CHAPTER TEN
RECOMMENDED INFRASTRUCTURE DEVELOPMENT PLAN

I. INTRODUCTION

The recommended infrastructure development plan presented in this chapter summarizes the SASP planning process which compared existing facilities and services at system airports to the facility and service objectives identified for each airport based on its recommended stratification in the Commonwealth's system of public-use airports. **Table 10-1** presents the facility and service objectives that were identified for system airports in each of the SASP functional levels. These objectives represent facility and service goals identified for Pennsylvania airports based on their recommended role in the system, as identified by their recommended stratifications, and the types of users anticipated for each functional level of airport in the system. It is important to note that no facility nor service objectives were developed for airports in the special use functional level, these facilities should be developed to meet the specific needs of their respective types of users.

Table 10-2 summarizes the SASP's recommended stratification of system airports. Through the comparison of existing facilities, recommended functional level and the associated facility and service objectives, airport-specific infrastructure development needs were identified for each system airport. These development needs include all projects and project costs associated with bringing each system airport into compliance with the facility and service objectives of its recommended role in the system. It is important to note that the airport functional level classifications presented in Table 10-2 are recommendations of the SASP and are made at the State airport system level. Some airports may not be able to be developed to meet the functional level classifications noted, and their respective facility and service objectives, due to land, physical, or aeronautical constraints.

In the following sections, estimated project costs are presented in 2002 dollars for system development needs relative to each category of facility and service objective. Total system development costs in each of the facility and service objective categories are separated by airport functional level. This data is intended to provide an estimate of total system development needs by project type and by airport functional level. It is important to note that the recommendations contained in this chapter are not intended to replace airport-specific recommendations that may result from more detailed airport planning. In addition, costs for maintenance and operation of airports, equipment, and other necessary projects are not included. Furthermore, the recommendations contained in the SASP do not in any way obligate the Bureau of Aviation to provide funding for noted improvements. Recommendations contained in this chapter are intended to provide general guidance for the Pennsylvania Department of Transportation in terms of the types of projects that should be implemented to help improve airport system performance relative to airport system goals developed in the SASP, as well as an estimate of overall infrastructure costs.

II. UNIT COST METHODOLOGY

The recommended infrastructure development plan presents cost estimates for bringing all system airports into compliance with facility and service objectives for their recommended system role. The costs of maintaining up-to-date airport planning documents at system airports, another SASP recommendation, are also included in the recommended plan. In addition, pavement management costs that were estimated for system airports in Pennsylvania's Pavement Management Study, a study conducted in conjunction with the SASP, are presented for system airports. Pavement management costs relate to recommended projects to preserve and maintain existing pavement areas at system airports.

The SASP utilized a methodology to estimate project costs for the recommended infrastructure development plan that included the following steps:

- Comparing existing facilities at each system airport to the minimum facility and service objectives identified for its recommended system role
- Determining specific airport needs for attaining compliance to the minimum facility and service objectives
- Using estimated unit costs developed for the SASP and applying them to airport needs to estimate project costs associated with the recommended infrastructure development plan

In this process, facility needs were identified on an airport-by-airport basis and the cost of bringing each system airport into compliance with its facility and service objectives was estimated. This chapter of the SASP presents a summary of those individual cost estimates and describes the recommended infrastructure development plan.

Unit cost estimates for specific airport development projects related to the facility and service objectives of the SASP were developed to aid in estimating the total cost of airport-specific recommended developments as well as the system-wide costs of the recommended infrastructure development plan. The unit cost estimates used in the SASP are presented in **Table 10-3**.

The unit cost estimates presented in Table 10-3 reflect actual average costs of similar projects conducted recently at Commonwealth airports and other regional airports, as well as industry standard averages. Where possible, actual equipment acquisition, design, engineering, construction, and inspection costs from recently completed projects were used as a baseline in the development of the unit costs in this analysis. Those unit costs for which recent actual costs were not available were estimated based on industry standard costs as shown in industry publications such as the Means Cost Guide.

As shown in Table 10-3, unit costs estimates were developed separately for the SASP airport functional levels. For airports in the advanced functional level, units costs were further sub-divided to reflect cost differentials that would likely be expected for project implementation in suburban versus rural areas. **Table 10-4** presents the Commonwealth's advanced airports and their classification as being in suburban or rural surroundings.

Table 10-1
Facility and Service Objectives 1/

Advanced Airports	
ARC:	B-II or greater (C-II for Commercial Service)
Runway Length:	Minimum of 5,000 feet (dry runway)
Runway Width:	To Meet ARC
Runway Strength:	At least 30,000 Pounds (60,000 Pounds for Commercial Service)
Taxiway:	Full Parallel for Primary Runway
Navigational Aids:	Published approach with decision altitude of 200 feet or less and visibility minimum of 1/2 mile or less
Approach Aids:	Rotating Beacon, Lighted Wind Indicator/Segmented Circle, REILs, PAPIs, MALSR
Lighting:	HIRL
Weather:	ASOS/AWOS
Services:	Phone, Restrooms, FBO, Maintenance, Jet Fuel, Ground Transportation
Facilities:	Local and Itinerant Aircraft Parking Apron, Local and Itinerant Aircraft Storage, Terminal, Auto Parking

Intermediate Airports	
ARC:	B-II or greater
Runway Length:	Minimum of 4,000 feet (dry runway)
Runway Width:	To Meet ARC
Runway Strength:	30,000 Pounds (accommodates all large B-II aircraft)
Taxiway:	Full Parallel for Primary Runway
Navigational Aids:	Published approach with decision altitude of 400 feet or less and visibility minimum of 1 mile or less
Approach Aids:	Rotating Beacon, Lighted Wind Indicator/Segmented Circle, REILs, VGSIs
Lighting:	MIRL
Weather:	ASOS/AWOS
Services:	Phone, Restrooms, FBO, Maintenance, Jet Fuel, Ground Transportation
Facilities:	Local and Itinerant Aircraft Parking Apron, Local and Itinerant Aircraft Storage, General Aviation Terminal, General Aviation Auto Parking

Basic Airports	
ARC:	B-I or greater
Runway Length:	Minimum of 3,000 feet (dry runway)
Runway Width:	To Meet ARC
Runway Strength:	Paved, at Least 12,500 Pounds
Taxiway:	Partial Parallel, Connectors, or Turnarounds
Navigational Aids:	Published approach with minimum descent altitude of 1000 feet or less and visibility minimum of 3 miles or less
Approach Aids:	Rotating Beacon, Lighted Wind Indicator/Segmented Circle, VGSIs
Lighting:	MIRL
Weather:	None
Services:	Phone, Restrooms, Fuel (Avgas)
Facilities:	Aircraft Parking Apron, Aircraft Storage Units, Auto Parking

Limited Airports	
ARC:	A-I or greater
Runway Length:	2,200 feet or greater (dry runway)
Runway Width:	To Meet ARC
Runway Strength:	Turf or Paved Up to 12,500 Pounds
Taxiway:	None
Navigational Aids:	None
Approach Aids:	Wind Indicator
Lighting:	None
Weather:	None
Services:	Phone, Restrooms
Facilities:	Aircraft Parking, Auto Parking

Special Use Facilities
No facility and service objectives were developed for this functional level. These facilities should be developed to meet the specific needs of their respective types of users.

Note 1/: Airport functional level classifications and facility and service objectives are recommendations of the SASP and have been made at the State airport system level. It is important to note that some airports may not be able to be developed to meet the functional level classifications and facility and service objectives noted, due to land use, physical, or aeronautical constraints.

Table 10-2
Summary of Recommended Functional Levels 1/

Advanced Airports	Associated City
Lehigh Valley International	Allentown
Altoona-Blair County	Altoona
Beaver County	Beaver Falls
Butler County	Butler
Chester County-G.O. Carlson	Coatesville
Doylestown	Doylestown
DuBois-Jefferson County	DuBois
Erie International	Erie
Venango Regional	Franklin
Harrisburg International	Harrisburg
Capital City	Harrisburg
Hazleton Municipal	Hazleton
Johnstown-Cambria County	Johnstown
Lancaster	Lancaster
Arnold Palmer Regional	Latrobe
Port Meadville	Meadville
Pocono Mountains Municipal	Mount Pocono
Northeast Philadelphia	Philadelphia
Philadelphia International	Philadelphia
Wings Field	Philadelphia
Allegheny County	Pittsburgh
Pittsburgh International	Pittsburgh
Pottstown Limerick	Pottstown
Schuylkill County-Joe Zerbey	Pottsville
Reading Regional	Reading
Penn Valley	Selinsgrove
University Park	State College
Wilkes-Barre/Scranton International	Wilkes-Barre/Scranton
Williamsport Regional	Williamsport
York	York

Intermediate Airports	Associated City
Queen City	Allentown
Bedford County	Bedford
Bradford Regional	Bradford
Carlisle	Carlisle
Clearfield-Lawrence	Clearfield
Perkiomen Valley	Collegeville
Connellsville	Connellsville
Indiana County-Jimmy Stewart	Indiana
Rostraver	Monongahela
Donegal Springs Airpark	Mount Joy/Marietta
New Castle Municipal	New Castle
Pottstown Municipal	Pottstown
Quakertown	Quakertown
Mifflin County	Reedsville
Northumberland County	Shamokin
Rock	Tarentum
New Garden Flying Field	Toughkenamon
Bradford County	Towanda
Washington County	Washington
Brandywine	West Chester
Zelienople Municipal	Zelienople

