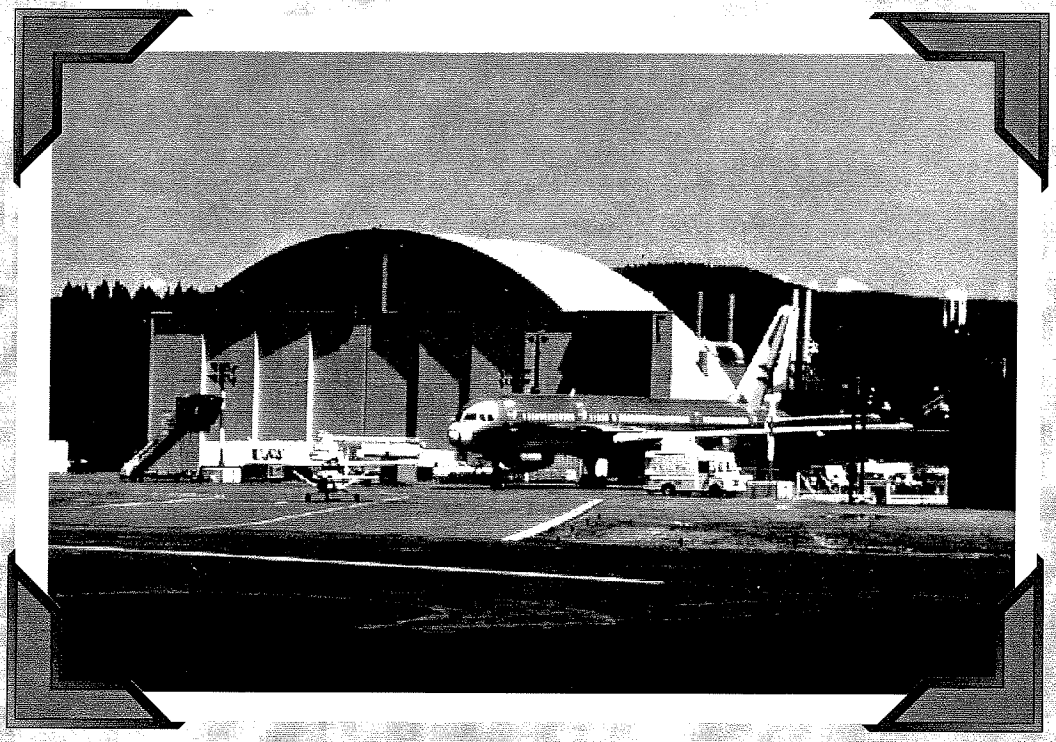


*Chapter Five:*

# Development Alternatives

# CHAPTER FIVE: DEVELOPMENT ALTERNATIVES

The objective of this chapter is to identify and evaluate alternative plans for the implementation and development of the facility requirements identified in the previous chapter. These facilities are required to meet FAA design standards and satisfy aviation demand levels for Renton Municipal Airport throughout the 20 year planning period. A three step process is used to accomplish this task:

- Identify alternative concepts that will meet the requirements for airport facilities imposed by the FAA and future demand levels;
- Evaluate each alternative, using a variety of criteria, to determine relative efficiency levels and the costs required for implementation; and
- Select a preferred alternative that maximizes the return on investment within the context of community/airport objectives.

Overall, the objective is to produce a balanced airside and landside complex to serve forecast aviation demand. The selection of a preferred development alternative is the culmination of the Master Plan; and the work completed prior to this action has been input into this effort. Beyond this phase, all work consists of refining and developing the selected recommendations. The following four areas are examined in this chapter:

- Airfield (runway and taxiway) Alternatives
- Terminal Area Alternatives;
- General Aviation Area Alternatives;
- Commercial Development Alternatives.

Prior to developing this alternative analysis, an airport planning advisory committee meeting was held to inform airport users and selected community representatives of the study's purpose, progress, and findings, and to provide a forum for open discussion. Presented and discussed at the meeting was an explanation of the Airport Master Plan; the need to re-assess the appropriate FAA design standards applicable to the airport in light of changes to FAA design criteria since the last Master Plan, and the concept of accommodating increased seaplane passenger operations at the airport and the resulting facility requirements (i.e., expanded hangar and terminal facilities) needed to support increased activity.

## 5.1 AIRFIELD ALTERNATIVES

Since the last Master Plan was adopted in 1987, significant changes have occurred in the way the FAA classifies an airport to determine the appropriate airport design criteria relating to the layout of airport facilities. Many components of the design criteria have also changed. The former classification system and design criteria was based on the class of aircraft a respective runway system could accommodate based on runway dimensions and pavement strength. There were two general design type categories used to classify airports; Utility and Transport. Renton Municipal Airport was classified in this way as a General Aviation Transport category airport. A Transport airport type was expected to serve aircraft with wingspans greater than 118 feet and with approach speeds of 121 knots or greater. Transport runways usually had the capability for precision approach operations.

As indicated in Chapter One, the FAA now classifies airports based upon a coding system referred to as the Airport Reference Code (ARC). The ARC is a new coding system developed by the FAA to more accurately relate airport design criteria to the operational and physical characteristics of the airplanes intended to regularly operate at an airport. The ARC has two components relating to the airport design aircraft. The first component, depicted by a letter, is the air-craft approach category and relates to aircraft approach speed. The second component, depicted by a Roman numeral, is the airplane design group and relates to airplane wingspan. Generally, aircraft approach speed applies to runways and runway related facilities. Airplane wingspan primarily relates to separation criteria involving taxiways and taxilanes.

Airports expected to accommodate single-engine airplanes normally fall into Airport Reference Code B-I. Airports serving larger general aviation and commuter-type planes are usually Airport Reference Code B-II or C-II. Small to medium-sized airports serving air carriers are usually Airport Reference Code C-III, while larger air carrier airports are usually Airport Reference Code C-VI. The Renton Municipal Airport is currently being considered by the FAA as a C-IV facility because of the use of the airport by Boeing 757's.

One of the primary objectives of this master plan was to reassess the appropriateness of the Airport Reference Code C-IV for the airport and determine how the airport can comply with FAA design standards given the constrained nature of the site and the mix of large and small aircraft that utilize the airport. Based on the analysis performed in Section 2.4 of Chapter Two, and Section 4.1 of Chapter Four, it was determined that the appropriate ARC for Renton Municipal Airport is an ARC of B-II, with certain facilities critical to Boeing 737 (ARC C-III) and 757 (ARC-IV) operations, such as runway width, pavement strength, and certain taxiway clearances, designed appropriately.

