

Appendix A

VERNON REGIONAL AIRPORT MASTER PLAN DEVELOPMENT ALTERNATIVES AND ANALYSIS

1. Introduction

In the previous chapter, the land and facility requirements to satisfy the projected demand for Vernon Regional Airport were identified. The next stage in the planning process is to develop the alternatives for meeting the needs and the vision of the airport for the next 20 years.

Four development alternatives were proposed. Any proposed development is evolved from an analysis and projected demands for the plan's time period. Each one of the proposed alternatives provides a different level of development, including airside and landside enhancements within the current airport site and optional expansion of the airport towards the east.

The first part of this chapter includes a review of each development option, proposed projects and cost, and an evaluation of alternatives and their effect on airport activity, the community and the region's economy. The second part of this chapter recommends the preferred development alternative for Vernon Regional Airport.

Runway Extension Feasibility Study

In 2014, a runway feasibility study for the Airport was done by Tetra Tech EBD Inc. Consulting. Four potential runway extension options were explored to serve business and general aviation aircraft in the airport (Appendix D).

The proposed runway extension is located within the Vernon Waterfront Neighbourhood Centre, along Vernon Creek. This is a sensitive habitat for plant and wildlife species. Each development option has been reviewed in-depth for potential environmental impacts followed by an outline of environmental permitting requirements, and avoidance, mitigation and compensation measures, as required.

All four extension options provided in the study presumed no conflict with the Obstacle Limitation Surfaces (OLS) or Zoning Bylaw #4888. Any obstacles within the OLS have not been identified or assessed.

Four options for the lengthening of the runway were provided, as follows:

Option 1: Provides a total runway length of 1,100.5 m (3,610 feet). This is the maximum length possible without encroaching onto Vernon Creek to the west while maintaining a 60 m wide runway strip within the current airport boundaries to the east. This provides an 8.8 m extension to the west and a 19.6 m extension to the east. The longitudinal 60 m long strip off the west end of the runway is shown at a slope of 2.5% which exceeds the recommended TP312E slope of 2%. The runway extension design drawings done by Pryde Schropp McComb Inc. shows a 2.5% strip which was likely provided due to the proximity of Vernon Creek.

Option 2: Provides a total runway length of 1,219.2 m (4,000 feet) by extending the runway to the east as per Option 1 and extending to the west by diverting Vernon Creek through a new culvert. The new culvert would be built adjacent to the existing creek bed to prevent disturbing the watercourse during construction.

Option 3: Provides the identical configuration as Option 2 except Vernon Creek would be diverted around the western end of the runway and associated strip, eliminating the culvert requirement under the runway structure.

Option 4: This option provides a total runway length of 1,219.2 m (4,000 feet) by extending the runway to the west only with Vernon Creek diverted around the end of the runway strip. This option provides relocation of approximately 741 m of Vernon Creek without the need for a culvert. Additionally, this option would maintain approximately 195 m of the abandoned portion of Vernon Creek, north of the runway.

Based on the estimated cost of each option, the environmental impacts and the long term requirements for 4,000 feet of runway, **Option 4** was used for the creation of various alternative development scenarios the Master Plan (Map 2). However, the Airport Master Plan recommended development does not include runway extension within the 20 year life of the plan.

2. Four Development Alternatives

Four development alternatives for the Vernon Regional Airport were developed:

