires the highest ATCT eye-level elevation of 1,384 MSL and future land acquisition. Also, new site utilities will be required to this site.

Table 4-5
Dayton International Airport
Strategic Master Plan Update Study

Proposed ATCT Eye-Level Height Requirements

		Existing ATCT			Site 1			Site 2			Site 3			Site 4			Site 5		
Runway	Rwy End Elevation	Distance to Rwy End	Eye Level Elevation Required [1/]	Eye Level Height Above Ground (AGL)	Distance to Rwy End	Eye Level Elevation Required [1/]	Eye Level Height Above Ground (AGL)	Distance to Rwy End	Eye Level Elevation Required [1/]	Eye Level Height Above Ground (AGL)	Distance to Rwy End	Eye Level Elevation Required [1/]	Eye Level Height Above Ground (AGL)	Distance to Rwy End	Eye Level Elevation Required [1/]	Eye Level Height Above Ground (AGL)	Distance to Rwy End	Eye Level Elevation Required [1/]	Eye Level Height Above Ground (AGL)
Future 18	982	11,038.16	1,094.38	89.38	12,988.14	1,114.24	117.24	13,998.28	1,124.52	136.52	5,124.16	1,034.17	43.17	7,172.19	1,055.02	70.02	11,111.04	1,095.13	97.13
Future 36	1001	2,802.86	1,029.54	24.54	6,093.57	1,063.04	66.04	10,206.32	1,104.92	116.92	5,535.58	1,057.36	66.36	3,356.79	1,035.18	50.18	3,770.32	1,039.39	41.39
Future 24L	1000	4,971.95	1,050.62	45.62	8,270.61	1,084.21	87.21	12,530.47	1,127.58	139.58	7,480.72	1,076.16	85.16	3,499.36	1,035.63	50.63	6,051.55	1,061.61	63.61
Future 6R	1003	6,929.25	1,073.55	68.55	4,552.10	1,049.35	52.35	7,726.44	1,081.67	93.67	12,338.86	1,128.63	137.63	12,922.43	1,134.57	149.57	6,474.23	1,068.92	70.92
Existing 24R	996	4,978.74	1,046.69	41.69	7,528.86	1,072.65	75.65	10,309.18	1,100.96	112.96	2,492.29	1,021.38	30.38	2,734.63	1,023.84	38.84	5,365.02	1,050.62	52.62
Existing 6L	998	7,341.35	1,072.75	67.75	4,077.01	1,039.51	42.51	3,850.60	1,037.20	49.20	10,440.15	1,104.30	113.30	12,877.55	1,129.11	144.11	6,294.15	1,062.08	64.08
Future 24	980	9,158.10	1,073.24	68.24	9,836.70	1,080.15	83.15	9,560.50	1,077.34	89.34	3,644.04	1,017.10	26.10	8,634.25	1,067.91	82.91	8,759.36	1,069.18	71.18
Future 6	980	11,964.08	1,101.81	96.81	9,427.31	1,075.98	78.98	5,681.67	1,037.85	49.85	12,182.28	1,104.03	113.03	16,346.90	1,146.43	161.43	10,945.97	1,091.45	93.45
Existing 18	992	6,933.34	1,062.59	57.59	9,398.15	1,087.69	90.69	11,551.19	1,109.61	121.61	2,603.75	1,018.51	27.51	3,306.64	1,025.67	40.67	7,196.82	1,065.27	67.27
Existing 36	1008	3,290.54	1,041.50	36.50	5,809.49	1,067.15	70.15	10,677.73	1,116.71	128.71	8,624.64	1,095.81	104.81	6,290.60	1,072.05	87.05	4,256.75	1,051.34	53.34
Existing 24L	1000	5,271.34	1,053.67	48.67	8,628.62	1,087.85	90.85	12,798.06	1,130.30	142.30	7,547.09	1,076.84	85.84	3,157.41	1,032.15	47.15	6,229.08	1,063.42	65.42
Existing 6R	1005	3,119.38	1,036.76	31.76	3,283.46	1,038.43	41.43	8,293.99	1,089.44	101.44	9,267.36	1,099.36	108.36	8,671.86	1,093.29	108.29	3,288.89	1,038.49	40.49
Shadow Study Eye Level Requirement																			
Future Emery Hangar [2/]			1,271.00	266.00		1,261.00	264.00		1,144.00	156.00		1,128.63	137.63		1,146.43	161.43		1,242.00	244.00
Existing Emery Tower [2/]			1,370.00	365.00		1,324.00	327.00		1,384.00	396.00		1,372.50	381.50		1,323.00	338.00		1,328.00	330.00
Emery Hangar 5 ft. shadow [3/]			1,264.00	259.00		1,254.00	257.00		1,142.00	154.00		1,128.63	137.63		1,146.43	161.43		1,236.00	238.00
Emery Tower 5 ft.shadow [3/]			1,364.00	359.00		1,319.00	322.00		1,376.00	388.00		1,365.50	374.50		1,318.00	333.00		1,323.00	325.00