Table 10-2
Summary of Recommended Functional Levels

Basic Airports	Associated City
Bloomsburg Municipal	Bloomsburg
Chambersburg Municipal	Chambersburg
Clarion County	Clarion
Corry-Lawrence	Corry
Danville	Danville
Stroudsburg Pocono	East Stroudsburg
Easton (Braden Airpark)	Easton
Ebensburg	Ebensburg
Finleyville Airpark	Finleyville
Farmer's Pride	Fredicksburg
Gettysburg Airport and Travel Center	Gettysburg
Grove City	Grove City
Kutztown	Kutztown
Jake Arner Memorial	Lehighton
William T. Piper Memorial	Lock Haven
Huntingdon County	Mount Union
Deck	Myerstown
Reigle	Palmyra
Pennridge	Perkasie
Mid State	Philipsburg
Somerset County	Somerset
Smoketown	Smoketown
St. Marys Municipal	St. Marys
Titusville	Titusville
Greene County	Waynesburg
Grand Canyon State	Wellsboro
Wilkes-Barre/Wyoming Valley	Wilkes-Barre

Limited Airports	Associated City
Millard	Annville
Bellefonte	Bellefonte
Grimes	Bethel
Baublitz Commercial	Brogue
Miller	Burgettstown
Butler Farm Show	Butler
Flying Dollar	Canadensis
Centre Airpark	Centre Hall
Penn's Cave	Centre Hall
McGinness Field	Columbia
Culmerville	Culmerville
Bandel	Eighty Four
Van Sant	Erwinna
Seamans Field	Factoryville
McVille	Freeport
Cherry Springs	Galeton
Flying M. Aerodrome	Germansville
Greenville Municipal	Greenville
Hanover	Hanover
Cherry Ridge	Honesdale
Inter County	Irwin
Greensburg-Jeanette Regional	Jeanette
Jersey Shore	Jersey Shore

Summary of Recommended Functional Levels

Limited Airports (cont)	Associated City
Bermudian Valley Airpark	Kralltown
Keller Brothers	Lebanon
Beltzville	Lehighton
Lakehill	Mars
Mifflintown	Mifflintown
Pittsburgh Monroeville	Monroeville
Morgantown	Morgantown
Mt. Pleasant-Scottsdale	Mount Pleasant
Blue Knob Valley	Newry
Albert	Phillipsburg
Brokenstraw	Pittsfield
Punxsutawney	Punxsutawney
Blue Swan	Sayre
Seven Springs	Seven Springs
Shippensburg	Shippensburg
Slatington	Slatington
Spring Hill	Sterling
Sunbury	Sunbury
Bendigo	Tower City
Sky Haven	Tunkhannock
Erie County	Wattsburg
Kampel	Wellsville
Cove Valley	Williamsburg

Special Use Facilities	Associated City
Total RF Heliport	Bensalem
Philadelphia Seaplane Base	Essington
Keystone Heliport	Exton
Mid-Atlantic Soaring Center	Fairfield
Southern Adams County Heliport	Gettysburg
Horsham Valley Airways Heliport	Horsham
WPHS Heliport	Mount Pleasant
Valley Forge Bicentennial Heliport	Norristown
Penn's Landing - Pier 36 Heliport	Philadelphia
Shoestring Aviation	Stewartstown
Sunbury Seaplane Base	Sunbury
Ridge Soaring Gliderport	Unionville

Note 1/: Airport functional level classifications and facility and service objectives are recommendations of the SASP and have been made at the State airport system level. It is important to note that some airports may not be able to be developed to meet the functional level classifications and facility and service objectives noted, due to land use, physical, or aeronautical constraints.
Source: Wilbur Smith Associates, Inc.

Table 10-3
Estimated Unit Costs for Recommended Development Plan

Item	Unit	Airport Functional Level				
		Advanced				
		Suburban	Rural	Intermediate	Basic	Limited
Runway Paving - Asphalt	Square Yard	$86.25	$74.75	$57.50	$34.50	$31.05
Runway Paving - Concrete	Square Yard	$172.50	$155.25	$155.25	NA	NA
Taxiway Paving - Asphalt	Square Yard	$69.00	$57.50	$46.00	$28.75	$28.75
Taxiway Paving - Concrete	Square Yard	$138.00	$126.50	$126.50	NA	NA
Apron Paving - Asphalt	Square Yard	$69.00	$57.50	$46.00	$28.75	$28.75
Apron Paving - Concrete	Square Yard	$138.00	$126.50	$126.50	NA	NA
Automobile Parking Paving	Square Yard	$70.00	$65.00	$60.00	$20.00	$20.00
Terminal Building	Square Foot	$300.00	$150.00	$150.00	$115.00	$100.00
Conventional Hangar 1/	Square Foot	$120.00	$110.00	$100.00	$85.00	$75.00
T-Hangars	Unit	$40,250.00	$34,500.00	$28,750.00	$28,750.00	$23,000.00
High-Intensity Runway Lighting	Linear Foot	$70.00	$65.00	$65.00	N/A	N/A
Medium-Intensity Runway Lighting	Linear Foot	$60.00	$55.00	**$50.00**	$50.00	$50.00
Low-Intensity Runway Lighting	Linear Foot	N/A	N/A	N/A	$40.00	$40.00
Medium-Intensity Taxiway Lighting	Linear Foot	$70.00	$65.00	**$65.00**	$60.00	$55.00
PAPI/VASI	Each	$60,000.00	$55,000.00	$45,000.00	**$40,000.00**	$40,000.00
REILS	Each	$50,000.00	$45,000.00	$40,000.00	**$35,000.00**	$35,000.00
MALSR 2/	Each	$725,000.00	$725,000.00	**$725,000.00**	$725,000.00	N/A
Localizer	Each	$800,000.00	$800,000.00	$750,000.00	$750,000.00	N/A
Glide Slope	Each	$725,000.00	$685,000.00	**$685,000.00**	$450,000.00	N/A
Weather Reporting Systems	Each	$162,500.00	$162,500.00	$162,500.00	N/A	N/A
Fuel Storage/Distribution	10,000 Gallon	$100,000.00	$100,000.00	$90,000.00	$90,000.00	$90,000.00
Airport Rotating Beacon	Each	$75,000.00	$60,000.00	$55,000.00	**$50,000.00**	$40,000.00
Wind Indicator	Each	$40,000.00	$35,000.00	**$30,000.00**	$30,000.00	$25,000.00

Notes:
1/ Based on Means Cost Guide
2/ Price dependant on height of structures
Bold indicates calculated estimate
Source: Means Cost Guides
L. Robert Kimball & Associates

Table 10-4
Recommended Infrastructure Development Plan
Advanced Airports: Unit Cost Classification

Advanced Airports	Associated City	Unit Cost Classification
Lehigh Valley International	Allentown	Suburban
Altoona-Blair County	Altoona	Rural
Beaver County	Beaver Falls	Rural
Butler County	Butler	Rural
Chester County-G.O. Carlson	Coatesville	Suburban
Doylestown	Doylestown	Suburban
DuBois-Jefferson County	DuBois	Rural
Erie International	Erie	Suburban
Venango Regional	Franklin	Rural
Harrisburg International	Harrisburg	Suburban
Capital City	Harrisburg	Suburban
Hazleton Municipal	Hazleton	Rural
Johnstown-Cambria County	Johnstown	Rural
Lancaster	Lancaster	Rural
Arnold Palmer Regional	Latrobe	Rural
Port Meadville	Meadville	Rural
Pocono Mountains Municipal	Mount Pocono	Rural
Northeast Philadelphia	Philadelphia	Suburban
Philadelphia International	Philadelphia	Not Applicable
Wings Field	Philadelphia	Suburban
Allegheny County	Pittsburgh	Suburban
Pittsburgh International	Pittsburgh	Not Applicable
Pottstown Limerick	Pottstown	Rural
Schuylkill County-Joe Zerbey	Pottsville	Rural
Reading Regional	Reading	Rural
Penn Valley	Selinsgrove	Rural
University Park	State College	Rural
Wilkes-Barre/Scranton International	Wilkes-Barre/Scranton	Suburban
Williamsport Regional	Williamsport	Rural
York	York	Rural

Source: Wilbur Smith Associates, Inc.

As a result of higher costs of project inputs; including but not limited to labor rates, supplies, mobilization, and other project contingencies, recommended development projects at suburban advanced airports are estimated to be marginally higher than at rural advanced airports. It should be noted that project costs for Pittsburgh International and Philadelphia International Airport were taken from airport-specific Capital Improvement Programs (CIPs) that have been developed by the airports and submitted to the FAA. Because project costs at these airports were taken from other sources, they were not included in the rural/suburban categorization process.

Unit costs were developed for each of the facility or service objectives developed within each airport functional level. While some unit costs were the same in several functional levels, weather reporting equipment for example, unit costs related to other projects, such as airfield pavement projects, varied by functional level. The variation in pavement costs between

functional levels is primarily the result of different strength requirements for those surfaces. It is important to note that all unit costs presented in Table 10-3 include design, inspection, and construction costs, however, property acquisition costs that may be required to implement projects in the recommended infrastructure development plan are not included. The wide variation in property acquisition costs throughout Pennsylvania made it impossible to develop a unit cost estimate for property acquisition. In addition, at the system planning level, it is impossible to identify specific property acquisition needs, both in terms of total acreage and specific parcels required, for recommended projects at system airports.