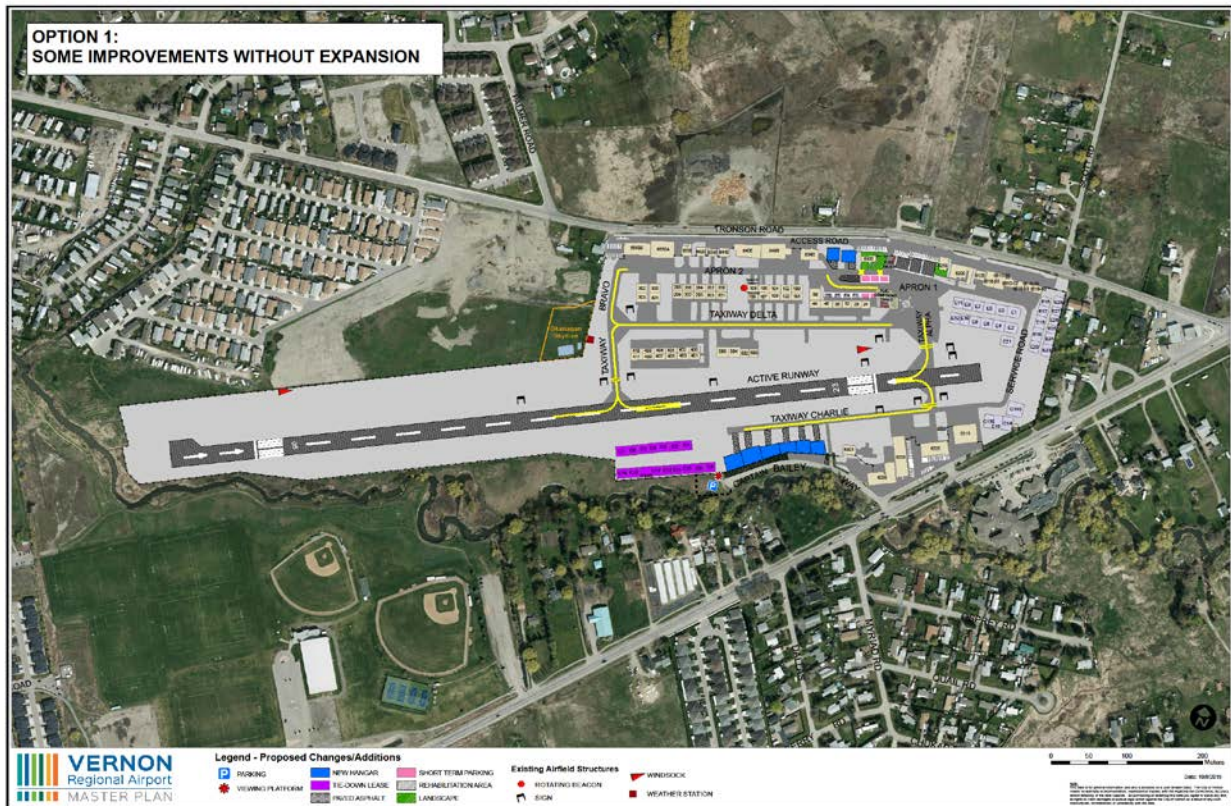
- Option 1: Some Improvements Without Expansion
- Option 2: Maximize Value Without Expansion
- Option 2B: Maximize Value With Runway Extension
- Option 3: Expansion With Runway Extension

All proposed alternatives presents the most viable projects that can be brought forward to further assess, through alternatives evaluation's section.

Option 1: Some Improvements Without Expansion

Map 1 illustrates Option 1. This option focuses primarily on maintaining existing airport assets, with improvements mainly to address safety and security of the Airport. The runway would be rehabilitated as well as Taxiway Alpha and the Apron 1 old section. The Captain Bailey Way area along Taxiway Charlie would be leased for hangar development. A permanent terminal building would be constructed, coupled with improvements to landscaping, a new gate, and signage and branding. The estimated cost for Option 1 is \$986,400 (Table 1).

Map 1: Option 1: Some Improvements Without Expansion



Option 2: Maximize Value Without Expansion

Map 2 illustrates Option 2. This option focuses on capacity improvements and upgrades within the existing airport lands. In addition to the projects outlined in Option 1, this option also includes developing new hangars at Tronson Road, an expansion of Apron 1 towards the east, a new apron (Apron 3) and a new taxiway (Taxiway Echo) at the southern end of the airport, along Captain Bailey Way, which would accommodate more hangar space, a dedicated helipad, an Airport

Table 1: Development Alternatives Projects Summary

	Option 1: Some Improvements Without Expansion	Option 2: Maximize Value Without Expansion	Option 2B: Maximize Value With Runway Extension	Option 3: Expansion With Runway Extension
Lands Acquisition				
The Triangle Lands	n/a	n/a	n/a	3,000,000
Facility Requirements				
Runway 23-05 Runway Surface Remediation	552,000	552,000	552,000	552,000
Runway Extension to 4,000 ft.	n/a	n/a	5,254,700	5,254,700
Taxiway Surface Remediation	132,000	132,000	132,000	132,000
Taxiway Echo	n/a	108,000	108,000	108,000
Apron 1 and 2 Surface Remediation and Maintenance	110,400	110,400	110,400	110,400
Apron 1 Expansion	n/a	170,000	170,000	576,000
Apron 3	n/a	420,000	420,000	420,000
Apron 4	n/a	n/a	n/a	420,000
Tie-Downs	n/a	32,000	32,000	42,000
Helipad	n/a	60,000	60,000	60,000
Visual Guidance Indicators (PAPI Relocation)	n/a	84,000	0	0
Obstruction Lighting	24,000	24,000	24,000	24,000
Terminal Building	15,000	60,000	60,000	60,000
Airport Operational Shop and Vehicle Storage	n/a	70,200	70,200	70,200
Fencing and Gates	84,000	84,000	84,000	84,000
Aircraft Movement Monitoring System	18,000	18,000	18,000	18,000
Commercial and Industrial Hangar	n/a	n/a	n/a	n/a
General Aviation Hangar	n/a	n/a	n/a	n/a
Vehicle Parking Requirements	n/a	n/a	n/a	n/a
Landscaping	15,000	96,000	96,000	96,000
Branding and Signage	36,000	36,000	36,000	36,000
Total (\$)	\$986,400	\$2,056,600	\$7,227,300	\$11,063,300

