DVT

PHOENIX DEER VALLEY AIRPORT

2015 Master Plan Update
Executive Summary

Background

Phoenix Deer Valley Airport (DVT), owned and operated by the City of Phoenix, is located on 914 acres within the northern City limits approximately 20 miles north of downtown, and serves to relieve general aviation air traffic from Phoenix Sky Harbor International Airport. No commercial passenger service operations are provided; however, air taxi service is provided by fixed base operators. DVT was founded in 1959 as a private airfield on 482 acres of land with a single runway. The City purchased DVT in 1971 and, with 355,000 operations in 2013, today it is the busiest general aviation airport in the United States.

Airport Features

- Two parallel runways
  - South Runway 7R-25L measures 8,196 feet long by 100 feet wide
  - North Runway 7L-25R measures 4,500 feet long by 75 feet wide
- Air Traffic Control Tower (ATCT) is open from 6:00 am to 12:00 am (midnight)
- Two fixed base operators (FBO)
  - Atlantic Aviation
  - Cutter Aviation
- Two flight training schools
  - Westwind School of Aeronautics
  - TransPac Aviation Academy
- City of Phoenix Police Air Support Unit
- General Aviation Terminal Building with restaurant
- 1,008 aircraft hangar parking positions located within
  - 58 T-hangar buildings
  - 12 shade hangar buildings

Airport Master Plan Process

The previous Master Plan for DVT was completed in 2007, just before the economic downturn began in 2008, resulting in fewer airport operations than projected in the previous Master Plan. A number of projects were also completed since 2007, including Taxiway A reconstruction and relocation, runway and taxiway safety area improvements, drainage improvements and ramp improvements and reconstruction. These changes served as the impetus for completing this current Master Plan Update. The Federal Aviation Administration's (FAA) current design advisory circular (AC) 150/5300-13A, published after the completion of the previous Master Plan, outlines new design standards focused on safety enhancements and improving airfield geometry to reduce the possibility of incursions, and was also taken into account during alternatives development.

At the onset of the project a collaborative airport and community visioning process led to the development of overarching Master Plan goals. These goals drove the planning process and were used to evaluate proposed concepts during alternatives development.

The primary goals, as identified in this Master Plan Update, are to:

- Improve safety
- Enhance operational efficiency
- Right-size future development at DVT
- Meet current FAA airport design standards
- Accommodate forecast demand at a high level of service
- Balance the utilization of the airfield (north and south)
- Implement financially responsible development

The Master Plan Update, prepared in accordance with the FAA AC 150/5070-6B: Airport Master Plans, began in February 2014 with the existing conditions evaluation and forecasting effort. The FAA approved the forecast on September 15, 2014 and facility requirements and development concepts were prepared. The Final Master Plan Update was prepared and presented to City Council for approval on June 3, 2015. After City Council approval, the Master Plan Update and Airport Layout Plan, depicting the proposed projects, was approved by the FAA on September 18, 2015.

Aviation Activity Forecast

The DVT Aviation Activity Forecast is comprised of projections of future aircraft operations, defined as aircraft take-offs and landings, and aircraft based at the airport. The DVT Forecast was developed for the base year (2013) and future years: 2018, 2023, 2028, and 2033 and informs future development needs. The DVT Forecast was developed based on recent DVT aviation activity, national aviation industry usage trends, projections of aviation fuel costs, historical and projected local socioeconomic data, such as population, employment, and income. The DVT Forecast evaluated the growth of each aircraft type, projecting jets and helicopters to increase as a percentage of the total with piston-powered aircraft continuing to account for the majority of operations through 2033.

The table below summarizes the forecast of based aircraft and total operations for each of the planning horizons, in addition to the projected average peak monthly, daily, and hourly operations. Based aircraft were forecast using a formula which correlates based aircraft growth with regional income growth and applies a negative correlation with increases in jet fuel prices.