1/ FAA Order 6480.4, "Airport Traffic Control Tower Siting Criteria," was used to calculate eye level requirements.
Equation: Ee = Eas + D Tan. (35 min. + Gs)
2/ ATCT eye-level elevation required to eliminate shadows on all "movement areas" (runways, taxiways, aprons).
3/ ATCT eye-level elevation required to cast a five foot shadow on the nearest movement area.

Notes:
1. Existing ATCT eye level elevation is 1088.5 MSL or 83.5 feet AGL.
2. Emery proposed hangar elevation is 1098 MSL or 100 feet AGL.
3. Emery existing tower elevation is 1155 MSL or 163 feet AGL.
4. Shadow study was conducted manually.

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Table 4-6
Dayton International Airport
Strategic Master Plan Update Study

Proposed ATCT Siting Evaluation

ATCT Site	Pros	Cons	Ranking
Existing	no new site utilities convenient location to terminal	line of sight constraint is new third parallel runway third highest ATCT eye level elev. 1,370 MSL impact existing tower while constructing new tower impact to aircraft gates during construction impact to DOA offices & other terminal space	5
Site 1	second lowest ATCT eye level elev. 1,324 MSL centrally located on airport property can construct immediately no impact to proposed airport development close proximity to existing utility corridor	line of sight constraint is relocated Runway 18/36	1
Site 2	secure land area easy roadway access	highest ATCT eye level elevation 1,384 MSL land acquisition required may impact Emery expansion to the southwest new site utilities required	6
Site 3	located on airport property easy roadway access secure land area	new site utilities required second highest ATCT eye level elevation 1,373 MSL may impact Logistics Park expansion capabilities	2
Site 4	located on airport property secure land area easy roadway access lowest ATCT eye level elevation 1,323 MSL	impact to relocated ASR facility new site utilities required	3
Site 5	located on airport property secure land area close proximity to terminal area	line of sight constraint is third parallel runway third highest ATCT eye level elevation 1,328 MSL new site utilities required relocate employee parking lot possible conflict with future terminal expansion	4

Proposed ATCT Site 3 is located northeast of the Emery Worldwide and Logistics complex and may impact their future expansion capabilities. This site has the second highest ATCT eye-level elevation of 1,3,73 MSL and will require new site utilities. Also, new site utilities will be required to this site.

Proposed ATCT Site 4 is located on the east side of Runway 18/36. This site has been allocated for a new ASR-11 facility. The existing ASR-9 facility must be relocated due to future Emery expansion plans. Site 4 requires the lowest ATCT eye-level elevation of 1,323 MSL.

Proposed ATCT Site 5 is located in the employee parking lot just north of the terminal building. This site may impact future long-term expansion of the terminal building, aircraft gate apron and access roadway system. Site 5 requires the third highest ATCT eye-level elevation of 1,328 MSL.

Recommendation: Base on the above analysis, it is recommended that a new ATCT be located on Site 1 and constructed with an eye-level elevation of 1,324 MSL. This site is available immediately and has easy access from Concorde Drive. Site 1 does not conflict with future expansion needs of the airport or its tenants. The tower height will be minimized at this location and will be determined based on development of the new third parallel runway.