It is also very important to note that a number of other costs that might be incurred in conjunction with, or as a result of, recommended projects, are excluded from cost estimates due to the site-specific nature of those costs. Examples of site-specific factors that could significantly increase the estimated project costs presented in this chapter include the following:

- Environmental Analysis
- Construction Contingencies
- Utility Relocation
- Project Scheduling Requirements (to maintain airport operations)
- Environmental Mitigation
- Major Earthwork
- Roadway Relocation/Redesign

In addition to property acquisition costs, the site-specific factors listed above could significantly impact project scheduling and the estimated costs of projects in the recommended infrastructure development plan. In some cases, actual implementation costs of recommended projects could be materially different than the estimated project costs presented in this chapter. As a result, the estimated project costs of the recommended infrastructure development plan presented in this chapter should be considered "best-case scenario" estimates and could represent only 50 to 70 percent of the total costs of certain projects. The actual costs of individual projects included in the recommended plan could be significantly higher than estimated herein, when site-specific analysis and planning is undertaken prior to the implementation of recommended projects.

By applying the unit costs shown in Table 10-3 to the airport needs that were identified by comparing existing facilities to the facility and service objectives of each airport's recommended role, system-planning level cost estimates of the recommended plan were developed. These estimated costs of the recommended infrastructure development plan are presented in the following sections of this chapter.

III. RECOMMENDED INFRASTRUCTURE DEVELOPMENT PLAN

The recommended infrastructure development plan for Pennsylvania's system of public-use airports, and its estimated cost, is summarized in the following sections. The recommended infrastructure development plan includes projects required to bring all system airports into compliance with the facility and service objectives of their recommended role, as well as other costs associated with future planning documents and pavement management at system airports. Implementation of the recommended infrastructure development plan will improve system

performance relative to the performance measures, benchmarks, and goals that were developed for the system in the SASP. The recommended infrastructure development plan includes projects in the following major categories:

- Airfield Pavement Projects
- Navigational Aids
- Approach Aids
- Lighting
- Weather
- Facilities
- Planning Costs

Total estimated costs of the recommended airport development and planning projects in each of the facility and service categories listed above are presented in the following sections. These estimated costs are presented by airport functional level for each type of project and then summed to present total estimated system costs for each project type. Total estimated project costs of all types of projects included in the recommended infrastructure development plan are presented at the conclusion of this chapter.

A. Airfield Pavement Projects

Maintaining, improving, and expanding the Commonwealth's airfield pavement areas is a significant undertaking that is important to preserving the utility of airport facilities. Ensuring the airfield pavement areas are adequate to support aviation users' needs throughout the Commonwealth, and maintaining the pavement's condition throughout the study period, will require significant investment by PennDOT. The following sections present cost estimates associated with developing airport pavement areas to meet the needs of aviation users throughout the 20-year planning period. Estimated pavement maintenance costs for the first five-years of the planning period, as developed in the Pavement Management Study, are also included. These pavement maintenance and rehabilitation cost estimates were expanded to include system level planning estimates of cost for the five to 20 year planning period of the SASP.

The cost estimates that have been developed in this analysis include costs associated with developing and constructing new pavement areas, including extended or widened runways, new taxiways, and/or new or expanded apron areas. In addition, costs of maintaining system pavements through scheduled preventative maintenance and pavement overlays have also been developed. Costs presented in the following sections summarize total project costs associated with bringing system airports into compliance with the following facility and service objectives of their recommended role:

- Runway Length
- Runway Width
- Runway Strength
- Taxiway
- Apron

The cost of constructing new pavement areas was estimated by comparing existing airfield pavement facilities at system airports to the objectives of their recommended role and identifying current deficiencies. Once deficiencies were identified, the unit cost estimates for pavement design, engineering, and construction were applied and the estimated costs of addressing the deficiencies in runway, taxiway, and apron areas were calculated. Pavement maintenance costs for system airports were developed as part of the Pennsylvania Pavement Management Study, a statewide analysis of pavement conditions that was conducted in conjunction with the SASP. It is important to note that the pavement maintenance costs developed in the Pavement Management Study were for a five-year period, those cost estimates were expanded to include estimated pavement management costs for the SASP's 20-year planning period.

Airfield pavement area costs are presented individually for the following project types:

- Runway Lengthening/Widening
- Runway and Taxiway Strengthening
- Taxiway Lengthening/Widening
- Apron Development
- Pavement Management

Costs presented for runway lengthening/widening, runway and taxiway strengthening, taxiway lengthening/widening, and apron development projects are specifically related to bringing airfield pavement areas at system airports into compliance with the facility and service objectives of their recommended role in the system. Pavement management costs are those costs associated with maintaining existing airfield pavement areas at system airports. It should be noted that estimated costs associated with bringing existing or planned runway safety areas into compliance with Federal standards were not quantified and are not included in this analysis. Costs associated with improving existing runway safety areas at system airports are being examined in a separate PennDOT runway safety area study that is currently underway.

1. Runway Lengthening/Widening

Runway lengthening/widening costs estimated in the recommended infrastructure development plan represent project costs associated with bringing system airports into compliance with runway length and runway width objectives. The costs included in this category summarize estimated project costs in the design, engineering, and construction of new pavement for expanded paved runway areas. Specific projects included in this category are either runway extension or runway widening projects. **Table 10-5** summarizes estimated project costs for recommended runway paving projects.

Table 10-5
Recommended Infrastructure Development Plan
Runway Lengthening/Widening Projects

Functional Level	Estimated Cost
Advanced	$13,895,561
Intermediate	$8,389,480
Basic	$3,540,022
Limited	$1,964,378
Special Use	$0
System Cost	**$27,789,442**

Source: Wilbur Smith Associates, Inc.; R.A. Wiedemann and Associates

As shown in Table 10-5, total system costs for runway lengthening/widening projects in the recommended infrastructure development plan are estimated at approximately $27.8 million. Runway lengthening/widening projects are recommended for airports in the advanced, intermediate, basic, and limited functional levels. The estimated costs of maintaining runway facilities at system airports are included in pavement management costs.

2. Runway and Taxiway Strengthening

Runway and taxiway strengthening projects included in the recommended infrastructure development plan address deficiencies at system airports related to runway strength objectives. By implementing recommended runway and taxiway strengthening projects, existing pavement at system airports can be augmented and strengthened to meet the runway strength objectives that were developed for system airports based on their recommended role. The following runway strength objectives were established for system airports in the SASP:

- Advanced Airports – single-wheel pavement strength of at least 30,000 pounds (general aviation) or at least 60,000 pounds commercial service
- Intermediate Airports – single- wheel pavement strength of at least 30,000 pounds
- Basic Airports – single-wheel pavement strength of at least 12,500 pounds
- Limited Airports – no pavement strength objective

It is also important to understand that in most cases, runway and taxiway strengthening projects should be completed in tandem to ensure that each component of the airfield system has the strength required to accommodate the types of aircraft anticipated to use the airport. Runway and taxiway strengthening project costs included in the recommended infrastructure development plan are summarized in **Table 10-6**.

Table 10-6
Recommended Infrastructure Development Plan
Runway and Taxiway Strengthening Projects

Functional Level	Estimated Cost
Advanced	$26,734,720
Intermediate	$13,189,980
Basic	$1,988,130
Limited	$0
Special Use	$0
System Cost	**$41,912,830**

Source: Wilbur Smith Associates, Inc.; R.A. Wiedemann and Associates

As shown in Table 10-6, runway and taxiway strengthening projects are recommended for some system airports in the advanced, intermediate, and basic functional levels. Estimated project costs of recommended runway and taxiway strengthening projects at system airports is approximately $41.9 million over the planning period. Runway and taxiway strengthening projects recommended for system airports and summarized in Table 10-6 only relate to strengthening existing pavement areas. Costs associated with maintaining pavement areas, also typically conducted through overlay projects, are included in the Pavement Management section of this chapter.

3. Taxiway Lengthening/Widening

Taxiway systems are transitional facilities that support the movement of aircraft between airside and landside facilities. Aircraft must taxi to runway ends and runway exits in order to access landside facilities at an airport or to initiate a departure. The existence of taxiways at an airport allows aircraft to complete these movements off the active runways thereby freeing runway facilities to accommodate additional demand. Different types of taxiway configurations including full parallel, partial parallel, or no taxiway, impact operational capacities at system airports to varying degrees. The following taxiway objectives were identified for system airports based on their recommended role in the Commonwealth and their anticipated activity levels:

- Advanced Airports – full parallel taxiway for primary runway
- Intermediate Airports – full parallel taxiway for primary runway
- Basic Airports – partial parallel, connectors, or turnaround taxiways for primary runway
- Limited Airports – no taxiway objective

System costs of recommended projects associated with meeting minimum taxiway objectives at system airports are summarized in **Table 10-7**.

Table 10-7
Recommended Infrastructure Development Plan
Taxiway Lengthening/Widening Projects

Functional Level	Estimated Cost
Advanced	$5,543,643
Intermediate	$9,064,581
Basic	$731,688
Limited	$0
Special Use	$0
System Cost	**$15,339,911**

Source: Wilbur Smith Associates, Inc.; R.A. Wiedemann and Associates

As shown in Table 10-7, taxiway lengthening/widening projects with an estimated cost of approximately $15.3 million are recommended for system airports in the advanced, intermediate, and basic functional levels. The costs presented in Table 10-7 are directly related to the construction of extended or new taxiway facilities. Costs of strengthening or maintaining taxiway pavements are included in other sections of this chapter.

4. Apron Development

Paved apron areas support the parking and storage of aircraft at system airports. Apron area needs at system airports are impacted by a number of factors including the number of based aircraft, transient aircraft operations, as well as the type of aircraft that operate at the airports. Based on existing aircraft storage practices at Commonwealth airports, as well as existing and projected based aircraft and aircraft operations levels at the airports, apron area needs were developed individually for system airports. Estimated costs of apron development projects recommended for system airports over the SASP planning period are summarized in **Table 10-8**.