DVT Based Aircraft and Operations Forecast Summary

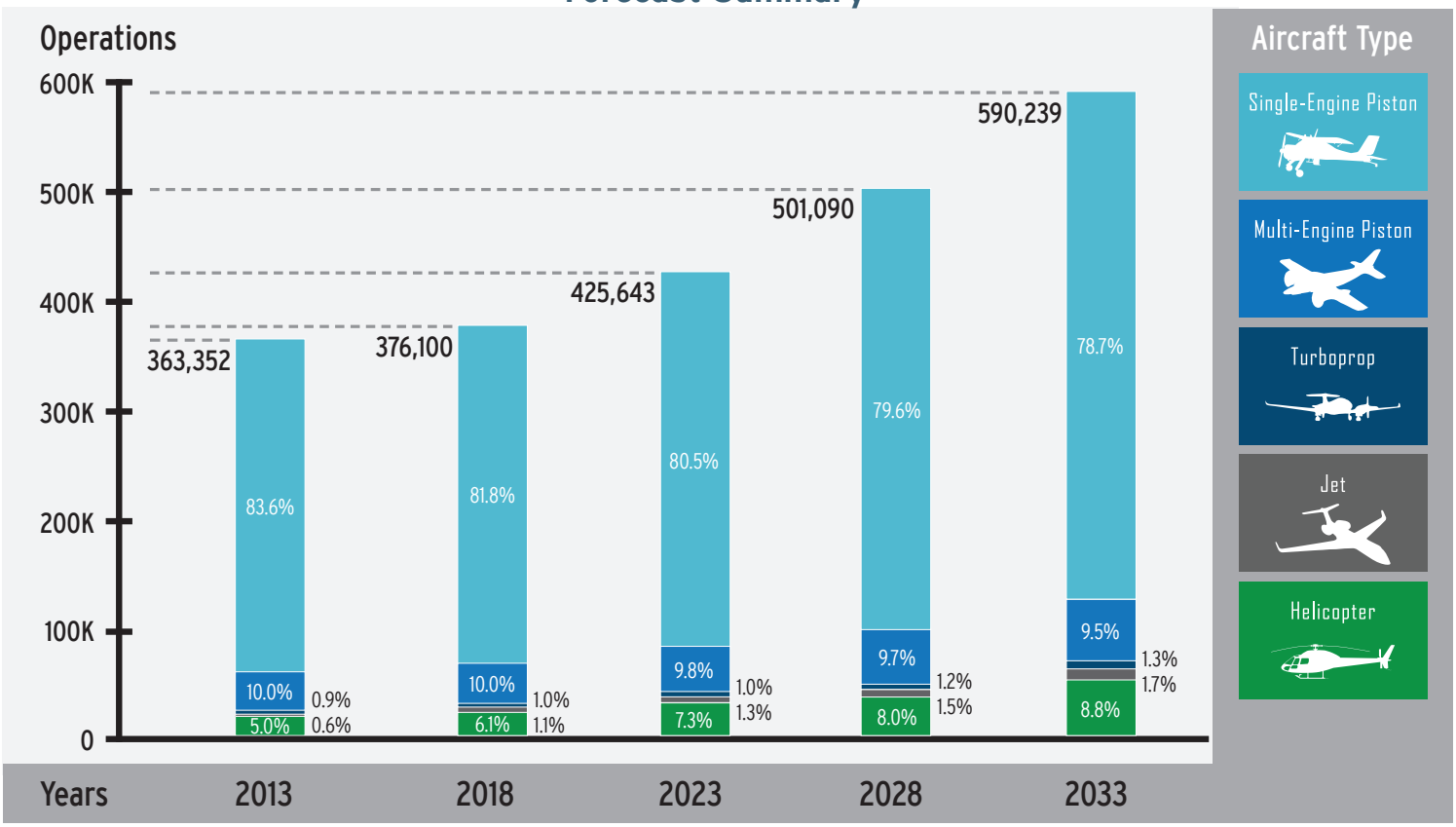
Year	Based Aircraft	Total Annual Operations	Peak Month Operations	ADPM Operations	Peak Hour Operations
2013 (Actual)	1,033	363,352	36,246	1,241	133
2018	1,167	376,100	37,517	1,284	137
2023	1,329	425,633	42,458	1,453	155
2028	1,538	501,090	49,985	1,711	183
2033	1,780	590,239	58,878	2,015	215
AAGR	**2.8%**	**2.5%**	**2.5%**	**2.5%**	**2.4%**

ADPM = Average Day of the Peak Month
AAGR = Average Annual Growth Rate

Total operations were calculated from based aircraft forecasts and the FAA's projected utilization trends. Aircraft operations between midnight and 6 am were estimated at 2.3% of daily total since the DVT tower is closed overnight and no aircraft operations that occur during that time are recorded. The peak activity forecast assumes, since no major change in DVT's role is anticipated, the peaking relationships will remain largely unchanged in the future. March is typically the peak month at DVT and accounts for approximately 10% of annual operations. There is a secondary peak in the fall, around October. Although DVT is busy throughout the week, it is typically busier on weekdays than on weekends because most flight training occurs on weekdays. The peak hour typically occurs in the morning between 9 am and 12 pm and accounts for between 10% and 11% of daily operations.

The chart below depicts based aircraft by type and annual operations by use category and type. Itinerant operations are those associated with visiting aircraft, while local operations represent operations associated with aircraft based at DVT. As shown, jets and helicopters are anticipated to be the fastest growing categories, but piston-powered aircraft are still expected to account for the majority of operations in 2033.

Forecast Summary



Total annual aircraft operations are expected to grow from 363,352 in 2013 to 590,239 in 2033, resulting in an average annual increase of 2.5%.

Facility Analysis

Future infrastructure needed to accommodate forecast demand for both based aircraft and operations were identified. The analysis took into account the condition of the existing airport infrastructure and its ability to accommodate projected demand. Identified infrastructure needs incorporated the qualitative recommendations and feedback of Airport staff, tenants, and other stakeholders gathered during tenant and user interviews along with technical and public advisory committee meetings.