5. AIR CARGO

(1) Emery Worldwide Cargo Facilities

The Dayton master plan has projected short-term and long-term Emery cargo expansion requirements to accommodate future demand through 2018 and are shown on ***Exhibit 4-25***, ***Exhibit 4-26***, and ***Exhibit 4-27***. All proposed expansion will occur west of existing Runway 6L/24R for the planning years 2003, 2008, and 2018.

The 2003 Site Plan proposes a 278,000 square foot expansion of the main sort hub building and a 668,000 square foot expansion of the aircraft parking apron and taxilane area. A new 115,000 square foot aircraft maintenance hangar will be constructed southwest of the sort hub facilities. The maintenance hangar base will include office space, auto parking, aircraft parking apron and other support facilities. A roadway connector bridge will be constructed over Mill Creek to provide ground equipment access to the maintenance base. New employee parking and trailer staging are planned north of the sort building as well as a new truck access road. Expansion of the ground maintenance building, and a new transfer dock and container repair station are also planned with a staging and circulation area. The northern detention pond and water tower will require relocation. An interim Cargo Access Road will be constructed between Dog Leg Pike and Peters Pike for access into the Emery facilities.

The 2008 Site Plan includes a new 87,000 square foot sort building with 4 million square feet of additional aircraft apron. In addition, the container repair station and ground equipment staging areas will be expanded. A portion of the two cross-field taxiways will be constructed to provide access to the new aircraft parking apron. The ultimate Cargo Access Road alignment will be constructed and connects into Dog Leg Pike and continues northward around the Runway 18 extension. A new Hangar Road will be built to access the aircraft maintenance base. A visitor center/human resource building and Conway Trucking building will be built on the west side of the Cargo Access Road. One new fuel farm will be located near the aircraft maintenance base and a second new fuel farm will be located near the container repair station. The existing glycol detention ponds and deicing stations will be relocated to an area west of the aircraft maintenance base and south of the Logistics building. Mill Creek will either be relocated around the Emery cargo expansion area or be placed into a culvert and buried under the Emery facilities.

The 2018 Site Plan includes a 600,000 square foot addition to the 2008 sort hub building along with 3.6 million square feet of aircraft apron. Additional container and ground equipment staging and circulation areas will also be provided. The employee parking and truck staging areas will be relocated west of the Cargo Access Road to provide expansion of the aircraft parking apron. A pedestrian bridge will be constructed between the human resource and cargo hub buildings. Space is reserved for future collateral development east of the cross-field taxiway and northeast of Logistics Road. An area for future aircraft apron expansion is reserved north of the aircraft maintenance base. The cross-field taxiways will connect into the new third parallel Runway 6/24, which is scheduled to be constructed during this time frame. Taxiway bridges will need to be constructed over the Cargo Access Road.

A cost summary for each of the proposed Emery Worldwide cargo expansion phases is shown on **Table 4-7**. The total cargo expansion plan cost is projected to be approximately $374.3 million (1999 dollars).

(2) Other Cargo Facilities

As discussed in Chapter 3, the facility requirements analysis indicates that there will be a surplus of total air cargo facility space through year 2018 (excluding Emery). However, FedEx has indicated that they anticipate future expansion of their building and truck dock facilities. Therefore, an expansion area has been reserved adjacent to their current cargo