3. Evaluation of Development Alternatives

The four alternatives presented in this chapter provide possible solutions to specific issues for the Airport. Evaluation criteria of the alternatives were developed in consultation with the Airport Master Plan Committees. Four evaluation factors were identified, as follows:

- Operational performance
- Airport economic impact
- Consultation input
- Transport Canada Aerodrome Standards

Operational Performance

Operational performance evaluates the Vernon Regional Airport function under each option, including the additional hangar space, airfield capability for the Airport demands, and future activity levels.

Runway 05-23 Development:

As discussed in Chapters 2 and 3, Runway 05-23 requirements identify surface remediation and extending the runway length as possible projects. As presented in Table 2, all four options include a surface remediation in the next 2-3 years. Options 2B and 3 also include an extension of the runway to 4,000 feet, to better meet the needs of existing corporate aviation users, as well as to attract more corporate aviation users.

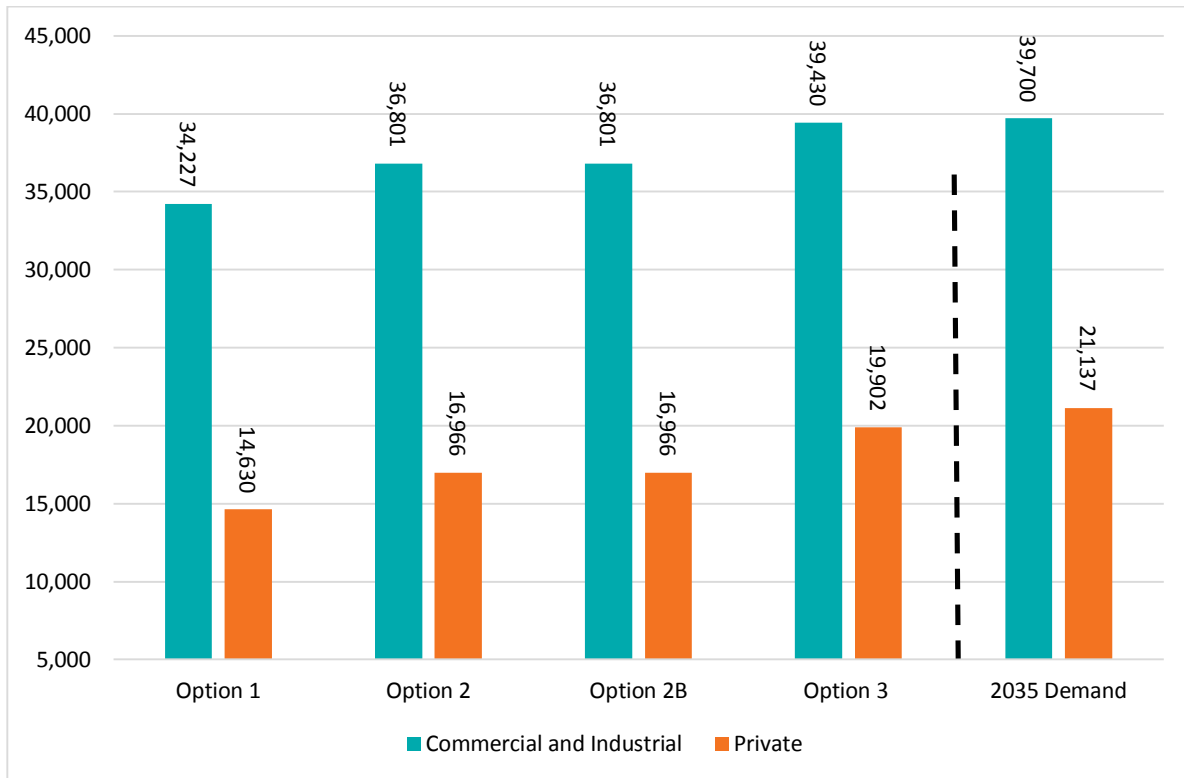
Table 2: Runway 05-23 Development Options