Airfield facility requirements defined by the Runway Design Code (RDC) and Taxiway Design Group (TDG) assigned to each runway are determined primarily by the number of aircraft operations and the performance characteristics of the aircraft operating and projected to operate at DVT. The RDC identifies the design standards that a runway is built to, including most of the required separation standards and clearance offsets, and is made up of three components: Aircraft Approach Category (AAC), Airplane Design Group (ADG), and approach visibility minimums for a specific runway's critical aircraft. The AAC identifies the range of final approach speeds that can be accommodated by the runway. The ADG is a function of the wingspan and tail height dimensions of the critical aircraft. The approach visibility minimum is defined as the approved minimum horizontal and vertical visibility that the specific runway accommodates, with VIS designating visual approach. RDC is written as a combination of the three elements: AAC/ADG/Approach Visibility Minimum. The existing RDCs for Runways 7L-25R and 7R-25L are B/I/VIS and C/II/5000, respectively. Similar to the RDC, the FAA has defined the TDG to determine taxiway/taxilane width standards, fillet radii, and some taxiway/taxilane separations. TDG is based on the undercarriage dimensions of the critical aircraft (main gear width and main gear to cockpit distance).

The FAA identifies the airport's critical aircraft as the most demanding aircraft with 500 or more operations per year. Based on this definition, the ***current critical aircraft at DVT is the Challenger 604, category C-II***. This aircraft category is projected to remain the critical aircraft through 2023. However, ***by 2028 the critical aircraft is expected to be the Gulfstream IV, category D-II***. It is important to note that these forecasts are sensitive to the basing decisions of individual aircraft owners. If one or two D-II aircraft owners choose to relocate their aircraft to DVT prior to 2028, the critical aircraft designation could change at that time. The resulting existing and forecast RDC and TDG are identified in the table below. Runway 7L-25R (the north runway) currently is classified as B/I/VIS but the Taxiway B centerline is only 200 feet from the runway centerline and is required to be 225 feet. RDC B/II/VIS standards require a minimum 240-foot centerline to centerline separation and the current Taxiway A separation is 300 feet.

Runway length requirements are dependent upon aircraft type and maximum takeoff weight (e.g. aircraft, passengers, baggage, cargo, and fuel), runway elevation, runway grade, conditions and obstructions, air temperature, and wind. The runway takeoff length requirements in the Master Plan Update represent those required at 105° F (an

Runway and Taxiway Design

Runway	Existing RDC	Forecast RDC	Existing TDG	Forecast TDG
Runway 7R-25L	C/II/5000	D/II/5000	1B	2
Runway 7L-25R	B/I/VIS	B/II/VIS	1A	1B

average day in July), which result in longer runway takeoff length requirements than on a typical day averaged throughout the year and minimize the potential for an aircraft to take a weight penalty during the summer months. The runway takeoff length requirement at maximum takeoff weight for a Gulfstream IV, DVT's future critical aircraft, is 8,153 feet. The Gulfstream IV is able to depart with 100% payload from DVT's Runway 7R-25L, which is currently 8,196 feet long. The existing runway lengths are sufficient to accommodate the current and forecast fleet through the planning horizon, however, to better balance the airfield, an extension of the north runway would allow enhanced flexibility for Air Traffic Control to utilize the runways and allow some jet departures and arrivals on the north runway should there be peak periods of very high traffic volume, or should there be an incident that temporarily closes Runway 7R-25L. This would provide increased operational efficiency on the airfield and an increase in overall airfield capacity as there could be less runway crossings as aircraft could utilize the runway closest to their parking area.

While the airfield also has sufficient capability to accommodate the forecast annual operations through 2033 without additional runways, as demand grows, there will be peak periods where users experience arrival and departure delay. This is further exacerbated by the current demand placed on the south runway, Runway 7R-25L, which handles more than 60% of DVT's operations due to the number of facilities on the south side, tenants' locations, and preference for a longer runway. Balancing the utilization of the runways would assist in mitigating delay that will be experienced in future years. While not necessarily adding capacity to the airfield, an extension of Runway 7L-25R by 800 feet could assist in balancing the airfield by being able to accommodate a greater number of operations without weight penalties.

As part of the general aviation facility assessment the demand for and use of aircraft hangar facilities were reviewed. There are three primary types of hangars at DVT: shade hangars, t-hangars and box hangars. DVT has 12 shade hangar buildings accommodating 240 aircraft parking positions. Shade hangars have a fairly high vacancy rate compared to the other hangar options. DVT offers two sizes of t-hangars (large and small). Both sizes of t-hangars currently have a wait list for availability with large t-hangars in greater demand. DVT has a total of 58 t-hangar buildings accommodating 768 aircraft parking positions. Box hangars typically house larger aircraft and corporate/business aircraft. DVT has 11 on-airport box hangar buildings. Box hangar development is largely driven by increases in corporate/business jet traffic. Facility requirements were prepared for each of the three types of hangars, taking into account the role that each hangar type will play in the future. The analysis assumes that t-hangars will continue to be the most in-demand hangar type at DVT with shade hangar demand growing at a significantly slower pace.