Table 10-8
Recommended Infrastructure Development Plan
Apron Development Projects

Functional Level	Estimated Cost
Advanced	$14,109,868
Intermediate	$5,785,098
Basic	$3,831,340
Limited	$2,142,421
Special Use	$420,498
System Cost	**$26,289,224**

Source: Wilbur Smith Associates, Inc.; R.A. Wiedemann and Associates

As shown in Table 10-8 apron development projects with an estimated cost of approximately $26.3 million are recommended for system airports over the project period. The recommended infrastructure development plan includes apron development projects in each of the functional levels. It is important to note that the estimated costs of maintaining paved apron areas at system airports is included in system pavement management costs.

5. Pavement Management

A MicroPAVER analysis was recently completed and the findings and recommendations of that analysis are included in the recommended infrastructure development plan. Data from on-site analysis of system pavements as well as "as-built" pavement design information was analyzed through the use of MicroPAVER software to develop a maintenance and rehabilitation program for the pavements at system airports. Based on current pavement condition index (PCI) data, this software identifies those pavement sections that have high enough PCI ratings, or are in satisfactory condition, to make preventative maintenance actions, such as crack sealing, cost effective. In addition, the software also identifies those pavement sections with low PCI ratings where major rehabilitation is warranted. Based on the findings of this project, a 20-year planning level estimate of pavement management costs for system airports was developed.

The MicroPAVER analysis uses an approach in which recommended pavement management projects are categorized in one of the following categories:

- Major rehabilitation – major pavement projects such as overlays or reconstruction are required
- Localized preventative maintenance – a preventative maintenance action, such as crack sealing or patching, can be applied to a distressed area
- Global preventative maintenance – a preventative maintenance action, such as a surface treatment, that is applied to an entire section

For each year of the analysis, MicroPAVER applies pavement performance models developed specifically for the Pennsylvania system and estimates the future condition of pavement sections. If a section falls below a "critical PCI" value, major rehabilitation is recommended during that year. If the section is above the critical PCI value, localized preventative maintenance is recommended for the year. In addition, surface treatments were triggered for apron sections with a PCI between 75 and 85 that are experiencing weathering and raveling and/or fuel spillage damage. The PCI rating system gives pavement sections a score of zero to 100, with 100 indicating that pavement is in the best possible condition.

Important assumptions that were used in the MicroPAVER analysis of Commonwealth airport pavements included the following:

- A critical PCI value of 70 was set for runway sections; once pavement sections fall below the critical PCI value, localized preventative maintenance is recommended
- A critical PCI value of 65 was set for taxiway, apron, and helipad sections
- A critical PCI value of 60 was set for T-hangar sections

The critical PCI values identified for specific pavement sections varied based on the type and frequency of activity that they support. For example, the critical PCI value for runway sections was higher than for other pavement sections because runways tend to more frequently accommodate heavier aircraft and aircraft traveling at high speeds.

The results of the analysis were modified as follows:

- Localized maintenance quantities (such as crack sealing, patching, and joint resealing) were calculated based upon the distress types and quantities observed during the 2001 pavement inspections for the first year of the analysis (2002) in combination with the maintenance policies presented earlier. It was assumed that cracks of all severity levels would need to be resealed in 2005 unless major rehabilitation was triggered on the section.
- No maintenance was recommended for pavements that were triggered for major rehabilitation within two years after the triggered maintenance.

Recommended 20-year pavement management projects and costs associated with the recommended pavement maintenance and rehabilitation program are summarized in **Table 10-9**.

Table 10-9
Recommended Infrastructure Development Plan
Pavement Management

Functional Level	Estimated Cost
Advanced 1/	$224,611,108
Intermediate	$59,183,973
Basic	$68,131,695
Limited	$18,588,490
Special Use	$3,387,507
System Cost	**$373,902,773**

Notes:
1/ Does not include Large Hub airports (PIT and PHL)
Source: Wilbur Smith Associates, Inc.; R.A. Wiedemann and Associates

As shown in Table 10-9, total estimated costs of pavement management projects at system airports, as developed from the MicroPAVER analysis, is approximately $373.9 million over the 20-year period. It should be noted that the costs presented in Table 10-9 do not include pavement management costs at the system's large hub airports, Pittsburgh International and Philadelphia International, as these costs would typically be funded from dedicated funding sources. Estimated pavement management costs at these airports, however, total an additional $112.9 million over the 20-year planning period.

It is important to note that the programs are based upon a network level analysis and are meant to provide PennDOT with an indication of the type of pavement-related work required during the next 20 years. In addition, the program costs have not been adjusted to take into account operational factors, such as completing required runway projects at night, associated with

maintaining airport operations that may result in increased project costs. Furthermore, it is likely that certain projects would experience cost reductions from being grouped together into a common project year even if they are triggered in different years. For example, one section of a runway may be recommended for one year and another section for the next year. Obviously, these projects would benefit from being grouped together into a common effort.

B. Navigational Aids

An important factor that was considered in the system adequacy analysis relates to navigational aids at system airports. A variety of navigational aids provide electronic information to pilots that allow for aircraft operations during periods of inclement weather or periods when atmospheric conditions prohibit visual flight operations at system airports. Based on the type of data provided and the minimum decision altitude and in-flight visibility distance associated with specific types of navigational aids, they can generally be categorized as providing precision, non-precision, or visual approaches. Instrument landing systems (ILS) are an example of a precision approach, while very high frequency omni-directional radio (VOR) systems and most global positioning satellite (GPS) systems are categorized as non-precision approaches.

Navigational aid objectives were developed for system airports based on their recommended role in the Commonwealth's system. The following minimum decision altitude and in-flight visibility distances were identified as navigational aid objectives for system airports in the SASP based on their recommended functional stratification:

- Advanced Airports – published approach with decision altitude of 200 feet or less and visibility minimum of ½ mile or less
- Intermediate Airports – published approach with decision altitude of 400 feet or less and visibility minimum of 1 mile or less
- Basic Airports – published approach with minimum descent altitude of 1,000 feet or less and visibility minimum of 3 miles or less.
- Limited Airports – no navigational aid objective

In order to develop estimated costs of meeting the navigational aid objectives at system airports, it was assumed that precision approaches would be required to meet advanced airport navigational aid objectives, non-precision approaches would allow airports to meet intermediate airport navigational aid objectives, while visual approaches would fulfill the objectives of the basic and limited functional levels. Based on these assumptions and the navigational aid objectives presented above, estimated costs of upgrading navigational aids at system airports to comply with the minimum navigational aid objectives identified in the SASP are presented by functional level in **Table 10-10**.

Table 10-10
Recommended Infrastructure Development Plan
Navigational Aid Projects

Functional Level	Estimated Cost
Advanced	$10,000,000
Intermediate	$3,000,000
Basic	$0
Limited	$0
Special Use	$0
System Cost	**$13,000,000**

Source: Wilbur Smith Associates, Inc.; R.A. Wiedemann and Associates

As shown in Table 10-10, navigational aid projects are recommended for some airports included in the advanced and intermediate functional levels. Estimated costs of recommended navigational aid projects are $13.0 million over the planning period.

C. Approach Aids

In contrast to the navigational aids that were previously discussed that provide electronic information, approach aids generally provide visual guidance to pilots through lighting systems and other highly visible objects such as wind cones or other wind direction indicators. Approach aids help pilots locate airports from the air, execute visual descents and landings on runways, identify the end of usable runway areas, and identify wind speed and direction at airports. The following approach aid objectives were identified for system airports in the SASP based on their recommended functional stratification:

- Advanced Airports – Rotating beacon, lighted wind cone or lighted segmented circle, runway end identifier lights (REILs), precision approach path indicators (PAPIs), medium intensity approach lighting system with runway alignment indicator lights (MALSR)
- Intermediate Airports – Rotating beacon, lighted wind cone or lighted segmented circle, REILs, visual glide slope indicators (VGSI)
- Basic Airports – Rotating beacon, lighted wind cone or lighted segmented circle, VGSI
- Limited Airports – Wind Indicator

It should be noted that there are currently two different types of VGSI currently in operation at system airports, precision approach path indicators (PAPIs) and visual approach slope indicators (VASIs). Although PAPIs are an approach aid objective at advanced airports, if VASIs are currently operational at advanced airports, costs associated with constructing PAPIs at those facilities are not included in the costs of the recommended plan because VASIs are considered adequate. Through the planning period, however, as VASIs at advanced airports reach the end of their useful life, it is recommended that they be replaced.

The estimated costs of bringing all system airports into compliance with the minimum approach aid objectives of their recommended functional level are summarized in **Table 10-11**.

Table 10-11
Recommended Infrastructure Development Plan
Approach Aid Projects

Functional Level	Estimated Cost
Advanced	$6,845,000
Intermediate	$1,490,000
Basic	$1,280,000
Limited	$50,000
Special Use	$25,000
System Cost	**$9,690,000**

Source: Wilbur Smith Associates, Inc.; R.A. Wiedemann and Associates

Total estimated costs of approach aid projects summarized in Table 10-11 are approximately $9.7 million over the planning period. As shown in the table, approach aid projects are recommended in each of the SASP functional levels.

D. Airfield Lighting

Airfield lighting, including runway and taxiway lighting, support aircraft operations at airports during periods of limited light and/or inclement weather. Supporting round-the-clock aircraft operations, when demand exists, is an important consideration when developing an airport system that can accommodate the needs of its users. The following runway and taxiway lighting objectives were identified for system airports in the Pennsylvania SASP based on their recommended functional stratification:

- Advanced Airports – High intensity runway lighting (HIRL) and medium intensity taxiway lighting (MITL)
- Intermediate Airports –Medium intensity runway lighting (MIRL) and MITL
- Basic Airports – MIRL and MITL
- Limited Airports – No lighting objective

Table 10-12 presents summary cost estimates of airport lighting improvement projects that are recommended to bring system airports into compliance with the minimum airport lighting objectives of their recommended role. Costs do not include rehabilitation of existing lighting systems.