Runway 05-23 Requirements	Option 1	Option 2	Option 2B	Option 3
Surface Remediation	✓	✓	✓	✓
Extension to 4,000 feet			✓	✓

Commercial/Industrial and Private Hangar Space:

The demand for hangar space at the Vernon Regional Airport can expect to grow by 35% in the next 20 years. As presented in Graph 1, each development option provides a different level of growth in hangar space, based on the Airport lands inventory and potential future expansion. Option 3 provides the most hangar space to meet projected demand, mostly as a result of the triangle lands acquisition.

Graph 1: Commercial/Industrial and Private Hangar Development Alternatives



Tie-Downs

As presented in Table 3, the tie-down demand for Vernon Regional Airport by 2035 is 84 spaces. None of the proposed options fully address that demand, and a shortage of a minimum of 19 spaces is expected.

Table 3: Outdoor Aircraft Tie-Down Development Alternatives

Outdoor Tie-Down Demand 2035	Option 1	Option 2	Option 2B	Option 3
84	44	52	52	65

Based Aircraft Change

The growth of the based aircraft at the Vernon Regional Airport is dependent on many factors, such as activity growth, availability of indoor and outdoor tie-down space and technological advancements. As presented in Table 4, the number of based aircraft at the airport under each

development alternative is lower than the future demand. Option 3 can accommodate the highest number of based aircraft.

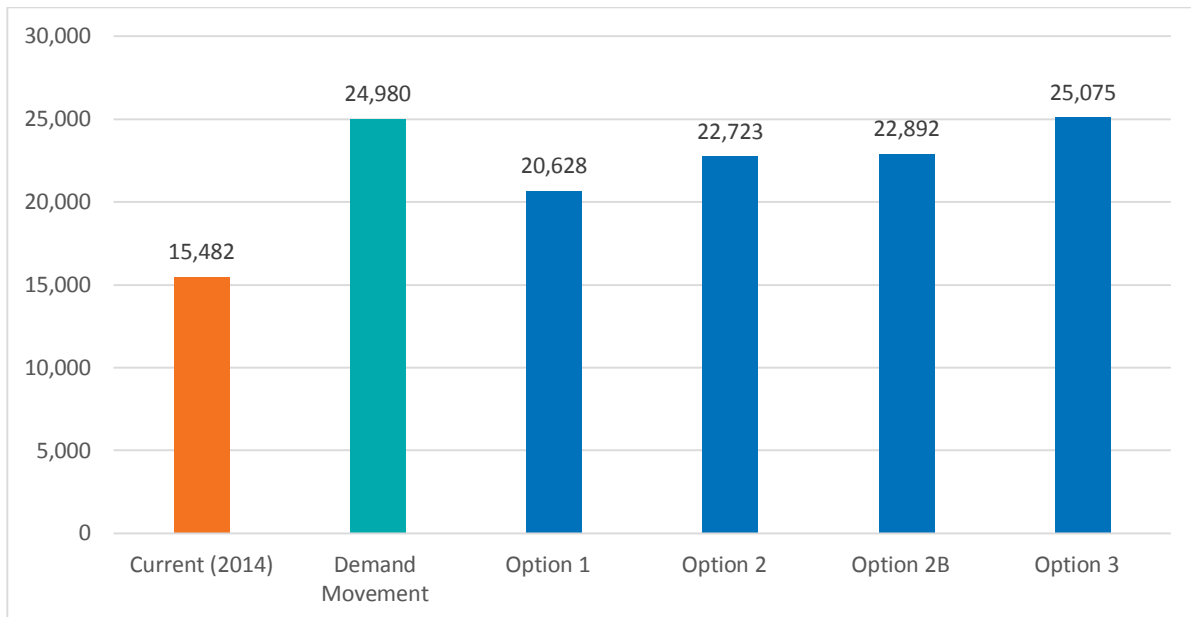
Table 4: Projected Based Aircraft for Development Alternatives

Based Aircraft Demand 2035	Option 1	Option 2	Option 2B	Option 3
178	140	155	162	171

Airport Movement Projections

The projected aircraft movement for each development alternative summarizes the airport operational performance, utilizing the airside elements as mentioned above. Graph 2 presents the projected aircraft movement for each development option. Option 3 provides the highest number of movements (25,075), as a result of additional development potential and the runway extension. Option 2 and 2B provide a very similar projections, except that Option 2 does not include an extension of the runway, and Option 2B does.