T-hangar and shade hangar demand are both correlated to the number of based aircraft. Box hangars have a stronger correlation to the volume of transient aircraft, especially jet aircraft. As shown in the table below, by the end of the planning horizon, there is a combined hangar building area deficiency of nearly 1,000,000 square feet, with nearly two-thirds being t-hangar building area. Aircraft parking apron requirements are based on a combination of factors, including projected volume of flight training, transient operations, and based operations. By the end of the planning period, there is a projected deficiency of approximately 667,000 square feet of aircraft parking apron.

In addition to the airfield and general aviation requirements, there is a need to replace the City of Phoenix Police Air Support Unit building which is in poor condition and requires frequent maintenance. Police response times require their facility to be located on the south side of the airfield so that helicopters will not have to cross over the flight paths of arriving and departing aircraft. DVT does not currently have any on-airport Aircraft Rescue and Firefighting services. Nearby City of Phoenix Fire Station 36 provides fire and rescue support services during incidents both on and off the airport. Should the Police Air Support Unit be relocated, it is recommended that Fire Station 36 be relocated and combined with the Air Support Unit in a consolidated Public Safety Building. A consolidated Public Safety Building could provide airside and landside fire response as well as Police Air Support Unit services in a single building. If a landside fire station is located on airport property, traditional landside firefighting equipment is expected to be sufficient to respond to any airside emergency.

Additional facility recommendations from this analysis are identified on the Master Plan Update Recommended Alternative.

Aircraft Hangar/Apron Requirements

Aircraft Hangar/Apron	2013	2018	2023	2028	2033
	Existing Supply	Surplus (Defecit)			
Shade Hangar Building Area (ft^2)	221,411	48,904	26,493	(2,389)	(35,376)
T-Hangar Building Area (ft^2)	952,952	(120,570)	(260,039)	(439,772)	(645,054)
Box Hangar Building Area (ft^2)	113,579	(47,409)	(105,940)	(188,941)	(297,745)
Aircraft Parking Apron Area (ft^2)	1,167,366	(36,259)	(195,215)	(414,655)	(667,403)