Table 4-7
Dayton International Airport
Strategic Master Plan Update Study

Emery Worldwide Site Plan Cost Summary

Cost Summary Description of Work	Total Cost ($)		
	2003	2008	2018
Site Preparation	$13,228,000	$15,747,000	$24,487,000
Employee & Visitors Entry & Parking	$1,606,000	$2,885,000	$3,140,000
Visitor Parking & Shuttle Pick-up/Drop-off Area		$339,000	
Human Resources Building		$3,000,000	
Pedestrain Bridge from HR Building to the Hub			$7,500,000
Truck Entry	$423,000	$661,000	$367,000
Apron Ground Equipment Connector	$3,712,000		
New Ramp Area for Aircraft Parking & Taxilanes	$22,357,000	$42,580,000	$40,286,000
Taxilane Connector to Taxiway	$210,000	$900,000	$900,000
Sort Building Expansion	$23,100,000	$26,748,000	$27,454,000
Maintenance Building & Apron	$309,000	$284,000	$1,675,000
Fuel Farm		$3,000,000	
Miscellaneous Support Areas	$2,000,000	$1,500,000	$2,200,000
Container Staging		$1,991,000	$564,000
Ground Equipment Staging & Circulation	$806,000	$1,278,000	$96,000
Container Transfer Dock & Truck Trailer Staging	$2,503,000	$1,094,000	$2,919,000
Conway Building--New Building	$310,000	$233,000	$1,550,000
Container Pick-up & Repair Station	$1,155,000	$1,440,000	$203,000
Hangar Aircraft Parking	$12,619,000		
Maintnenance Base	$30,350,000	$2,500,000	$18,400,000
Deicing Stations		$5,000,000	
Emery Building & Site Area Requirements	**$114,688,000**	**$111,180,000**	**$131,741,000**
Cargo Access Road	$4,435,000		
Glycol Ponds--expand on east & west	$250,000	$2,500,000	$2,500,000
Relocate Detention Pond & Water Tower	$1,500,000		
Cross-field Taxiways	$2,145,000	$3,355,000	
Subtotal Non-Emery Site Items	$8,330,000	$5,855,000	$2,500,000
Total Costs	**$123,018,000**	**$117,035,000**	**$134,241,000**

Notes:

1. Costs do not include Emery's material handling systems or furniture, fixtures & equipment.
2. Costs are in 1999 dollars.
3. Costs do not include contingency and design/engineering costs.

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facility. Also, if any new air cargo operators or expansion of existing air cargo facilities unexpectedly occur, the land area southwest of Taxiway "U" has been reserved for future air cargo expansion.

6. OTHER SUPPORT FACILITIES

(1) Airport Maintenance Facilities

As discussed in Chapter 3, the airport maintenance facilities are deficient in meeting existing needs. Equipment is being stored outside in inclement weather that needs to be stored inside. Also, as airport operations increase requiring additional airfield pavement and land, it will be necessary to expand the airport maintenance facilities to support equipment and personnel. Therefore, approximately 6 acres of land has been reserved north of the US Air & Trade Show Exhibit Hall in GA Center 1 to expand or relocate airport maintenance facilities as necessary.

(2) Airport Rescue and Fire Fighting (ARFF)

The ARFF facilities at DAY exceed the current requirement for Index C, and meet response time requirements for the existing runway system. However, the addition of a third parallel runway in the future will jeopardize the ability of the existing ARFF facility to meet FAR Part 139 response time requirements to that runway. It will be necessary to develop a second ARFF facility that can service this third parallel runway and any support facilities located in that area.

Two sites were analyzed for a new ARFF facility, as shown in ***Exhibit 4-28***. This analysis was performed using Advisory Circular 150/5210-15, "Airport Rescue and Firefighting Station Building and Design," dated July 30, 1987 as a guideline. FAA site selection criteria include:

- Response Time
- Checklist Items
  - Operational Response Factors
  - Lot Size
  - Physical Facilities
  - Topography and Station Orientation
  - Accessibility by Personnel

These factors, along with the size and location of the existing ARFF facility, were taken into consideration for analysis of the two new ARFF alternative sites.

ARFF Site 1 is located in the area southwest of the proposed Emery Worldwide aircraft maintenance base. It will be between existing Runway 6L/24R and the new parallel Runway 6/24. This site is within close proximity of the two outboard parallel runways and the Emery cargo complex. This ARFF facility can also service other future development between these runways. The one disadvantage of this site is the lack of direct access to the third parallel runway without traversing the Emery complex.

ARFF Site 2 is located northeast of the Emery Worldwide within the Logistic Park area. This site is within close proximity of the two parallel runways, the Emery cargo complex, and the Logistics Park area. There will be easy access from the public roadway system and to the airfield pavement areas for a quick response time.