Based upon the determination that the airport should be categorized as a B-II facility, Chapter Four also identified existing and future development needs. As indicated in Chapter Four, airfield improvements and modifications identified at Renton Municipal Airport included changing the Airport Reference Code (ARC) from C-IV to B-II and a reconfiguration of the runway and taxiways. These improvements and modifications will allow the airport to accommodate critical FAA design

standards and provide additional operating area for seaplanes. In identifying alternative ways of meeting the defined requirements, the following parameters were used as guidelines:

- Eliminate existing airfield design deficiencies and meet or exceed FAA guidelines outlined in FAA Advisory Circular 5300-13, Airport Design;
- Maximize the use of existing facilities;
- Provide sufficient airfield flexibility to meet the long range demand that is forecast to occur;
- Provide facilities in a manner that minimizes impacts on the community; and
- Plan future airfield alternatives that maintain an emphasis on airfield safety and efficiency.

Following a preliminary investigation, four runway alternatives were identified as best representing a reasonable range of options for airfield modifications at Renton Municipal Airport. When compared to maintaining the existing ARC of C-IV and existing airfield configuration under the No Change alternative, these four runway alternatives will help determine the most advantageous course of action for the airport to follow.

The evaluation process, presented below, differentiates and distinguishes alternatives from one another and focuses primarily on proposed changes to the airfield and those aspects that distinguish one alternative from another.

### 5.1.1 Key Assumptions

Due to the constrained nature of the airport site, the type of aircraft utilizing the airport, and changes in the FAA regulatory environment, Renton Municipal Airport is currently out of compliance with many FAA design standards. The most pressing need is for the establishment of adequate runway safety areas and a runway obstacle free area (OFA) on land controlled by the airport. Runway safety areas are a defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway. The runway safety area should be capable of supporting aircraft rescue and firefighting equipment. An OFA is an area surrounding the runway that should be clear of all parked airplanes and objects.

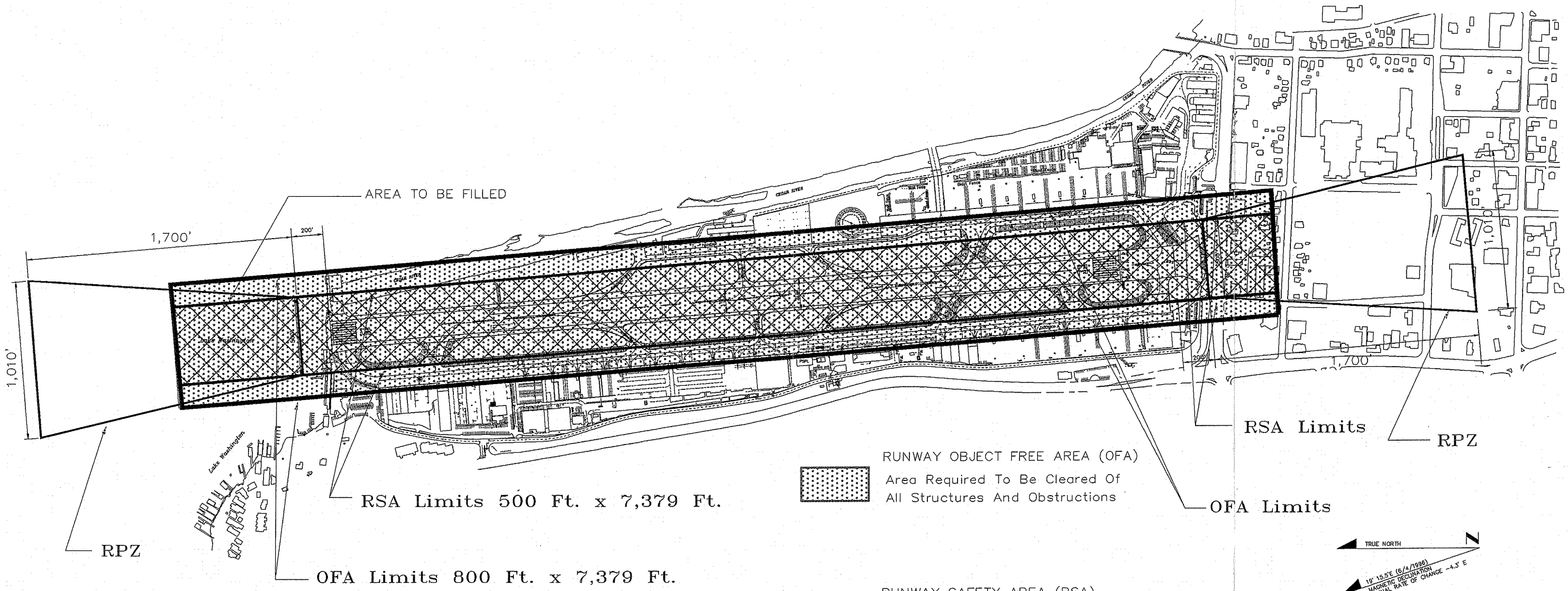
A primary assumption is that the FAA will no longer allow the airport to continue to operate out of compliance with standards. Recent communications with the FAA have indicated that until an acceptable mitigation plan is worked out in regard to airfield design deficiencies, no further development may take place on the airport. Failure to comply with FAA design standards could also affect the airport's eligibility for Federal Airport Improvement Program (AIP) funds.

### 5.1.2 Runway Development Alternatives

Four alternatives were developed plus the No-Change Alternative. The No Change Alternative and Alternative 1 explore the implications of the airport continuing to support an ARC of C-IV, while Alternatives 2, 3, and 4 investigate three development strategies related to the implementation of ARC B-II standards.

Exhibits 5-1 through 5-5 depict in generalized form each of the runway development alternatives. Each of these alternatives and the No-Change alternative are described as follows.