Graph 2: Projected Aircraft Movement for Development Alternatives



Economic Impact

The Vernon Regional Airport is home to industrial and commercial based businesses in the aviation sector, focusing on aircraft manufacturing and maintenance. It is also as a base for

corporate and general aviation. Appendix C provides the Economic Impact Study for Vernon Regional Airport.

The Economic Impact Study evaluates the development alternatives by two main factors, the direct and indirect benefits. Direct benefits generate employment and income wholly or largely related to the operation of the airport. This in turn prompts indirect benefits for employment and income generated by the chain of supplies of goods and services to direct suppliers.

Table 5 presents the current direct and indirect economic impact of Vernon Regional Airport, and the projected economic impact generated by the four development alternatives by number of employees and dollar value in wages. As presented, Option 3 projected to provide the highest economic impact, by adding 17 more employees to the airport.

Table 5: Airport Development Alternatives Economic Impact

	Employees	Economic Impact Income (\$)
Current 2014	Direct: 97 Indirect: 361	Direct: \$6,459,518 Indirect: \$13,245,812
Option 1 Some Improvements Without Expansion	Direct: 97 (0%) Indirect: 361 (0%)	Direct: \$6,459,518 Indirect: \$13,245,812
Option 2 Maximize Value Without Expansion	Direct: 104 (6.7%) Indirect: 387 (7.2%)	Direct: \$6,925,669 Indirect: \$14,199,804
Option 2B Maximize Value With Runway Extension	Direct: 106 (9.3%) Indirect: 395 (9.4%)	Direct: \$7,058,855 Indirect: \$14,493,340
Option 3 Expansion With Runway Extension	114 (17.5%) Indirect: 424 (14.8%)	Direct: \$7,591,599 Indirect: \$15,557,408

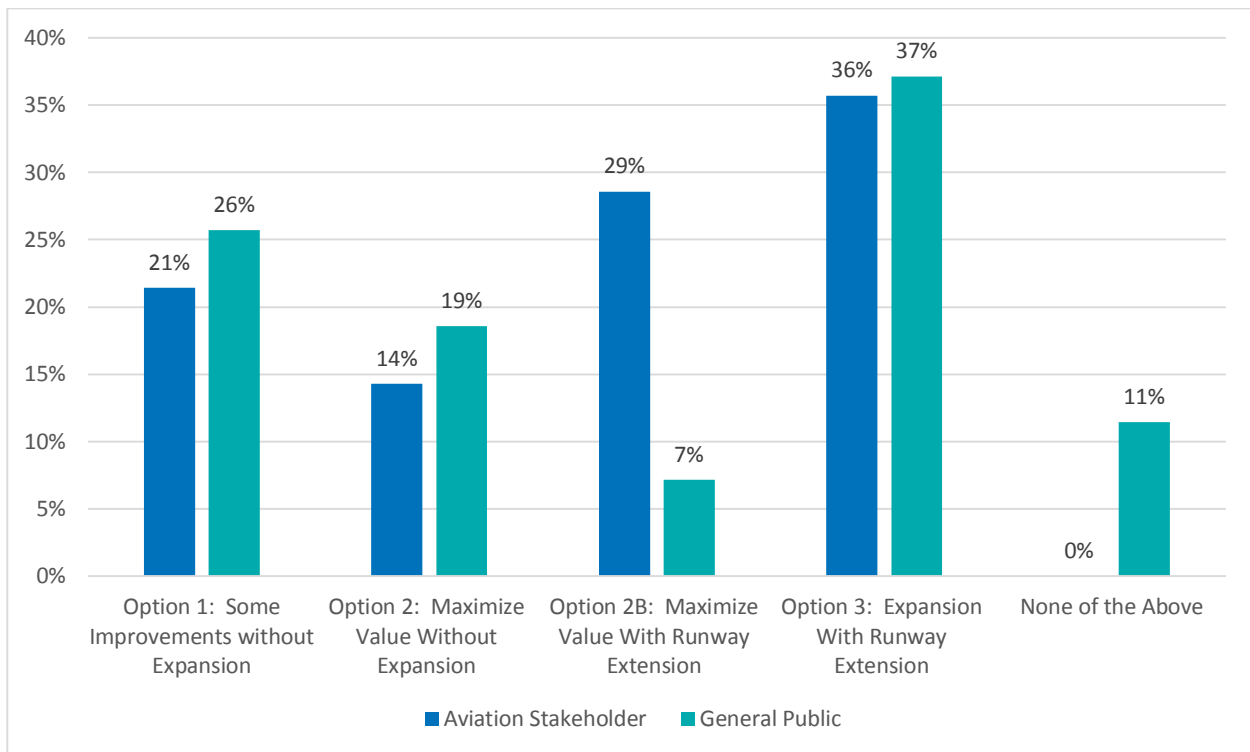
Consultation Input

Consultation for Master Plan began in the first stage of the Planning Process. The process focused on providing the public with opportunities to provide input on the plan, specifically with regard