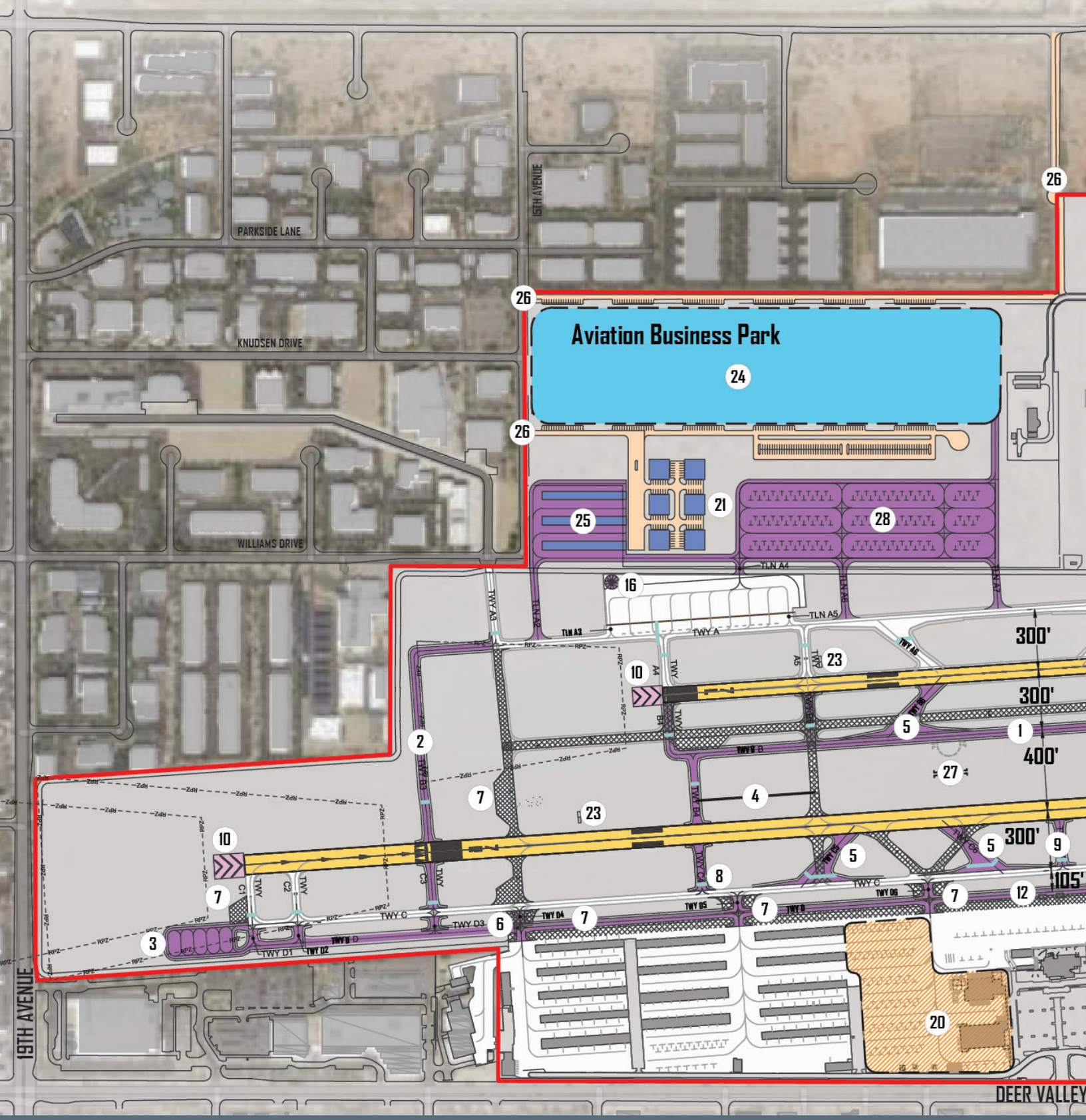
Master Plan Recommendations

DVT's Master Plan Update Recommended Alternative meets DVT's forecast facility needs through 2033. The plan provides for future airfield, general aviation, and support facilities. The major airfield development projects within this Master Plan Update's horizon include the implementation of airfield geometry improvements which meet FAA's design AC 150/5300-13A safety guidelines, addition of a second parallel Taxiway D south of Runway 7R-25L, relocation and reconstruction of Taxiway B, and an 800 foot extension of Runway 7L-25R. To meet FAA design standards the runway holdbars south of Runway 7R-25L must be moved from their current location 150 feet from the runway centerline to 250 feet. The relocation of the holdbars eliminates the area to hold between the runway and Taxiway C requiring arriving aircraft to taxi directly onto Taxiway C. The construction of parallel Taxiway D will allow departing and arriving aircraft to taxi on separate taxiways, eliminating the need for arriving aircraft to hold short of Taxiway C upon arrival to avoid other taxiing aircraft. The relocation of Taxiway B from 200 to 300 feet from the Runway 7L-25R centerline will allow Runway 7L-25R to meet RDC B/II/VIS standards and match the Taxiway A separation providing maximum flexibility in the future.

Support projects include constructing a north side pilot's flight planning room and installing a compass calibration pad, which were the the top two requests in the DVT user survey. A public safety building to house the relocated Police Air Support Unit and provide space for a future landside fire station was also included. Corporate aviation development is slated for the southeast corner of airport property. The site has already been graded with the construction of utility stub-outs, a taxilane and roadway to foster future development.