NO CHANGE




RUNWAY OBJECT FREE AREA (OFA)
Area Required To Be Cleared Of
All Structures And Obstructions

RUNWAY SAFETY AREA (RSA)
Required To Support Passage
Of Aircraft

TRUE NORTH
N
19° 13.5'E (6/4/1998)
MAGNETIC DECLINATION
ANNUAL RATE OF CHANGE -4.3' E

EXHIBIT 5-1

RENTON MUNICIPAL AIRPORT

C-IV STANDARDS
NO CHANGE

BUCHER, WILLIS & RATLIFF
CORPORATION

# ALTERNATIVE ONE

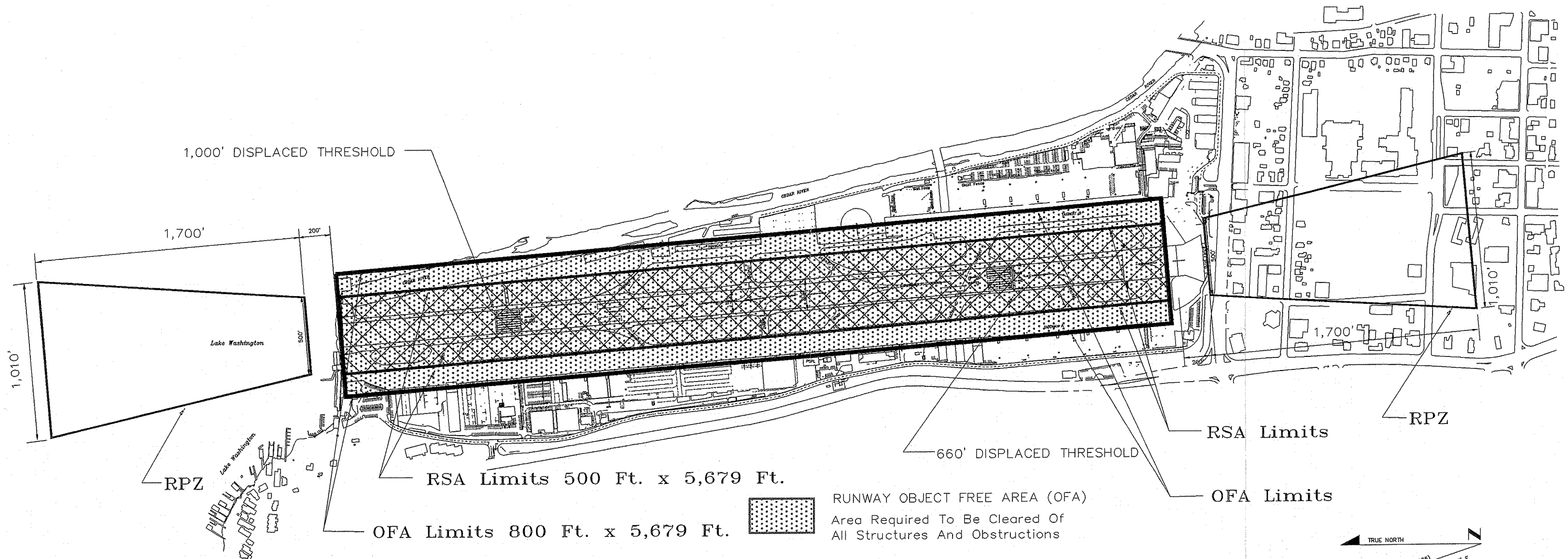



EXHIBIT 5–2

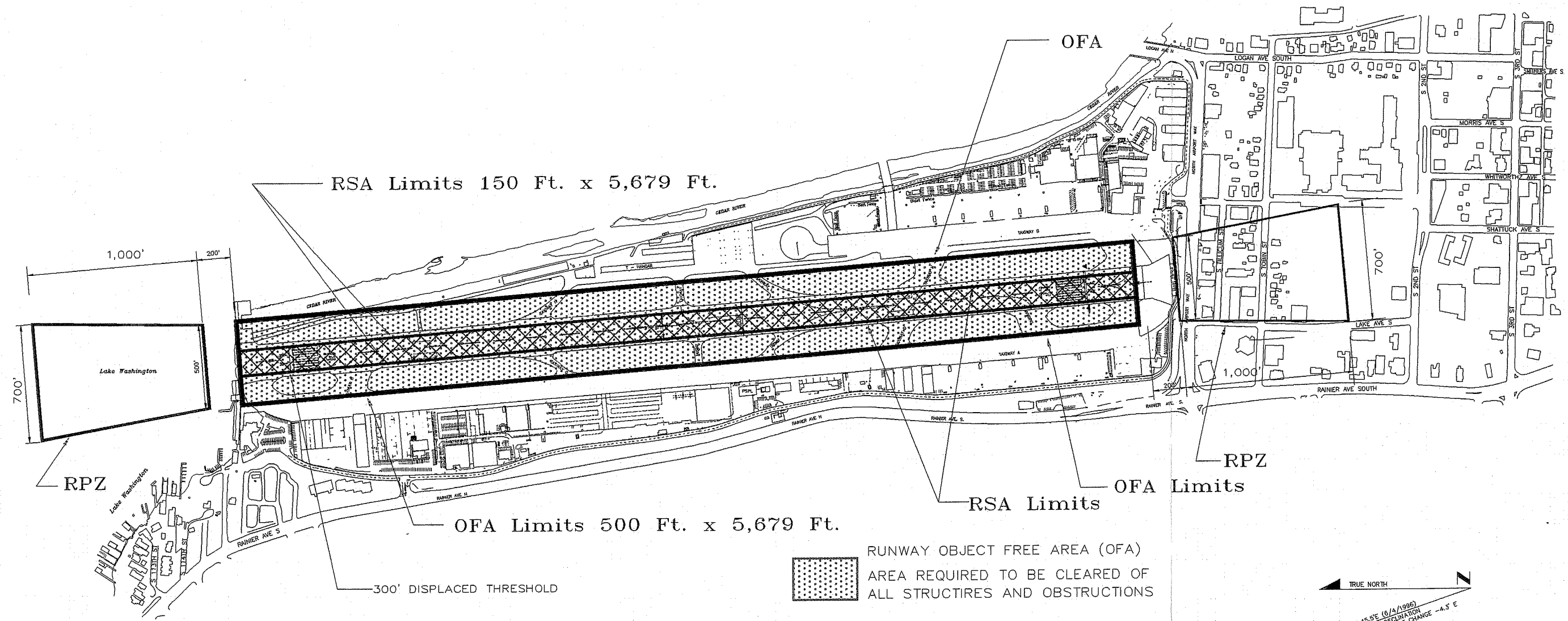
1,700 FT Reduction of Rwy 15–33 Thresholds