Table 10-12
Recommended Infrastructure Development Plan
Airfield Lighting Projects

Functional Level	Estimated Cost
Advanced	$4,188,305
Intermediate	$3,819,795
Basic	$1,905,000
Limited	$0
Special Use	$0
System Cost	**$9,913,100**

Source: Wilbur Smith Associates, Inc.; R.A. Wiedemann and Associates

To meet the airfield lighting objectives of their recommended functional level, lighting improvement projects, whose estimated costs are summarized in Table 10-13, are recommended for some system airports in the advanced, intermediate, and basic functional levels.

E. Weather Reporting

Weather reporting equipment promotes safe operations at system airports by supplying pilots with real-time weather and visibility information for their destination. The following weather reporting objectives were identified for system airports in the SASP based on their recommended functional stratification:

- Advanced Airports – Automated surface observing system (ASOS), automated weather observing system (AWOS)
- Intermediate Airports – ASOS or AWOS
- Basic Airports – no weather objective
- Limited Airports – no weather objective

It should be noted that air traffic control towers (ATCT) typically can provide the same type of information as AWOS and ASOS equipment. At those system airports with operational ATCTs, ASOS and AWOS facilities and their estimated costs are not included in the recommended infrastructure development plan. **Table 10-13** presents cost estimates of bringing system airports into compliance with weather reporting objectives identified in the SASP.

Table 10-13
Recommended Infrastructure Development Plan
Weather Projects

Functional Level	Estimated Cost
Advanced	$162,500
Intermediate	$1,625,000
Basic	$0
Limited	$0
Special Use	$0
System Cost	**$1,787,500**

Source: Wilbur Smith Associates, Inc.; R.A. Wiedemann and Associates

As shown in Table 10-13, weather projects with an estimated cost of approximately $1.8 million are recommended for airports included in the advanced and intermediate functional levels.

F. Ancillary Facilities

Objectives for other ancillary airport facilities were also developed in the SASP. Facility objectives were developed for the following types of airport support facilities:

- General aviation terminal
- Hangars
- Fuel facilities
- Auto parking

These objectives have been developed for facilities that help support airport operations by meeting the needs of the airport users. Facility objectives were developed for each functional level of airport in the SASP. The objectives reflect the types of facilities that are typically preferred by the users of each airport based on its recommended role in the system and the types of aircraft and operators anticipated to use each facility.

1. General Aviation Terminal

General aviation terminal buildings function in a variety of ways throughout the Commonwealth. In most instances, general aviation terminal buildings provide a gateway for arriving general aviation passengers to the community, as well as provide necessary facilities such as restrooms, waiting areas, pilot lounges, and public telephones to meet the needs of the users and allow them to travel in comfort. In addition, on-airport businesses such as flight schools, rental car agencies, or tourist-based activities may base their operations in a general aviation terminal. As a result of their role in the system and the types of users and activities they are intended to support, airports in the advanced and intermediate functional levels are recommended to have general aviation terminal buildings.

It should be noted that general aviation terminals do not need to be stand-alone buildings in order to meet the needs of their users or comply with SASP objectives. In many cases, areas within a fixed base operator's facility are considered to be the "terminal area" as the typical facilities are provided including restrooms, pilot lounges, public telephones, etc. The SASP analysis used existing data on general aviation terminal facilities at system airports as well as local knowledge of PennDOT staff to determine those airports for which new, improved, or expanded general aviation terminal building facilities are recommended. **Table 10-14** summarizes the results of the general aviation terminal analysis and presents summary costs of recommended general aviation terminal building development projects at Commonwealth airports.

Table 10-14
Recommended Infrastructure Development Plan
General Aviation Terminal Projects

Functional Level	Estimated Cost
Advanced	$2,898,000
Intermediate	$4,032,000
Basic	$0
Limited	$0
Special Use	$0
System Cost	**$6,930,000**

Source: Wilbur Smith Associates, Inc.; R.A. Wiedemann and Associates

As shown in Table 10-14, general aviation terminal building projects with an estimated cost of approximately $6.93 million are included in the recommended infrastructure development plan.

2. Hangars

Aircraft hangar storage facilities and the access to secure, covered storage that they provide are important to many aircraft owners in the Commonwealth. As presented in previous chapters of the SASP, the number of system airports that currently have hangar waiting lists illustrates the importance of hangar facilities to aircraft owners and overall airport system performance in Pennsylvania. The SASP analysis examined existing aircraft hangar storage facilities at each system airport, existing hangar storage practices at each airport, and determined the need for additional hangar facility development at each airport. Hangar development projects included in the recommended plan are intended to address existing hangar shortfalls at system airports as well as meet the demands for hangar facilities that projected future activity levels may generate.

Table 10-15 summarizes estimated costs of recommended hangar development projects at system airports.

Table 10-15
Recommended Infrastructure Development Plan
Total Hangar Projects (T-hangar and Conventional)

Functional Level	Estimated Cost
Advanced	$43,376,230
Intermediate	$30,775,300
Basic	$18,028,315
Limited	$18,825,875
Special Use	$2,461,000
System Cost	**$113,466,720**

Source: Wilbur Smith Associates, Inc.; R.A. Wiedemann and Associates

As shown in Table 10-15, hangar development projects with an estimated project cost of approximately $113.5 million are recommended for system airports. Most hangar development is recommended in the advanced and intermediate functional levels, however, hangar development projects are recommended in each of the SASP's airport functional levels. It is important to note that the hangar development projects summarized in Table 10-15 include conventional hangar and T-hangar development projects.

3. Fuel Facilities

Different types of aircraft operators and different types of aircraft require varying aircraft fueling facilities to support their operations. Based on the recommended roles of system airports and the types of aircraft and users anticipated to operate at them, the following fuel facility objectives were developed in the SASP:

- Advanced Airports – Jet fuel and avgas
- Intermediate Airports – Jet fuel and avgas
- Basic Airports - Avgas
- Limited Airports – no fuel facility objective

Table 10-16 summarizes estimated project costs of bringing all system airports into compliance with the fuel facility objective of their recommended functional roles.

Table 10-16
Recommended Infrastructure Development Plan
Fuel Facility Projects

Functional Level	Estimated Cost
Advanced	$500,000
Intermediate	$180,000
Basic	$363,000
Limited	$0
Special Use	$0
System Cost	**$1,043,000**

Source: Wilbur Smith Associates, Inc.; R.A. Wiedemann and Associates

As summarized in Table 10-16, total estimated costs of recommended fuel facility development projects are estimated at over $1.0 million.

4. General Aviation Auto Parking

Having sufficient general aviation automobile parking facilities to meet the needs of airport users is another consideration in providing an adequate system to the Commonwealth's airport users. The SASP analysis focused on general aviation parking facilities and compared existing parking areas to estimated existing and future demand for such facilities. Based on this analysis, the SASP has identified those airports for which general aviation automobile parking expansion is recommended. **Table 10-17** summarizes estimated project costs for recommended general aviation automobile parking development projects.

Table 10-17
Recommended Infrastructure Development Plan
General Aviation Auto Parking Projects

Functional Level	Estimated Cost
Advanced	$212,625
Intermediate	$646,680
Basic	$80,360
Limited	$55,300
Special Use	$7,700
System Cost	**$1,002,665**

Source: Wilbur Smith Associates, Inc.; R.A. Wiedemann and Associates

As shown in Table 10-17, general aviation auto parking projects with an estimated cost of $1.0 million are recommended for facilities in the SASP's five functional levels. It is important to note that the estimated costs presented in Table 10-17 address general aviation auto parking needs at system airports. Parking projects that may be required to support commercial service

passengers at Commonwealth airports are not included in this analysis. Commercial service passenger parking needs should be identified through detailed airport-specific planning that can examine the individual travel, peaking, and passenger demand characteristics exhibited at each commercial service facility.

G. Planning Costs

Airport planning documents provide a means through which airport sponsors can identify their long-term needs while identifying and protecting the resources required to support their viable development. While the types and frequencies of planning documents that may be required at different types of airports may vary, airport planning documents are important to all facilities regardless of their size and role. The following airport planning document objectives were identified for system airports in the SASP based on their recommended functional stratification:

- Advanced Airports – Master Plan or Master Plan Update should be completed at least every five years. Master plan and master plan update unit costs used for airports in the advanced functional level range from $150,000 to approximately $1 million based on airport size and complexity.
- Intermediate Airports – Master Plan or Action Plan should be completed at least every five years. Master plan and action plan unit costs used for airports in the intermediate functional level range from $50,000 to $200,000 based on airport size and complexity.
- Basic Airports – Action Plan or Layout Plan should be completed at least every 10 years. Planning unit costs used for basic airports ranged from $10,000 for a layout plan to $100,000 for an action plan/master plan.
- Limited Airports – Standardized airport layout drawing should be on file with PennDOT. The airport layout plan unit cost for limited airports was estimated at $10,000.
- Special Use Facilities - Standardized airport layout drawing should be on file with PennDOT. The airport layout plan unit cost for special use facilities was estimated at $10,000.

Estimated costs of implementing the recommended planning document objectives at system airports over the study period are summarized in **Table 10-18**.