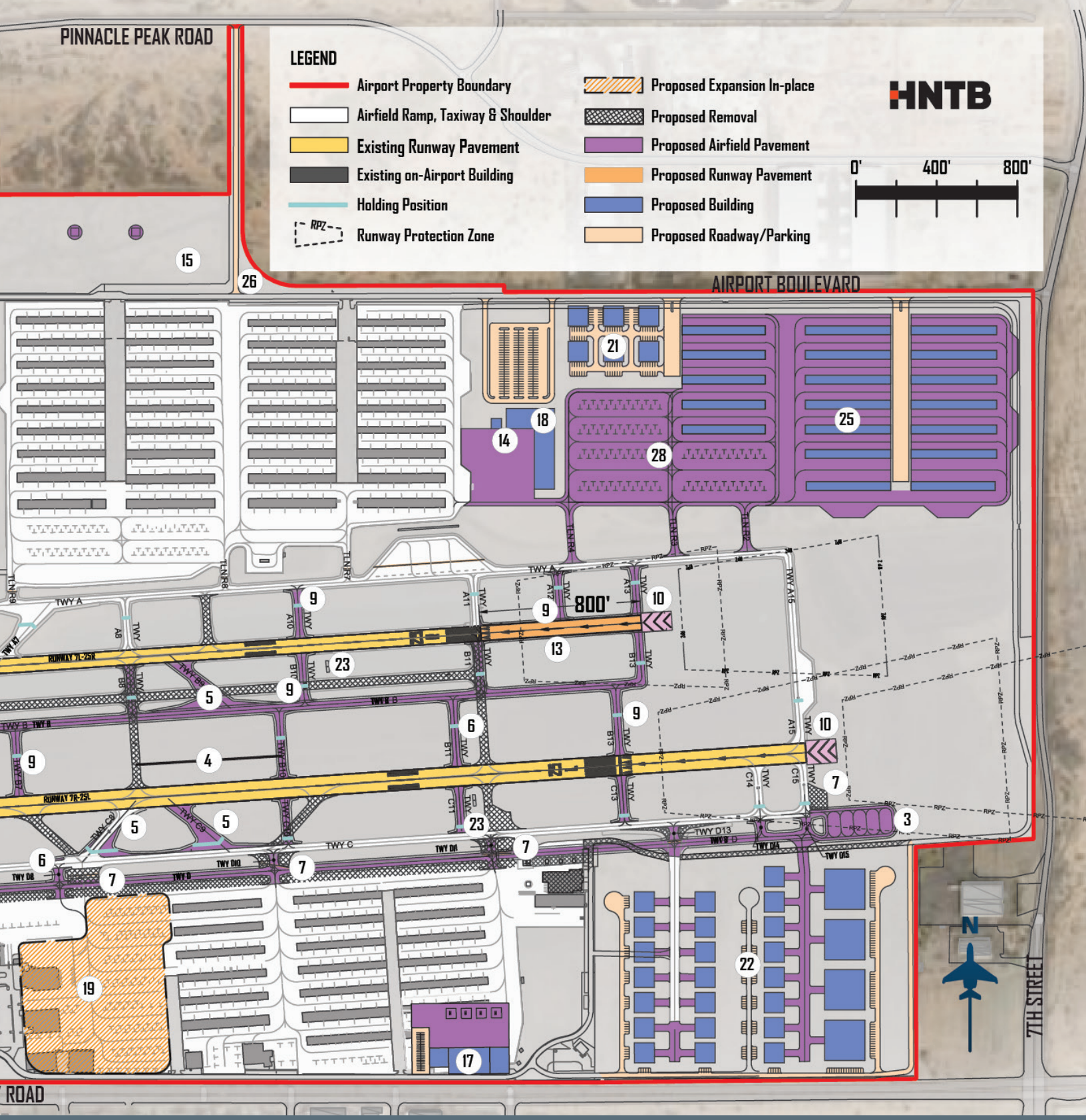
In order to balance demand between the north and south sides of the airfield, the two flight schools would ultimately relocate to the north side, allowing expansion of the FBO's on the south side. Aircraft hangar expansion is also designated for the north side along with an area for a future aviation business park to serve aviation related businesses or industrial airparks with provisions for aircraft hangar and ramp space with direct taxiway access. North side non-secure access would be provided to the aviation business park development from Pinnacle Peak Road and 15th Avenue. Additional roadway access to the north hangars would be provided by developing 3rd Avenue from Pinnacle Peak Road. In addition, 7th Avenue would be extended to Airport Boulevard providing access to the ATCT and north hangar facilities.

It is important to note that the layout of proposed land-use facilities (e.g. general aviation or corporate hangars, tie-downs, buildings, ramp, and taxilanes) is shown as one potential configuration. However, the actual configuration of such facilities will likely be different, depending heavily on market conditions and how tenants develop individual parcels.



Recommended Improvement Projects

1. Relocate Taxiway B to 300' from Runway 7L-25R Centerline
2. Relocate Taxiway B3/C3 Outside of Runway 7L-25R RPZ
3. Relocate Runway 7R-25L Run-up Areas
4. Mitigate Hot Spots 1 and 2 (Taxiways B5/C5 and B9/C9)
5. Construct Acute Angle Taxiway
6. Mitigate Direct Runway Access to Aprons
7. Mitigate Excess Pavement
8. Relocate Runway 7R-25L South Side Holdbars *(typical)*
9. Construct New Taxiway Connector
10. Upgrade/Install Runway Blast Pads
11. Improve Taxiway and Runway Shoulders *(typical, not shown on plan)*
12. Construct Full Length Parallel Taxiway D
13. Construct 800' Eastward Extension of Runway 7L-25R
14. Construct North Side Pilot Flight Planning Room



15 Designate Helicopter Training Area
16 Install Compass Calibration Pad
17 Relocate Public Safety Building
18 Construct Aviation Support Building
19 Expand Cutter Aviation In-place
20 Expand Atlantic Aviation In-place
21 Construct Flight-school Classrooms
22 Develop Corporate Aviation
23 Upgrade PAPI System to Four Lights
24 Develop Aviation Business Park
25 Expand T-Hangars
26 Provide New Roadway Access
27 Relocate Segmented Circle
28 Expand Tie-downs

Estimated Program Cost & Funding

The potential phasing of individual projects proposed in the Master Plan Update Recommended Alternative are separated into five-year increments through the planning horizon representing projects that are likely to be developed during each time period. If funding or facility needs arise sooner or later than projected in the phasing plan, projects can be shifted between phases. A preliminary planning level program cost estimate was prepared for the recommended projects and costs for each project by development phase are shown in the following table. The costs are presented in 2014 dollars and represent a planning level estimate. The costs include hard construction cost for each project and an estimate of the total cost for each phase inclusive of soft costs and owner's contingency.