C–IV STANDARDS

ALTERNATIVE ONE

BUCHER, WILLIS & RATLIFF CORPORATION

# ALTERNATIVE TWO




RUNWAY OBJECT FREE AREA (OFA)

AREA REQUIRED TO BE CLEARED OF ALL STRUCTIRES AND OBSTRUCTIONS

RUNWAY SAFETY AREA (RSA)

Required To Support Passage Of Aircraft

TRUE NORTH

19° 15.6'E (6/1/1996)
MAGNETIC DECLINATION
ANNUAL RATE OF CHANGE -4.5' E

EXHIBIT 5-3

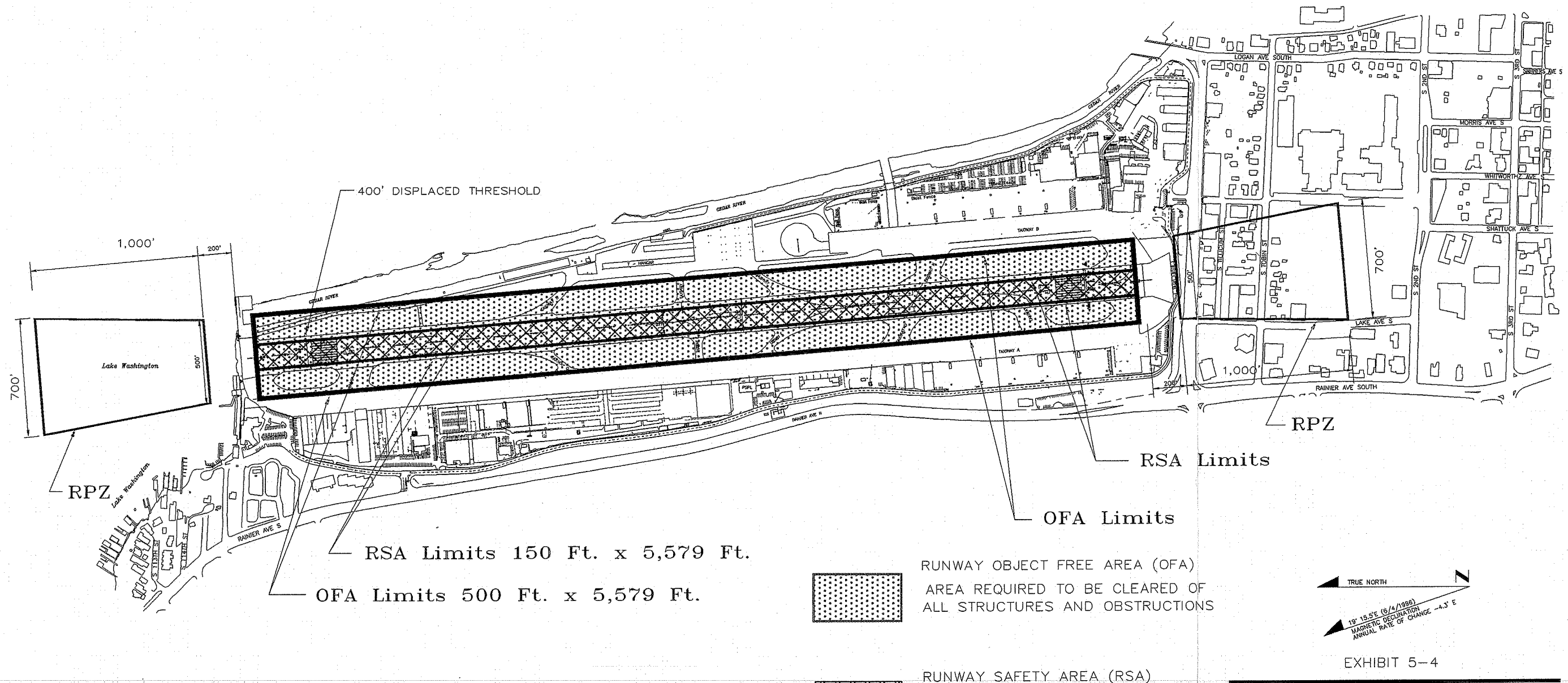
300 FT Reduction of Rwy 15 Threshold

B-II STANDARDS

ALTERNATIVE TWO

BUCHER, WILLIS & RATLIFF CORPORATION

# ALTERNATIVE THREE




RUNWAY OBJECT FREE AREA (OFA)
AREA REQUIRED TO BE CLEARED OF ALL STRUCTURES AND OBSTRUCTIONS

RUNWAY SAFETY AREA (RSA)
Required To Support Passage Of Aircraft

TRUE NORTH
19° 15.5'E (6/4/1998)
MAGNETIC DECLINATION
ANNUAL RATE OF CHANGE -4.3' E

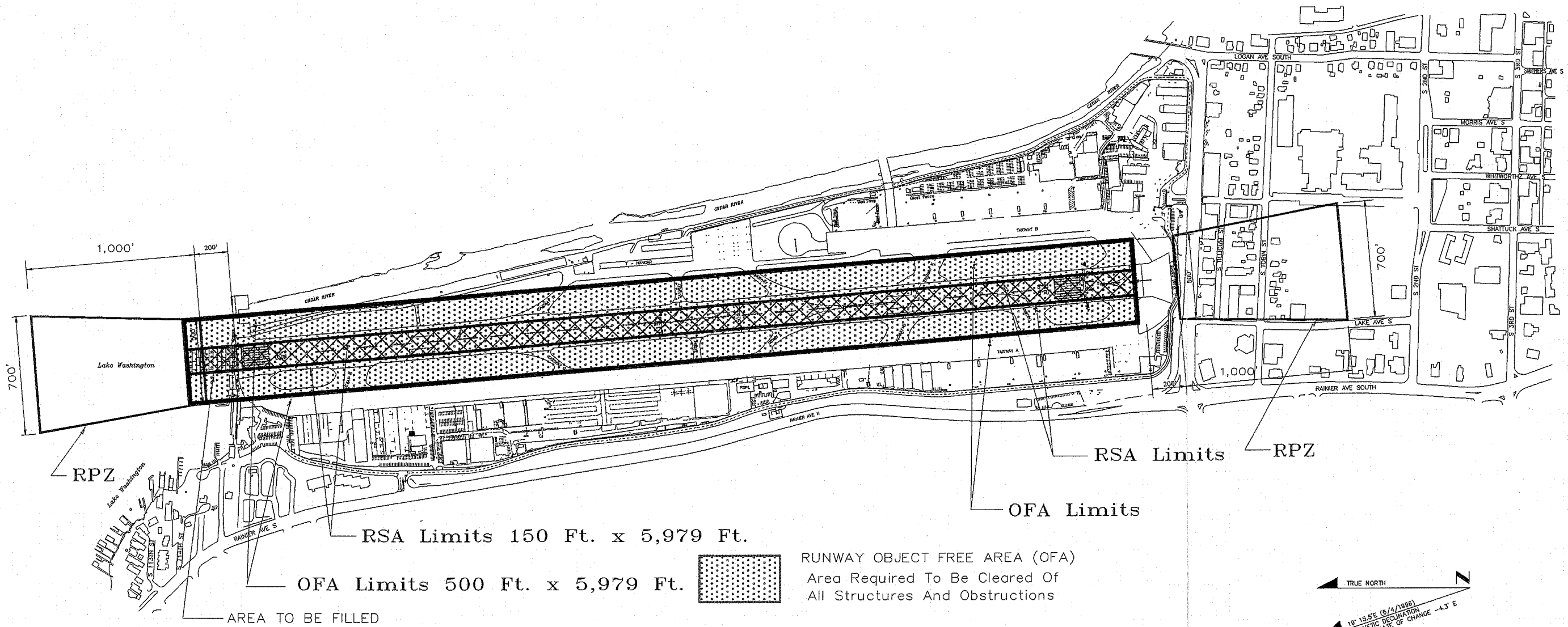
EXHIBIT 5-4

400 FT Reduction of Rwy 15 Threshold

B-II STANDARDS
ALTERNATIVE THREE

BUCHER, WILLIS & RATLIFF CORPORATION

# ALTERNATIVE FOUR




RUNWAY OBJECT FREE AREA (OFA)
Area Required To Be Cleared Of
All Structures And Obstructions

RUNWAY SAFETY AREA (RSA)
Required To Support Passage
Of Aircraft

TRUE NORTH

19° 15.5'E (6/4/1986)
MAGNETIC DECLINATION
ANNUAL RATE OF CHANGE -4.3' E

EXHIBIT 5-5

300 FT Extension of Rwy 15 Safety Area into LK Washington

B-II STANDARDS

ALTERNATIVE FOUR

BUCHER, WILLIS & RATLIFF CORPORATION

No Change

The No Change Alternative examines the option of keeping the existing airfield configuration as it is and relocating structures and purchasing additional land to bring the airport into compliance with ARC C-IV standards. This alternative is used to establish baseline conditions against which the true differences represented by the runway development alternatives can be measured. The existing condition is considered to be the current airfield layout with FAA Airport Reference Code (ARC) C-IV design standards applied, including the implications of establishing a 1,000 foot safety area on each end of the runway per FAA requirements.

Alternative 1: A Total 1,700 Foot Reduction of Runway 15-33 Thresholds

Alternative 1 represents the option of modifying the airfield configuration to comply with C-IV design standards without purchasing additional land. This would require that the end of Runway 15 be relocated inward 1,000 feet to the south, and the Runway 33 end be relocated inward approximately 700 feet to the north. This alternative represents the situation the airport will most likely encounter if no action is taken to adjust and modify its existing FAA design classification.

Alternative 2: A 300 Foot Displacement of Runway 15 Threshold

In this alternative, using ARC B-II standards, the north runway threshold (Runway 15 End) is displaced 300 feet to the south to accommodate FAA B-II runway safety area requirements. As with all of the B-II alternatives, modifications will be made to Taxiways A and H as reflected in the exhibit.

Alternative 3: A 400 Foot Displacement of Runway 15 Threshold