Table 10-18
Recommended Infrastructure Development Plan
Planning Projects

Functional Level	Estimated Cost
Advanced	$24,650,000
Intermediate	$10,160,000
Basic	$6,120,000
Limited	$920,000
Special Use	$60,000
System Cost	**$41,910,000**

Source: Wilbur Smith Associates, Inc.; R.A. Wiedemann and Associates

Planning projects with an estimated cost of approximately $41.9 million are recommended for system airports over the SASP's 20-year planning period. These costs were estimated by applying the planning document recommendations developed in the SASP to airport-specific estimates of planning project costs.

H. Total Recommended Infrastructure Development Plan Costs

Based on the facility and service objectives developed in the SASP, the recommended functional roles of system airports, and their existing facilities, a recommended infrastructure development plan has been developed for each system airport and the system as a whole. Total costs of the recommended infrastructure development plan are presented in **Table 10-19**.

Table 10-19
Recommended Infrastructure Development Plan
Total Costs

Functional Level	Estimated Cost
Advanced	$377,727,560
Intermediate	$151,341,887
Basic	$105,999,550
Limited	$42,546,465
Special Use	$6,361,705
System Cost	**$683,977,165**

Source: Wilbur Smith Associates, Inc.; R.A. Wiedemann and Associates

As shown in Table 10-19, over the 20-year planning period of the SASP, projects with an estimated cost of almost $684 million are included in the recommended infrastructure development plan. It should be noted that the recommended infrastructure development plan included in the SASP does not include project costs for the system's large hub airports, Pittsburgh International and Philadelphia International. Funding of projects at these airports are primarily the responsibility of the Federal Aviation Administration.

IV. SUMMARY OF RECOMMENDED INFRASTRUCTURE DEVELOPMENT PLAN

The recommended infrastructure development plan that has been summarized in this chapter presents estimated costs for projects recommended for implementation at system airports to improve the overall performance of Pennsylvania's aviation system. As has been presented in this analysis, the total estimated cost of the recommended infrastructure development plan is approximately $684 million over the 20-year project period.

Table 10-20 presents a summary of estimated project costs of the recommended infrastructure development plan by airport functional level.

Table 10-20
Recommended Infrastructure Development Plan
Total System Costs by Functional Level

Functional Level	Estimated Cost	% of Total Costs
Advanced	$377,727,560	55.2%
Intermediate	$151,341,887	22.1%
Basic	$105,999,550	15.5%
Limited	$42,546,465	6.2%
Special Use	$6,361,705	0.9%
System Cost	**$683,977,165**	100.0%

Source: Wilbur Smith Associates, Inc.; R.A. Wiedemann and Associates

Table 10-21 summarizes estimated costs of the recommended infrastructure development plan by project type.

Table 10-21
Recommended Infrastructure Development Plan
Total System Costs by Project Type 1/

Functional Level	Estimated Cost	% of Total Costs
Runway Paving	$27,789,442	4.1%
Runway and Taxiway Overlay	$41,912,830	6.1%
Taxiway Paving	$15,339,911	2.2%
Apron Paving	$26,289,224	3.8%
Pavement Management	$373,902,773	54.7%
Navigational Aids	$13,000,000	1.9%
Approach Aids	$9,690,000	1.4%
Lighting	$9,913,100	1.4%
Weather	$1,787,500	0.3%
Terminal	$6,930,000	1.0%
T-Hangar	$34,074,500	5.0%
Conventional Hangar	$79,392,220	11.6%
Fuel Facilities	$1,043,000	0.2%
Auto Parking	$1,002,665	0.1%
Planning Projects	$41,910,000	6.1%
System Cost	**$683,977,165**	100.0%

Notes:
1/ As stated previously, these are system wide cost estimates and do not include items such as land acquisition, general maintenance, or other specific airport-identified projects that may be included in airport Twelve-Year Plans that do not relate to SASP facility and service objectives.
Source: Wilbur Smith Associates, Inc.; R.A. Wiedemann and Associates

The project costs included in the recommended infrastructure development plan represent infrastructure development costs and include all engineering, design, and construction costs of the recommended projects. Only those projects related to the facility and service objectives of system airports, recommended planning objectives, and pavement management costs are included in the recommended plan. Costs included in the recommended infrastructure development plan are system planning level of detail cost estimates and are intended to provide an order-of-magnitude cost estimate. To more accurately estimate the total cost of each recommended project, site-specific analysis is required. In many instances, actual project costs of recommended projects could be significantly greater than the estimates included in the SASP as a result of site-specific conditions and contingencies that can not be identified in a study of this nature.

The statewide nature of the SASP makes it unfeasible to examine all projects included in the recommended infrastructure development plan and identify all-inclusive project costs. Factors that could significantly increase the estimated project costs identified in the SASP's recommended infrastructure development plan could include, but are not limited to, the following:

- Environmental Analysis
- Construction Contingencies
- Utility Relocation
- Environmental Mitigation
- Major Earthwork
- Roadway Relocation/Redesign
- Project Scheduling Requirements (to maintain airport operations)

In addition, it is also important to note that the project costs do not include estimates of land acquisition costs, maintenance costs of the recommended projects, or other equipment acquisition costs that may be required at system airports over the planning period.

V. RECOMMENDED INFRASTRUCTURE DEVELOPMENT PLAN FUNDING NEEDS AND SOURCES

As estimated project costs were developed for the recommended infrastructure development plan, each facility development recommendation was examined to determine its eligibility for federal and state funding through various airport programs. Funding for airport improvement projects is an important issue when considering the future needs of Pennsylvania's airport system. In order to meet the needs of their communities and the aviation users that they support, airports typically rely on funding sources in addition to their own revenues to fund infrastructure and facility development. The ability to identify funding sources for specific airport projects and to obtain the funding levels required directly impacts the implementation of those projects.

In general, funding for infrastructure development projects at system airports can be obtained from the following major sources; federal, state, local, or private funds. **Table 10-22** summarizes funding requirements for the recommended infrastructure development plan based on estimated funding eligibility of recommended projects.

Table 10-22
Recommended Infrastructure Development Plan 1/
Estimated Funding Sources

Funding Source	Total Eligible Cost
Federal	$422,107,285
State	$73,917,819
Local	$23,747,385
Private	$132,037,876
System Cost	**$651,810,365**

Notes:
1/ Does not include some long-term pavement management costs, such as preventative maintenance or surface treatment, for which need and funding sources could not be estimated on an airport-by-airport basis at the present time.
Source: Wilbur Smith Associates, Inc.; R.A. Wiedemann and Associates

It is important to note that some long-term pavement management costs, such as preventative maintenance costs and surface treatment costs, are not included in Table 10-22 since they are primarily driven by site-specific factors that could not be anticipated throughout the 20-year period. Systemwide costs associated with these types of projects were estimated based on historic averages and are included in Table 10-9 and in Table 10-21.

A brief description of the each source of funding included in Table 10-22 is presented in the following sections.

A. Federal Funding Sources and AIR 21

1. Federal Funding Sources

The FAA, in the form of Airport Improvement Program (AIP) grants, distributes federal funds back to the nation's airport system from the Aviation Trust Fund. The Aviation Trust Fund, in its present general form, was originally established in 1970 and has since been amended on numerous occasions. The purpose of the Aviation Trust Fund is to establish a source of funds, collected only from the users of the nation's airport system, that can be used to fund airport improvements at system airports. The current AIP legislation provides both entitlement funds (enplanement, cargo, and apportionment) and discretionary funds for projects that are eligible according to FAA Order 5100.38B, "Airport Improvement Handbook." General types of projects that are eligible to be funded with AIP grants include those projects that:

- Preserve or enhance safety, security, or capacity of the national air transportation system
- Reduce noise or mitigate noise impacts resulting from aircraft
- Furnish opportunities for enhanced competition between or among air carriers

Table 10-23 presents total AIP funding for the fiscal years 1996 through 2002.

Table 10-23
Recommended Infrastructure Development Plan
Historical National AIP Funding (Billions)

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002
Total AIP Funding	$1.38	$1.46	$1.50	$1.95	$1.85	$3.20	$3.30

Source: FAA Airports Financial Assistance Division

One of the major sources of funds for the Aviation Trust Fund is a ticket tax levied on each scheduled service airline ticket sold in the U.S. This ticket tax ensures that the users of the nation's aviation system are responsible for funding its improvements.

Some airports with scheduled service receive grant funds each fiscal year based on the number of passengers that they enplaned the prior calendar year. These are referred to as "enplanement" entitlement funds. Commercial service airports are given entitlement funding based on a graduated methodology developed by the FAA that equates to a lower per enplanement

entitlement for the airport as that airport's total enplanement level increases. This process is used to offset funding disparity, to the extent possible, that results from the vastly different levels of enplanements that occur at U.S. airports, from less than 10,000 enplanements per year at small airports to tens of millions of enplanements at major hub airports. With AIR-21, discussed in a subsequent section, the minimum passenger entitlement for Primary airports (those airports enplaning at least 10,000 passengers per year) was increased from $500,000 to $1 million, in years where the appropriation is greater than or equal to $3.2 billion. If the appropriation does not reach the $3.2 billion level, the minimum passenger entitlement for Primary airports is $650,000. Very large airports are capped in terms of entitlement funds based on whether or not they charge a passenger facility charge (PFC) and the amount of the PFC.

Scheduled service airports can also receive cargo funding based on the landed weight of cargo aircraft. This cargo entitlement is also calculated based on a graduated methodology similar to the enplanement entitlement methodology described above. In addition, federal AIP apportionment funds are available to each state's eligible general aviation airports. The FAA allocates funds for general aviation airports in each state based on a formula that considers the size and population of the State. General aviation airports compete for these funds based on the priority of each project.

Airports also compete for federal discretionary funds, which are awarded based on priority ratings given to each potential project by the FAA. The prioritization process ensures that the most important and most beneficial projects are the first to be completed, given the availability of adequate discretionary funds.