Construction Cost Estimate (Phases 1 - 4)

Project Number	Improvement	2014 Hard Construction Cost
	Phase 1 (2015-2018)	
3	Relocate Runway 7R-25L Run-up Areas	$1,112,575
25	Expand T-Hangars	$5,559,170
12	Construct Partial Length Parallel Taxiway D	$438,066
8	Relocate Runway 7R-25L South Side Holdbars	$603,750
6	Mitigate Direct Runway Access to Aprons	$74,539
7	Mitigate Excess Pavement	$848,475
10	Upgrade/Install Runway Blast Pads	$210,416
11	Improve Taxiway and Runway Shoulders (South Runway & Taxiway Only)	$426,229
15	Designate Helicopter Training Area	$45,029
16	Install Compass Calibration Pad	$12,500
23	Upgrade PAPI System to 4 Lights	$250,000
26	Provide New Roadway Access (On-Airport)	$142,180
28	Expand Tie-downs	$829,301
	Total Construction Cost	**$10,552,230**
	Soft Costs	*$2,894,561*
	Total Phase 1 Program Cost	**$13,446,791**

Construction cost estimates for Phases 2 - 4 are provided on the next page.

Construction Cost Estimate (Phases 1 - 4, continued)

Project Number	Improvement	2014 Hard Construction Cost
	Phase 2 (2019-2023)	
17	Relocate Public Safety Building with Fire Station	$10,041,728[1]
12	Construct Full Length Parallel Taxiway D	$957,213
27	Relocate Segmented Circle	$25,000
1	Relocate Taxiway B to 300' from Runway 7L-25R Centerline	$2,795,474
4	Mitigate Hot Spots 1 and 2 (Taxiways B5/C5 and B9/C9)	$633,269
9	Construct New Taxiway Connector	$146,760
6	Mitigate Direct Runway Access to Aprons	$353,285
28	Expand Tie-downs	$1,328,108
21	Construct Flight-school Classrooms	$7,871,763[2]
7	Mitigate Excess Pavement	$170,700
10	Upgrade/Install Runway Blast Pads	$166,493
14	Construct North Side Pilot Flight Planning Room	$415,843
18	Construct Aviation Support Building	$7,980,709[2]
22	Develop Corporate Aviation Area	$1,103,419[2]
25	Expand T-hangars	$16,657,829[2]
	Total Construction Cost	**$50,647,620**
	Soft Costs	*$14,866,634*
	Total Phase 2 Program Cost	**$65,514,254**
	Phase 3 (2024-2028)	
26	Provide New Roadway Access	$1,179,375
28	Expand Tie-downs	$2,371,623
25	Expand T-hangars	$4,209,200[2]
21	Construct Flight-school Classrooms	$7,573,295[2]
2	Relocate Taxiway B3/C3 Outside of Runway 7L-25R RPZ	$877,350
5	Construct Acute Angle Taxiway	$1,913,588
9	Construct New Taxiway Connector	$356,349
22	Develop Corporate Aviation Area	$1,295,855[2]
	Total Construction Cost	**$19,776,635**
	Soft Costs	*$5,759,814*
	Total Phase 3 Program Cost	**$25,536,449**
	Phase 4 (2029-2033)	
13	Construct 800' Eastward Extension of Runway 7L-25R	$734,231
9	Construct New Taxiway Connector	$908,706
26	Provide New Roadway Access	$543,861
24	Develop Aviation Business Park	$320,360[2]
10	Upgrade/Install Runway Blast Pads	$83,273
19	Expand Cutter Aviation In-place	N/A
20	Expand Atlantic Aviation In-pace	N/A
	Total Construction Cost	**$2,590,431**
	Soft Costs	*$700,310*
	Total Phase 4 Program Cost	**$3,290,741**

1. Costs for public safety building may be shared among City departments (Aviation, Police, Fire).
2. Third-party funding may be utilized to develop facilities. See Section 7.4 of the Master Plan Report for more discussion.
N/A = Not applicable. Expansion cost funded by FBO.
Project Number corresponds to Recommended Improvement Projects Map.

Financing capital improvements at DVT will not rely exclusively upon operating revenue or local financial resources. Capital improvements funding is available through various grant-in-aid programs on Federal levels. DVT has four potential sources of funding for capital projects at this time:

FAA Funds

Funding is provided to airports through the FAA's Airport Improvement Program (AIP). As a non-primary airport in Arizona, DVT can fund up to 91.06% of eligible costs with grants. Future levels of AIP funding will be dependent on Congressional reauthorization. This analysis assumes that AIP funding will be maintained at current levels; however, long-term funding of AIP at these levels cannot be guaranteed.

ADOT Grants

The Arizona Department of Transportation (ADOT) has a program similar to the FAA's AIP which distributes grants to Arizona airports to assist in matching Federal grants. The maximum amount of ADOT funds awarded to an airport in any fiscal year may not exceed 10% of the prior three fiscal years average revenue from all airports to the Arizona Aviation Fund.

Third-Party Sources

Third-party sources, such as tenant-funded projects, may provide an alternative funding approach for new hangars, FBOs such as flight training facilities, aviation support or other revenue-generating facilities not operated by the airport.