In this alternative, using ARC B-II standards, the north runway threshold (Runway 15 End) is displaced 400 feet to the south to accommodate FAA B-II runway safety area requirements, with an additional 100 feet of displacement added to provide room for seaplane operations outside of the runway Obstacle Free Area (OFA).

Alternative 4: A 300 Foot Extension of Runway 15 Safety Area into Lake Washington

In this alternative, a 300 foot by 150 foot runway safety area is created at the approach end of Runway 15 by filling in Lake Washington beyond the end of the paved runway. This action would accommodate FAA Design Criteria, provide a breakwater for seaplane activities, and enable the Runway 15 threshold to remain in its current location at the north end of the runway pavement surface. This alternative also assumes application of the ARC B-II design standards to the airport.

In general, runway development Alternatives 2, 3, and 4 explore various reconfigurations of the north end of the runway to improve operating conditions and address FAA B-II design requirements. No other changes to airport layout and configuration (other than minor taxiway modifications) are contemplated under the runway alternatives analysis. The Runway 33 threshold remains displaced by 340 feet, and each runway development alternative includes minor modifications to Taxiways A and H.

### 5.1.3 Runway Development Alternatives Evaluation

The purpose of this section is to evaluate the effects of the alternatives and thus provide the technical basis necessary for selecting a preferred runway development plan for the airport. The alternatives are subjected to an evaluation that permits a comparison of the merits and deficiencies of each option under consideration. In the following analysis, the basic findings for each of the general evaluation criteria are presented followed by interpretations of the findings for each alternative. An evaluation matrix is also provided to summarize the composite rankings of each alternative.

General criteria used in the alternatives evaluation include:

- FAA Design Standards: This category will examine each alternative within the context of FAA Advisory Circular 5300-13, Airport Design, to determine compliance with runway design criteria.

- Operational Efficiency: This category examines the efficiency of each alternative relative to its ability to accommodate the critical aircraft identified in the facility requirements, and the efficiency and safety of air and ground movements related to Boeing 737 and 757 aircraft. FAA Declared Distance calculations for each alternative are also included in the analysis.

- Environmental Compatibility: This portion of the analysis examines the environmental compatibility of the alternatives relative to each other in terms of the effects on sensitive areas, parks, recreational areas and historic sites on the area surrounding the airport.

- Development Costs: Comparisons of the relative costs required to modify the existing airfield under each alternative will be made. The relative cost assessments will provide a basis for comparing the cost effectiveness among the various alternatives.