Recommendation: Based on the above analysis, it is recommended to locate the new ARFF facility at Site 2. This site provides quick access to the airfield pavement areas and can serve all development between the two outboard parallel runways. Site 2 can also quickly respond to any incidents on Runway 18/36, particularly when it is extended to the north.

(3) General Aviation Facilities

The general aviation facilities at DAY show no need for additional expansion. However, in the event additional space is needed, an area has been reserved directly north of the existing facilities in GA Center 1 for expansion. Also, an area has been reserved south of the ramp in GA Center 2 for future expansion. These future expansion areas are shown in ***Exhibit 4-29***. Additional detailed analysis of these facilities will be assessed in a separate study as demand warrants.

7. RECOMMENDED AIRPORT DEVELOPMENT PLAN

The analysis of alternative methods to meet the 20 year development needs for various components of the airport resulted in an overall 20 year development plan for the airport. ***Exhibit 4-30*** shows all of the recommended development actions. These recommended development actions are the basis of the Airport Layout Plan presented in Chapter 8.

The recommended development plan should occur in three phases. The first phase meets all short-term development needs and should be in place prior to year 2004. This phase includes the following DAY projects:

- Extension of Runway 6R by 4,800 feet
- Displace the 24L threshold 400 feet
- Parallel and connecting taxiways
- Relocation of U.S. 40
- New Cargo Access Road (relocated Dog Leg Road)
- Realignment of Terminal Drive and Airport Access Road
- New airport perimeter roads
- Acquisition of the Amateur Trapshooters Association facilities
- Land acquisition for runway extension and road relocations
- Public Parking garage in terminal area

As stated in Chapter 3, the second parallel runway should have a minimum length of 11,000 feet for arrivals and departures. However, the use of declared distance criteria will need to be applied to Runway 6R/24L due to the non-standard runway safety area on the 24L end. The Runway 24L threshold will be displaced 400 feet in order to provide the required runway safety area clearances. Therefore, the Runway 6R extension will need to be 4,800 feet to provide the full 11,000 feet for 6R arrivals and departures. The ultimate length of Runway 6R/24L will be 11,400 feet. In addition to these projects, Emery Worldwide is expected to expand their employee parking, aircraft apron, office/administration space, fuel storage, aircraft maintenance hangar, and various support facilities.

These projects deliver the short-term airfield capacity needs of the Emery Worldwide cargo sort hub. In addition, they upgrade Runway 6R/24L to meet modern FAA Airport Design Standards. Construction of perimeter service roads will substantially reduce the volume of vehicle crossings of runways. Reducing the volume of vehicles crossing runways has been a recent national FAA safety initiative.

The second phase of the recommended airport development plan includes all of those projects that should be completed to meet year 2008 forecast airport facility requirements. These projects include:

- New FAA Air Traffic Control Tower and TRACON facility
- Extension of Runway 18 by 4,100 feet
- Relocation of the Runway 36 threshold northward by 3,100 feet
- Parallel and connecting taxiways
- Navigation aids for independent simultaneous parallel ILS approaches
- Realignment of Ginghamsburg-Frederick Road
- New airside service and perimeter roads

In addition to these projects, Emery Worldwide is expected to continue expanding their facilities.

These projects upgrade Runway 18/36 to a full-use independent crosswind runway. In addition to meeting airport capacity needs for year 2008 and beyond, it also brings the runway into compliance with modern FAA Design Standards. Relocating the Runway 36 threshold northward allows the construction of an airside service road between the east side of the airport and the passenger terminal area. This airside service road will eliminate the need for vehicles to cross Runway 18/36.

The third phase of the recommended airport development plan includes all of those facilities that will support airport development beyond the year 2018. DAY should monitor the growth of future demand in order to reconfirm the timing of the need for future facilities. The third phase projects include:

- Third parallel runway (11,000 feet)
- New public roads northwest of the airport
- Additional Airport Rescue and Firefighting Station
- Additional Emery Worldwide sort hub and aircraft maintenance facilities

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