to various development options at the airport, and with working closely with various stakeholders at the airport, many of whom were represented on an Airport Technical Advisory Committee (ATAC). In addition to the public open houses, a series of surveys were distributed to the public for comment. These surveys asked residents which of the four development alternatives they preferred.

Graph 3 focuses with the consultation results for the preferred development alternatives, by aviation stakeholders and general public. Option 3, was the most popular alternative by the aviation stakeholders (36%) and the public (37%). Option 1, was the second preferred option, results of low development cost. It is important to note that opinions on the runway extension itself were split, with 45% of the public and 35% of the aviation stakeholders respondents choosing an option that do not include a runway extension (Options 1 and 2), and 44% of public and 64% of aviation stakeholders respondents choosing an option that does include the extension (Options 2B and 3).

Graph 3: Consultation Results for Preferred Development Alternative



Transport Canada Aerodrome Standards TP312 5th Edition

On September 2015, Transport Canada has been released the 5th Edition of Aerodrome Standards and Recommended Practices (TP312 5th Edition). It is an Operational document as opposed to a Design document and, as such, is a substantive change to how standards are applied. An initial assessment of the changes brought to the new TP312 document include the application of the standards to what is defined by aircraft group numbers (AGN), obstacles and how they are handled (obstacle free zones, OLS, obstacle identification surfaces), taxiways, runway strips, runway safety area, aerodrome data, declared distances, runway width and slopes and lighting systems.

The main impact of the TP312 5th Edition on Vernon Regional Airport are:

- Runway length is no longer the determining factor for runway strip width standards.
- Runway Strip width for increases from 30 metre to minimum 40 metre (AGN II).
- Runway to taxiway centreline distance in 5th Edition increase from 42 metres to 52 metres.
- OLS approach surfaces are independent from take-off surfaces depending on obstacles and/or provision of clearways.
- Declared Distances are calculated differently for runways with displaced thresholds and clearways due to the new Take-Off Surface.

The new edition of Transport Canada TP312 has a major impact on future development opportunities at Vernon Regional Airport, especially on the proposed Runway 05-23 extension, as presented in Options 2B and 3.

Transport Canada stated that any proposed development airport plans may use the standards contained in TP312 4th edition, be completed in full and affected areas fully operational not later than September 2017.

4. Recommended Development Alternative

After evaluating the four development alternatives and their feasibility under Transport Canada federal restrictions, a new development concept for the Vernon Regional Airport is recommended. This concept, as presented in Map 5, is a combination of Option 2 and Option 3. This new development concept provides a long term vision for Vernon Regional Airport.

This concept includes all of the projects included in the other options, but excluding the Runway 05-23 extension project. Extension of the runway to 4,000 feet has a doubtful viability, especially in relation to the projected aircraft movement, the environmental impact and the construction

Table 6: Master Plan Recommended Development Option Projects

Airport Master Plan Projects	Estimated Cost
Land Acquisition	\$3,000,000
Runway 23-05 Runway Surface Remediation	\$552,000
Taxiway Surface Remediation	\$132,000
Taxiway Echo	\$108,000
Apron 1 and 2 Surface Remediation and Maintenance	\$110,400
Apron 1 Expansion	\$576,000
Apron 3	\$420,000
Apron 4	\$420,000
Tie-Downs	\$42,000
Helipad	\$60,000
Visual Guidance Indicators (PAPI Relocation)	\$84,000
Obstruction Lighting	\$24,000
Terminal Building	\$60,000
Airport Operational Shop and Vehicle Storage	\$70,200
Fencing and Gates	\$84,000
Aircraft Movement Monitoring System	\$18,000
Commercial and Industrial Hangar	Via private development
General Aviation Hangar	Via private development
Vehicle Parking Requirements	Via private development
Landscaping	\$96,000
Branding and Signage	\$36,000
Total	\$5,892,600