FAA Design Standards

A comparison of FAA ARC C-IV and B-II design standards is included in this alternatives evaluation as a distinguishing characteristic between the No-Change, Alternative 1, and B-II runway development alternatives. The FAA ARC C-IV standards applied under the No Change and Alternative 1 are designed to accommodate aircraft with wingspans up to 170.99 feet, while B-II standards applied to the runway development alternatives are for wingspans up to 78.99 feet. As a result, ARC C-IV standards are significantly more restrictive and require larger safety areas and greater separation distances than needed under ARC B-II standards. Exhibit 5-6 compares key ARC C-IV and B-II design standards relevant to evaluating runway alternatives at Renton Municipal Airport.

## EXHIBIT 5-6: COMPARISON OF FAA ARC DESIGN REQUIREMENTS

| FAA ARC Design Element | C-IV (feet)* | B-II (feet)* |
|---|---|---|
| Runway centerline to parallel taxiway/taxilane centerline | ***400*** | 240 |
| Runway centerline to edge of aircraft parking | ***500*** | 250 |
| Runway width | 150 | 75 |
| Runway safety area (RSA) width | ***500*** | 150 |
| Runway safety area length beyond each runway end or stopway end, whichever is greater | ***1,000*** | 300 |
| Runway object free area (OFA) width | ***800*** | 500 |
| Runway object free area length beyond each runway end or stopway end, whichever is greater | ***1,000*** | 300 |
| Runway protection zone at the primary runway end ** | | |
| • Length | 1,700 | 1,000 |
| • Width 200 feet from runway end | 500 | 500 |
| • Width at far end from runway | 1,010 | 700 |
| Runway protection zone at other runway end | | |
| • Length | ***1,700*** | ***1,000*** |
| • Width 200 feet from runway end | 500 | 500 |
| • Width at far end from runway | ***1,010*** | ***700*** |
| Taxiway width | ***75*** | 35 |
| Taxiway safety area width | ***171*** | 79 |
| Taxiway object free area width | ***259*** | 131 |

* Note: The airport is not in compliance FAA ARC design requirements listed in ***Bold Italics.***
** Assumes approach minimums greater than 3/4 mile.

As is apparent from Exhibit 5-2, ARC C-IV standards are significantly more restrictive than B-II and substantially affect the airport's ability to comply with FAA design requirements. The more restrictive lateral separations called for under ARC C-IV standards would require major reconstruction of airfield facilities in both the No Change alternative and Alternative 1 to relocate taxiways, aircraft parking areas, aircraft hangars, and buildings farther from the runway centerline. Also to be removed would be the bridge abutments on the Cedar River at the north end of the runway.

To implement the No Change alternative and bring the airport into full compliance with C-IV standards without modifying the airfield would require the City of Renton to acquire property rights to an area of land 800 feet wide by 700 feet long south of the existing runway to accommodate the runway OFA and safety area. This action would require the City to reroute Airport Way and remove all structures within the area. On the north end of the runway, the City would have to fill an area 800 feet by 1,000 feet to establish a safety area on that end. For Alternative 1, a modification of the airfield to accommodate C-IV safety areas and OFA, it is expected that the FAA will require the airport to relocate the Runway 15 threshold 1,000 feet to the south and move the Runway 33

threshold approximately 700 feet to the north, effectively reducing the runway length to 3, 544 feet for landings. Even with this action, the Cedar River and the Boeing bridge would still be in the runway safety area.

Under both the No Change alternative and Alternative 1, Boeing bridge abutments, seaplane launching and recovery operations near the north end of the runway, as well as a large part of the existing restaurant, fall within the 800 foot wide runway ARC C-IV object free area. The existing seaplane launch ramp is located only approximately 75 feet from the edge of the Runway 15 threshold. This creates operational constraints to the use of the runway while seaplanes are being launched and recovered. Continuance of these activities would require a temporary waiver from the FAA. Other structures along the runway are more problematic and airport facilities and development on both the east and west sides along the entire length of the runway may need to be removed or relocated if ARC C-IV standards are strictly applied.

Given the constrained nature of the airport site and the magnitude and costs of such an undertaking, both the No Change option and Alternative 1, reconfiguration of the airport to meet ARC C-IV requirements, are impractical given the insignificant level of C-IV aircraft activity at the airport. Because of the unlikelihood of the implementation of the No Change option, it has been eliminated from further analysis.

Under FAA ARC B-II design requirements, the lateral separation distances from the runway, and the object free area required, are significantly reduced from ARC C-IV standards. The result of the reduced standards is that, while the seaplane staging area would be located within the runway object free area, the launch and recovery operations occurring on the ramp would be adjacent to, but outside, the OFA. Under Alternative 2, a 300 foot displacement of the Runway 15 threshold, the restaurant building falls outside the runway OFA. As in Alternative 1, a temporary FAA waiver would likely be required for continued operation of the seaplane staging area under this alternative and operational constraints on the runway could remain. The seaplane ramp will eventually need to be relocated out of the OFA.

In Alternative 3, a 400 foot displacement of the Runway 15 threshold, as with Alternative 2, compliance with ARC B-II lateral separation and object free area requirements are significantly eased compared to ARC C-IV standards under Alternative 1. Seaplane launch and recovery can freely occur without causing operational constraints to the runway because both the launch ramp and staging area fall outside the runway safety and object free areas. No FAA waivers would be required for continued seaplane operations under this alternative.

Under Alternative 4, a 300 foot extension of the runway into Lake Washington, the seaplane staging and launch and recovery operations remain within the runway object free area, while the restaurant building falls outside the OFA. As in Alternative I and Alternative 2, a temporary FAA waiver would be required for continued operation of the seaplane launch ramp under this alternative, and the ramp would eventually need to be relocated.

Operational Efficiency

A primary measure of operational efficiency in the context of this analysis is the capability of an alternative to accommodate the Boeing 737/757 aircraft To measure operational efficiency, FAA Declared Distances were calculated for each alternative. The Declared Distances serve to inform pilots of the distances available for takeoff run (TORA), overall takeoff distance (TODA), accelerate-stop distance (ASDA), and landing distance available (LDA). These published numbers, when compared to an aircraft's operating and performance requirements, help to inform pilots about the aircraft's ability to operate safely at the airport.