As a general rule, airport projects that are related to non-revenue producing facilities, such as airfield improvements and land acquisition, can be eligible for up to 90 percent federal funding. Only those airports deemed as being crucial to the national system, those airports included in the National Plan of Integrated Airport Systems (NPIAS), are eligible for federal funding. It is important to note, however, that all projects at airports included in the NPIAS are not necessarily eligible for federal funding. In addition, the use of federal AIP funds at any airport requires local matches from State and/or sponsor/owner sources.

It is also important to note that federal funding is limited to development that is justified to meet aviation demand according to FAA standards. Each airport development project, including those recommended in the SASP, will be subject to eligibility and justification requirements in the normal AIP funding process.

2. AIR-21

On April 5, 2000, the Wendell H. Ford Aviation Investment and Reform Act for the 21st Century (AIR-21) was passed. The three-year AIR-21 legislation is complex and contained a number of changes from previous Airport Improvement Program (AIP) budget authorizations undertaken in conjunction with the Aviation Trust Fund. New procedures for distributing funds to the nation's airports were developed in AIR-21, and a number of AIP procedures were revised or amended. The AIP must be reauthorized through legislation for the program to continue beyond 2003. The result of the AIR-21 legislation was that the resources available for airport improvement and

development projects at U.S. airports were significantly increased. In addition to providing for a significant increase in federal funds available for airport improvement projects at primary commercial service airports, AIR-21 outlined new procedures that provided states and smaller general aviation airports with dramatic increases in funding that can be used, and/or saved or "bankrolled" to support important projects at smaller general aviation airports.

Table 10-24 presents a comparison of the FY 2000 (October 1999 through September 2000) AIP budget and the FY 2001 AIR-21 budget. As the table shows, significant increases were seen in all areas of funding.

Table 10-24
Recommended Infrastructure Development Plan
Comparison of FY 2000 and 2001 (AIR-21) National AIP Funding Levels

Fund Category	FY 2000 AIP	FY 2001 AIP (AIR-21)
Entitlements	$1,100,512,335	$2,004,840,795
Small Airport Fund	$142,204,990	$274,936,625
Discretionary Set-Asides	$231,147,417	$355,758,049
Other Discretionary	$377,135,258	$564,464,531
TOTAL	**$1,851,000,000**	**$3,200,000,000**

Source: House Transportation and Infrastructure Committee Staff

As shown in Table 10-24, the AIP funds available to support airport projects at U.S. airports increased from approximately $1.85 billion to approximately $3.2 billion in fiscal year 2001. The major funding changes identified in AIR-21 are summarized below:

- Minimum passenger entitlement for Primary airports (those airports enplaning at least 10,000 passengers per year) was increased from $500,000 to $1 million.

- Total entitlement amounts for cargo activity (only airports with over 100 million pounds of gross landed weight annually) increased from 2.5 percent of AIP funding to 3 percent.

- When the AIP level is authorized at $3.2 billion or more, states' apportionment increases to 20 percent of the budget, or approximately $640 million at the $3.2 billion level. A general aviation entitlement program was implemented in which general aviation airports received the lesser of $150,000 or 1/5th of the most recently published estimates of five-year costs contained in the NPIAS. The total of these general aviation entitlements are subtracted from the overall state apportionment dollars for that fiscal year and the remaining amount is apportioned to each state.

- The maximum Passenger Facility Charge (PFC) was increased from $3.00 per enplanement to $4.50 per enplanement. Large and medium hub airports that increase

their PFC to $4.50 forego 75 percent of their federal passenger entitlement monies and must meet a variety of specific provisions identified in AIR-21.

The changes described above have a significant impact on total funding available at the federal level, increasing the AIP budget from approximately $1.85 billion to $3.2 billion in FY 2001. Full funding of the FY 2002 AIP at $3.3 billion was attained upon the signing of the FY 2002 Transportation Appropriations Bill in December 2001. As of September 2002, FY 2003 AIP appropriations had not been authorized, however, the Senate Appropriations Committee had approved the FY 2003 Transportation Spending Bill with full funding of the AIP program at $3.4 billion.

AIR-21 is a multi-year plan that includes fiscal years 2001 through 2003. This is important because it allows individual airports and states to plan for airport improvements over the three-year period, instead of the single-year periods included in previous AIP authorizations. Because of this change, airports have been able to implement multi-year development plans that had previously been impossible because of uncertainty about future funding levels. In addition, general aviation airport entitlements can be saved over the three-year period to allow these smaller airports to "bankroll" their apportionment for use on major projects. In general, these new AIR-21 provisions allow the FAA and PennDOT's Bureau of Aviation to implement a multi-year development plan at individual airports and for the system of airports, and therefore gives the funding agencies greater ability to meet not only airport-specific improvement goals, but also system-wide goals.

B. State Funding Sources

The Bureau of Aviation is actively involved in promoting, developing, and preserving Pennsylvania's system of public-use airports. Act 164, passed by the legislature in 1984, authorized the Bureau of Aviation to provided assistance to all public-use airports, including those that are privately owned. Act 164 also provided for expanded airport development and real estate tax relief to public airports. The Bureau's responsibilities under this law are to preserve, upgrade, and when possible, build new airport facilities. Since being enacted, the funds allocated to the Bureau of Aviation have steadily increased from annual appropriations of $1 million in the early 1980's to the current annual level of $9.0 million. The Bureau of Aviation uses State funding sources to ensure the continued preservation, growth, and development of the Commonwealth's airport system.

As a block grant state, Pennsylvania has the authority to determine how AIP grants are distributed to eligible NPIAS airports, excluding primary commercial service airports and some of their affiliated general aviation airports, within the State generally in accordance with the federal prioritization process. The state block grant program was initiated on October 1, 1989, for three states - - Illinois, Missouri, and North Carolina. Since that time, the program has been extended to include nine states, one of which is Pennsylvania. Specific requirements of block grant states are presented in FAR Part 156, however, as a general rule, only those projects eligible for AIP funding are eligible to be funded under the block grant program. Pennsylvania became a block grant state beginning in FY 1998 and has received between $8.5 and $10.5 million annually in federal AIP funding. Additionally, the Bureau is responsible for managing

the non-primary entitlement funds to those general aviation airports that are eligible to receive them. Annual funding from the non-primary entitlement program averages approximately $5.5 million. Funding through the block grant program is only available to airports included in the National Plan of Integrated Airport Systems (NPIAS). NPIAS airports can receive up to 90 percent of eligible project costs through the AIP Block Grant Program for projects included in the State's Twelve Year Transportation Program (TYP).

The Bureau of Aviation has developed an internal, FAA-approved process that is used to determine project prioritization. Some factors examined in the prioritization process include the type of improvement projects proposed at system airports, current activity levels at airports with proposed projects, and airport roles within the State system. This prioritization process is required because on an annual basis project funding requests received by the Bureau of Aviation are significantly larger than the amount of federal funds made available through the block grant program. Although AIR 21, as described in a previous section, has increased the total amount of federal funds available for disbursement through the block grant program, it is anticipated that funding shortfalls will continue in future years.

In addition to federal funds made available to support airport development through the block grant program, the Bureau of Aviation is also charged with disbursing State funds to Pennsylvania system airports. State funding sources include the following:

- Aviation Development Program (ADP)
- Capital Budget/Transportation Assistance Program (TAP)

These State funding sources are summarized in the following sections.

1. Aviation Development Program

The ADP is funded through taxes on jet fuel and avgas fuel sales at Commonwealth airports. The revenues from these taxes are collected and deposited into Pennsylvania's Aviation Restricted Account. These funds are typically used to pay for eligible project costs up to 75 percent at State obligated airports and 5 percent at federally obligated airports. For example, eligible project costs for a project at a federally eligible airport would typically be funded 90 percent through block grant program funds, up to 5 percent from ADP funds, and the remaining funding would come from local and/or private funding sources. Eligible project costs for projects at airports not eligible for federal funding, but eligible for State funding, would typically be funded up to 75 percent from ADP funds with the remaining 25 percent of funding coming from local or private sources. Total State funding available through the ADP is estimated at approximately $9.0 million annually.

2. Capital Budget/Transportation Assistance Program

Commonwealth capital budget monies are available to fund airport development projects at publicly-owned system airports. Funds from this source can be acquired through a process that includes fostering legislative support for projects at specific airports. A wide variety of projects, including hangar development projects, that are not currently eligible for funding from other

federal or State sources are eligible for funding through the Capital Budget/TAP programs. By the nature of this funding source, however, Capital Budget/TAP funding dollars are typically earmarked for specific projects by the legislature, limiting the Bureau of Aviation's control over the allocation of available funds.

C. Local Funding Sources

Local public airport owners and sponsors such as counties, cities, and authorities are responsible for costs associated with airport development projects that remain after federal and State shares have been applied. Historically, in Pennsylvania, the local share of federally funded projects has typically been about 5 percent after the 5 percent State share and the 90 percent federal share was applied. For non-federal projects, the local share has varied from 25 percent to 50 percent depending on the nature of the improvement after State funds have been applied.

Local government funding of airport development projects is derived from the following three basic sources:

- General Fund Revenues
- Bond Issues
- Airport Generated Revenues

Each of these local funding sources will be discussed in the following sections.

1. General Fund Revenues

Capital development expenditures from the general fund revenues of municipalities or counties in which eligible airports are located have been somewhat difficult to obtain in recent years. One reason for this difficulty is the seemingly universal shortfall in local general fund revenues throughout the Commonwealth. Budgetary problems have created an environment where local funding is uncertain. The amount of general fund support of airport improvement projects varies by airport and is based upon the local tax base, priority of the development project, historical funding trends, and, of course, local attitudes concerning the importance of aviation.