Local Revenues

Local revenues, typically those resulting from the City's Aviation Department operations, are used to match Federal or state grants or to fund projects that are not eligible for funding from other sources.

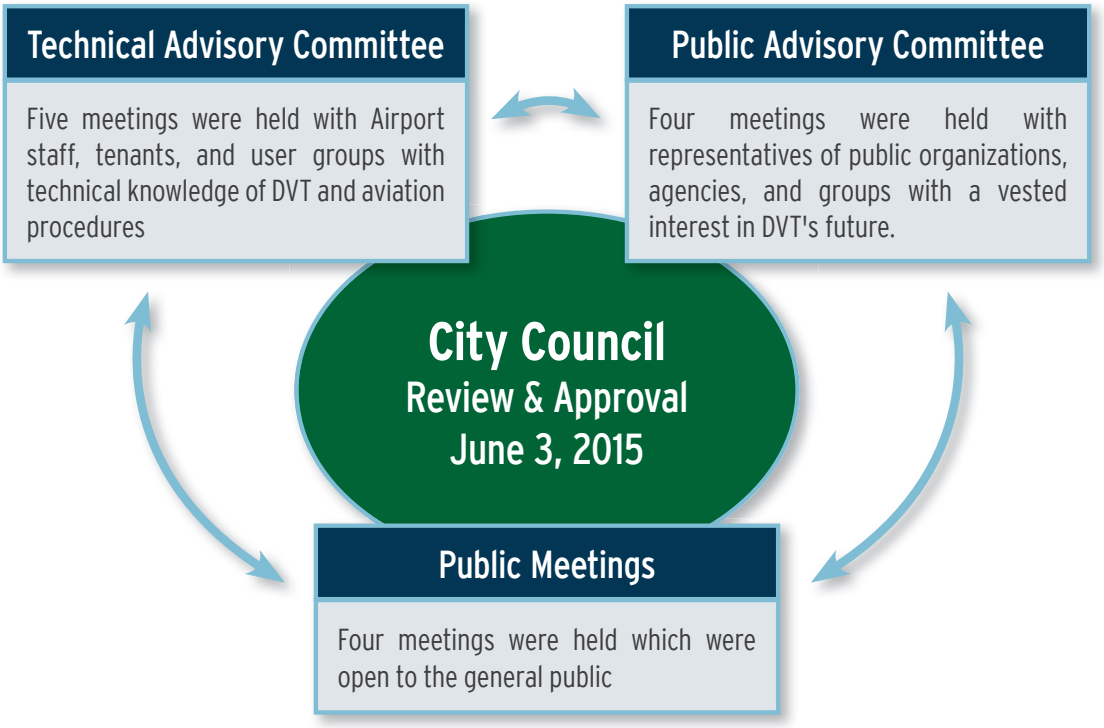
Since the Master Plan Update Recommended Alternative project costs were estimated in 2014 dollars, an escalation factor of 2.0% per year, based on recent inflation levels, was included for future projects to reflect the impact of inflation. This is fairly minor for Phase 1 projects (5.1%) but significant for Phase 4 projects (40%). The table below summarizes the escalated project costs by phase and funding eligibility. A little more than 50% of the Master Plan Update costs are scheduled for Phase 2, but most of these are revenue-generating projects that are anticipated to attract third-party funding. The majority of grant-eligible projects are projected to occur in Phase 1, primarily because of the apron and perimeter road reconstruction projects expected during that period.

Summary of Project Costs by Phase and Eligibility

Phase	Total Costs (Including Escalation)	FAA Eligible	ADOT Eligible	Third Party Funding	Local
1	$30,331,518	$22,017,519	$1,064,603	$6,184,793	$1,064,603
2	$81,955,285	$13,563,762	$665,825	$67,059,873	$665,826
3	$32,386,391	$4,567,338	$224,204	$27,370,646	$224,204
4	$4,607,833	$2,765,803	$135,769	$1,570,491	$135,769
Total	**$149,281,028**	**$42,914,421**	**$2,090,401**	**$102,185,804**	**$2,090,402**

Public & Stakeholder Involvement

The Master Plan Update included a robust public and stakeholder coordination process which was comprised of three parts: a Technical Advisory Committee (TAC), a Public Advisory Committee (PAC), and open public workshops. The TAC was technically focused and familiar with aviation procedures providing targeted discussions and technical feedback on airport facility needs and operations. The primary purpose of the PAC was to inform community representatives on the status of the project and gain input on how the plans will affect them. Public workshops were also held to inform the community at-large about the project and gather feedback throughout the process. The City's Aviation Department staff met with the Deer Valley Pilot's Association to share the plan and solicit input. All pilots with aircraft based at DVT were surveyed about what they felt worked and what needed improvement at the airport, and the responses were taken into account during the facility analysis and alternatives development tasks.



DVT

PHOENIX DEER VALLEY AIRPORT

For additional information about the Phoenix Deer Valley Airport Master Plan,
visit www.DeerValleyAirport.com or call (623) 869-0975