**EXHIBIT 5-7: FAA DECLARED DISTANCES BY ALTERNATIVE**

| FAA Declared Distances (in feet) | Alt. 1 ARC C-IV | Alt. 2 ARC B-II | Alt. 3 ARC B-II | Alt. 4 ARC B-II |
|---|---|---|---|---|
| **Takeoff Run Available (TORA)*** | | | | |
| • Runway 15 | 5,379 | 5,379 | 5,379 | 5,379 |
| • Runway 33 | 5,379 | 5,379 | 5,379 | 5,379 |
| **Takeoff Distance Available (TODA)*** | | | | |
| • Runway 15 | 5,379 | 5,379 | 5,379 | 5,379 |
| • Runway 33 | 5,379 | 5,379 | 5,379 | 5,379 |
| **Accelerate-Stop Distance Available (ASDA)** | | | | |
| • Runway 15 | 4,549 | 5,249 | 5,249 | 5,249 |
| • Runway 33 | 4,379 | 5,079 | 5,079 | 5,379 |
| **Landing Distance Available (LDA)** | | | | |
| • Runway 15 | 3,549 | 4,949 | 4,849 | 5,249 |
| • Runway 33 | 3,379 | 4,739 | 4,739 | 5,039 |

* Note: Total runway length equals 5,379 feet.

Alternative 1: Modification of the Airport to C-IV Standards
Alternative 2: A 300 Foot Displacement of Runway 15 Threshold
Alternative 3: A 400 Foot Displacement of Runway 15 Threshold
Alternative 4: A 300 Foot Extension of Runway 15 Safety Area into Lake Washington

In Chapter 4, Airport Facility Requirements, a recommended runway length of 3,900 feet is identified as needed to accommodate the critical design aircraft. As is evident from Exhibit 5-7, all of the alternatives under consideration could satisfy runway length requirements for the critical aircraft.

According to Boeing Commercial Airplane Group, the greatest concern to Boeing Test Flight operations is that all of the Boeing flights are the first flight of a new production aircraft. Therefore, it is of primary importance to Boeing that runway length calculations consider worst case parameters when evaluating alternatives to the existing runway configuration. Other concerns that need to be considered in regard to runway configuration changes relate to runway length requirements of potential new Boeing aircraft designs, the landing of Boeing 737/757 aircraft at the airport, the introduction of electronic precision instrument approaches (PIA), and military operations.

The Boeing Company has indicated that for B-737 production aircraft, a worst-case accelerate-stop distance requirement is 4,800 feet. This distance calculation leaves little or no margin for error or unfavorable conditions. Given that initial flights of new production aircraft are normally made using Runway 33, Alternative 4, a 300 foot extension of Runway 15 Safety Area into Lake Washington, would provide the longest available runway surface for meeting accelerate-stop distance requirements. Application of FAA declared distances as part of ARC C-IV requirements under Alternative 1 clearly reduces Runway 33 accelerate-stop distance below acceptable levels as is evident in Exhibit 5-3.

Alternatives 2 and 3, while not reducing the actual runway length available for takeoff have some possible adverse implications for Boeing operations due to the relocation of painted runway surfaces toward an area of critical importance for maximum braking effort during an aborted takeoff. The Boeing Company has indicated that a 300 foot relocated threshold for Runway 15 would likely have negligible adverse impacts on their operations.

Considering Boeing Company comments, Alternative 4, a 300 foot extension of Runway 15 Safety Area into Lake Washington, is the most favorable runway development alternative relative to Boeing 737/757 operations at the airport, followed by Alternative 2, a 300 foot displacement of Runway 15 threshold. The differences between Alternative 1 and Alternatives 2, 3, and 4 are primarily the application of FAA standards and the safety margins available based on declared distances. None of the runway development alternatives call for lengthening or shortening the actual paved runway surface. Safety margins are increased by either reducing the declared distances to reflect FAA safety margins under Alternatives 2 and 3, or creating a runway safety area by means of a 300 foot extension into Lake Washington under Alternative 4.

Environmental Compatibility

The purpose of this discussion is not to attempt to quantify the environmental impacts associated with each alternative under consideration. This will be done for the preferred alternative in the following chapter. Rather, this discussion is intended to provide a relative comparison of the alternatives against one another from an environmental perspective.

Alternative 1 could result in substantial impacts if FAA ARC C-IV design standards are applied to the airport. These impacts would result from the total reconfiguration of airport facilities that would be required to provide a 500 foot safety area width and an 800 foot wide object free area for the runway. Under this scenario, no fixed or movable objects would be allowed within 400 feet of the runway centerline, except those required for air navigation or aircraft ground maneuvering. A quick review of airport plan drawings indicates that a substantial percentage of airport facilities would be impacted by such a requirement.

Alternative 3 may provide some minimal favorable environmental impact over other alternatives by eliminating any operating constraints imposed on the runway by the seaplane operation.

However, the possibility of relocating the seaplane ramp and staging area outside of the runway object free area in Alternatives 1 and 3 could provide the same benefits.

The most significant environmental impact associated with any of the runway development alternatives is the filling of Lake Washington to create a runway safety area under Alternative 4. Assuming a fill area slightly larger than the 150 foot by 300 foot runway safety area, and also assuming an average fill depth of 15 feet, approximately 38,000 cubic yards of fill material could be needed accounting for settling and compaction. Additional riprap would also need to be provided to protect the sides of the filled area from erosion by wave action.

Fill material would be obtained from the Cedar River, immediately adjacent to the airport. The Cedar River is currently under review for a US Army Corps of Engineers dredging project to help alleviate flooding caused by the siltation of the river over many years. The fill material is believed to be of high quality and would impose no environmental problems. Even so, this action would require a significant level of review and analysis by the applicable and appropriate regulatory agencies.

Development Costs

As with the environmental analysis above, the purpose of this discussion is to compare and contrast the relative cost differences between each of the alternatives. This comparison helps to provide a basis for selecting the appropriate course of action for the airport.

From the information presented above, it should be clear that Alternative 1, modification of the airport to C-IV standards, is not assumed to be cost free. Substantial costs could be incurred in relocation of the restaurant and other airport facilities to comply with FAA ARC C-IV design requirements. Although difficult to quantify, Alternative 1 could, in the long-run, be the most expensive alternative of those under consideration.

Alternatives 2 and 3 are expected to be essentially equivalent in cost. For both alternatives, development costs will include those associated with relocating the Runway 15 threshold, and associated modifications to Taxiways A and H. Threshold relocation costs will include relocating the threshold lighting system, paint, and re-painting and striping of the runway. For comparison purposes with other alternatives, this work is expected to amount to approximately $50,000.