2. Bond Issues

Two different types of bond issues can be used to help fund the local share of project costs. General obligation bonds, able to be issued only by states, counties, and municipalities, are bonds backed by the full faith, credit, and taxing authority of the issuing government agency. General obligation bond issues frequently require voter approval. Because of the taxing power of the issuing governmental agency and its guarantee on the bonds, general obligation bonds can typically be issued at lower interest rates, and therefore lower costs to the government agency, than other types of bonds. Government agencies, however, are usually limited in the amount of general obligation debt that they may issue. The limit is typically set as a fixed percentage of the total value of all taxable property within an agency's jurisdiction. As a result, airport projects seeking to be funded with general obligation debt must compete with other public projects seeking bond funding. As the need for bond funding has increased in many local governments,

the competition between projects vying for that funding has significantly increased. At the same time, it has become increasingly difficult in many areas to receive voter approval for bond issues. These factors have significantly impacted the number of airport projects whose local share of project costs has been funded through general obligation bonds.

Revenue bonds are another form of bond issue that can be used to fund the local share of project costs. In this approach, payments on principal and debt service are payable solely from revenue derived from the operation of a facility expanded, constructed, or acquired with the proceeds of the bonds. Revenue bonds have become a common form of financing for projects at larger commercial service airports. The inability of many general aviation airports to generate sufficient revenues to cover bond costs, however, has limited the use of this financing approach at smaller airports.

3. Airport-Generated Revenues

Airport-generated revenues for general aviation airports are those revenues associated with goods and services that the airport provides. After expenses, net revenues can be used to pay the local share of capital improvement projects. Historically, most general aviation airports have not been able to realize enough revenue to completely cover their expenses and, therefore, operate at a deficit. As a result, general aviation airports do not expect generated revenues to fund the local share of project costs.

Commercial service airports, in most cases, do generate enough revenue to cover expenses and realize profits to fund the local share of capital improvement projects. These revenue sources typically come from landing fees, space rentals, auto parking, and fees and commission on gross sales.

Another recently enacted means for air carrier airports to generate revenue for eligible capital improvement projects is the implementation of a Passenger Facility Charge (PFC). The PFC program is part of the Aviation Safety and Capacity Expansion Act of 1990, enacted November 5, 1990. The ruling under this act, and subsequent amendments, requires the Department of Transportation to issue regulations under which a public agency may be authorized to impose an airport passenger facility charge of up to $4.50/enplaned passenger at a commercial service airport it controls. The proceeds from such PFCs are to be used to finance eligible airport-related projects. PFC-generated revenue can be used to pay all or part of the allowable costs of an approved project; it may be used to pay debt service and financing costs incurred on that portion of a bond issued to carry out approved projects; it may be used in combination with airport grant funds to accomplish an approved project; or it may be used to meet the non-federal share of the cost of projects funded under the federal airport grant program.

D. Private

A final source of funds for airport development is the private sector. At publicly owned airports, specific facilities on the airport, such as hangars and fuel distribution facilities are often built with private financing. These facilities are typically constructed on lands leased from the airport and the private developer retains the right to operate and profit from the facility that is

constructed. Privately owned airports that are not eligible for federal project funding typically must fund all capital development with a combination of State and private funding. In many instances, development on some of the Commonwealth's privately owned airports is limited by the ability of the private owner to fund the private share of project costs.

VI. PENNSYLVANIA TWELVE YEAR PLANS

The Bureau of Aviation has implemented a continual planning process through which its staff members and airport sponsors work together to identify long-term planning and facility needs at the Commonwealth's public-use airports. Through this process, Twelve Year Plans (TYPs) are developed for system airports from which Airport Capital Improvement Plans (ACIPs) for Block Grant eligible airports served by PennDOT are prepared and submitted to the FAA. TYPs and ACIPs include prioritized project requests and funding needs identified by system airport sponsors, in conjunction with Bureau of Aviation staff, that represent the long-term facility development goals of system airports.

Current system airport TYPs are summarized in **Table 10-25**.

Table 10-25
Recommended Infrastructure Development Plan
Twelve Year Plan Costs

Functional Level	Estimated Cost	Total System Airports	Airports with TYPs
Advanced	$771,347,146	30	27
Intermediate	$87,699,865	21	17
Basic	$17,699,340	27	11
Limited	$4,517,500	46	2
Special Use	$0	12	0
System Cost	**$881,263,851**	**136**	**57**

Source: Pennsylvania Department of Transportation

As shown in Table 10-25, total system funding requests included in airport TYPs is over $881.3 million. In comparison, estimated costs of projects included in the recommended infrastructure development plan identified in the SASP are approximately $409.9 million. In comparing project and funding requests included in airport TYPs to the recommended infrastructure development plan, it is important to the note the following points:

- Many of the airports for which TYPs have been submitted have only identified project requests through the FY 2005 timeframe, a time period significantly shorter than the 20-year planning period of the SASP.

- Only 57 of the system's 136 public use airports have up-to-date TYPs that have been included in the analysis.

- Project funding requests for Philadelphia International Airport (PHL) and Pittsburgh International Airport (PIT) are not included in the summary data presented in Table 10-25.

The FAA has current ACIPs for both Philadelphia International Airport and Pittsburgh International Airport. ACIPs for these airports can be summarized as follows:

- **Philadelphia International Airport** – For the period FY 2002 to FY 2007, funding requests totaling $260 million are shown for development projects at the airport. Funding requests for the airport include total project costs for the following projects; terminal building modernization and expansion, runway construction, noise mitigation, security equipment, taxiway and apron rehabilitation, environmental impact statement for airfield development, snow removal equipment (SRE) building, and airfield guidance signage. It is also important to note that the airport is currently undergoing planning and NEPA documentation for a significant airport reconfiguration. The 10 to 15-year cost estimate for reconfiguration is between $2 to $2.5 billion.

- **Pittsburgh International Airport** – For the period FY 2002 to FY 2006, development in the amount of $144 million is shown for the airport on its ACIP. Total funding requests include in the airport's ACIP are for the following projects; noise mitigation, aircraft rescue and fire fighting building (ARFF) and SRE building, terminal building improvements, several runway safety area improvements, pavement and lighting improvements, remote deicing area, security equipment, design and environmental analysis of runway construction, and ARFF and SRE equipment.

Project funding requests included in current airport TYPs and ACIPs are significantly greater than the estimated project costs of the SASP's recommended infrastructure development plan. It is important to understand that TYPs and ACIPs represent project and funding requests compiled by system airports; the SASP's recommended infrastructure development plan is comprised of airport system needs that have been identified through the SASP's process of stratifying system airports and determining facility and service objectives based on their recommended role. Estimated project costs included in the recommended infrastructure development plan include only those infrastructure development costs and pavement management costs that are required in order to bring system airports into compliance with the facility and service objectives of their recommended role. Property acquisition costs, noise mitigation, environmental analysis, and equipment procurement, are examples of other project costs that are included in TYPs and ACIPs but are not included in the cost estimates of the recommended infrastructure development plan.

VII. SUMMARY OF RECOMMENDED INFRASTRUCTURE DEVELOPMENT PLAN

Capital development costs of the recommended infrastructure development plan were estimated to total approximately $684 million over the planning period. These cost estimates correspond to the facility development cost schedules developed for use in this analysis and include engineering costs and contingency fees. The costs also include some capital maintenance, based

on the pavement management analysis performed as a part of the statewide system plan. In addition, the costs include estimates of action plans and master planning studies that could be anticipated throughout the planning period. Commonwealth-specific estimates of project unit costs were used in the development of the cost estimates of the recommended infrastructure development plan. To estimate total costs, these unit costs were applied to the required number of units for each facility need identified at a Commonwealth airport over the planning period. It is important to note that the ACIPs for Pittsburgh International Airport and Philadelphia International Airport, with projects totaling approximately $404 over the next five years, are **not** included in the SASP's estimated cost of the recommended infrastructure development plan.

In this analysis, both publicly and privately owned airports were shown as requiring facility development or capital maintenance. Privately owned airports were included to reflect their deficiencies as they currently exist, or the funding required to correct those deficiencies. Several sources were used in developing cost estimates to assure that relatively accurate costs were derived. These sources include:

- Historical cost data from recent Pennsylvania airport planning documents and construction contracts
- Engineering cost estimates
- Cost data from other statewide aviation planning documents

Estimated costs of the recommended infrastructure development plan were developed separately for each airport. Estimated project costs at each airport were also presented by funding source based on the anticipated funding of each project in the recommended plan. Anticipated eligibility of recommended projects incorporated the following guidelines:

- Federal assistance, either through grants or entitlement funds, of 90 percent on all eligible items as per Federal Aviation Regulations Part 152, *The Airport Improvement Program* (AIP).

- State assistance for 5 percent of the total cost of all federally eligible items; for non-NPIAS public-use airports, State assistance of 75 percent for eligible projects was assumed.

- The sponsor is responsible for the remaining 5 percent of funded FAA projects; for State funded, non-NPIAS public-use airport projects, the sponsor is responsible for 25 percent funding; for all other projects, including revenue producing projects, the sponsor and/or private enterprise is responsible for 100 percent of the funding.

It should be noted that these cost estimates are system planning level of detail estimates. More detailed studies, including airport-specific master plans must be undertaken to increase the precision of the cost estimates for recommend projects at specific airports. For example, the costs to remove obstructions or to purchase special equipment at system airports has not been estimated or included in these totals. Thus, some special projects may not appear in these cost summaries, however, on a relative basis, the system planning numbers should be useful as a gauge of the overall system facility needs.