Of the B-II runway development alternatives, Alternative 4 is expected to be the most costly, as well as taking the longest time period to implement. Order of magnitude estimated costs for filling into Lake Washington would be $150,000 for fill material and an additional $285,000 for rip-rap. For preliminary planning purposes an overall cost of $500,000 should be assumed. Clearly, Alternatives 2 and 3 represent the lower cost alternatives for the airport.

### 5.1.4 Runway Alternative Analysis Summary

The purpose of this section is to summarize the alternatives analysis and provide the basis necessary for selecting a preferred runway development plan for the airport. The matrix provided in Exhibit 5-8 subjectively ranks each alternative on a scale of 1 (lowest level of desirability) to 5 (highest desirability), according to its relative performance against each of the evaluation criteria discussed above.

**EXHIBIT 5-8: ALTERNATIVES COMPARISON SUMMARY**

| | FAA Design Standards | FAA Declared Distances | Operational Efficiency | Environmental Impacts | Development Cost | Score |
|---|---|---|---|---|---|---|
| Alternative 1 | 1 | 1 | 3 | 2 | 1 | 8 |
| Alternative 2 | 4 | 4 | 4 | 5 | 3 | 20 |
| Alternative 3 | 4 | 3 | 5 | 5 | 5 | 22 |
| Alternative 4 | 5 | 5 | 3 | 1 | 2 | 16 |

1 = lowest ranking 5 = highest ranking
Alternative 1: Modification of Airport to C-IV Standards
Alternative 2: A 300 Foot Displacement of Runway 15 Threshold
Alternative 3: A 400 Foot Displacement of Runway 15 Threshold
Alternative 4: A 300 Foot Extension of Runway 15 Safety Area into Lake Washington

Alternative 1, modification of the existing runway, receives the lowest score due to the significant problems of complying with FAA standards. Compliance with FAA standards will impact the airport's ability to meet declared distance requirements for Boeing aircraft. Even if the runway thresholds are relocated, per FAA requirements, full compliance to runway safety area standards will be impossible to meet. At the northeast end of the airport, the runway safety area and obstacle free area both extend eastward over the Cedar River and the north Boeing bridge. Both the bridge and the river channel would be injurious to the passage of an aircraft through the safety area. In addition, seaplane support vehicles on land and the seaplanes, even when in the water, would be within the safety and obstacle free areas west of the runway. The seaplane launch/retrieval ramp would have to be relocated 315 feet to the west to permit its use under this alternative. This could not be accomplished without removal of a portion of the existing restaurant building.

Alternative 2, displacement of the Runway 15 (north) threshold 300 feet to the south, ranks closely with Alternative 3. Alternative 2 receives a lower scoring, however, due to the fact that it does little to permit improved seaplane support vehicle operations on the west side of the runway and the obstacle free area extends over the north Boeing bridge and the Cedar River on the east side. This is because the boundary of the OFA extends 300 feet north of the threshold line. Because the seaplane support vehicles cannot operate within the obstacle free area, the seaplane area must be reduced to provide clearance for aircraft wings and vehicles. Both support vehicles and seaplanes in the water would have to be relocated prior to Boeing takeoffs, a procedure detrimental to seaplane operations.

Alternative 3, displacement of the Runway 15 threshold 400 feet to the south, puts the existing seaplane ramp 100 feet north of the end of the runway obstacle free area and eliminates the need to immediately relocate the ramp. Seaplane support vehicles could operate within the 100 foot area between the north edge of the obstacle free area and the launch/retrieval ramp, but seaplane operations would still need to be interrupted when Boeing takeoffs are initiated. Both support vehicles and seaplanes in the water would have to be relocated prior to the Boeing takeoff, which is a detrimental operations procedure. On the east side of the airport, the obstacle free area stops at about the west bank of the Cedar River. The landing distance available (LDA) to aircraft is 100 feet less than Alternative 2.

Alternative 4, a 300 foot extension of the Runway 15 safety area into Lake Washington, is desirable from a Boeing operational standpoint. The OFA, however, would still extend over the north Boeing bridge and the Cedar River, as in Alternative 2, and it would require the relocation of the seaplane ramp approximately 65 feet to the west. As with the other alternatives, support vehicles and seaplanes in the water would have to be relocated prior to Boeing take-offs. Nevertheless, because of the extreme difficulty of obtaining approvals for constructing such protrusions into Lake Washington, not considering any potential environment impact on the Lake or shoreline, it is considered an impractical option.

The preferred course of action concerning the establishment of an airport reference code (ARC) for Renton Municipal Airport is to adopt an ARC of B-II for the airport, with certain facilities critical to Boeing 737 and 757 operations, such as runway width, pavement strength, and certain taxiway clearances, designed appropriately.

The preferred course of action concerning runway development alternatives is the implementation of Alternative 3, the 400 foot displacement of the Runway 15 (north) threshold. This alternative is recommended because it will address immediate FAA mandated design requirements and operating issues at the airport until adequate land area at the northwest corner of the airport can be obtained to permit the relocation of the seaplane launch/retrieval ramp. While this alternative is not as favorable to Boeing operations as Alternative 4, it does provide a low-cost, short-term solution while not having a significant impact on Boeing operations.

When the seaplane launch/retrieval ramp is relocated, consideration should be given to the implementation of Alternative 2, the displacement of the Runway 15 threshold 300 feet to the south, providing an additional 100 feet of useable runway. An FAA waiver would be required for that portion of the OFA which extends over the north Boeing bridge and the Cedar River on the east side.

## 5.2 TERMINAL AREA DEVELOPMENT ALTERNATIVES

As indicated in Chapter Two, Demand Forecasts, and Chapter Four, Facility Requirements, a significant amount of activity at the airport comes from itinerant pilots and passengers, and commercial service passenger operations, conducted by both land based charter operators and seaplane air taxi operators utilizing Lake Washington. Existing and forecast levels of growth are significant enough to warrant the establishment of a combination air taxi passenger/general aviation terminal area. A terminal building helps smooth the transition from airside to landside operations, and can also function as an important gateway to the community. Components of a terminal area complex should include a terminal building, terminal airside staging area/apron, support facilities, and access system.

### 5.2.1 Terminal Area Criteria

There are a number of basic factors that must be considered in the siting of a passenger terminal. These factors revolve around the relationship of the terminal to the airfield, the relationship of the terminal to other airport facilities, and physical siting considerations. Criteria used to evaluate a recommended terminal site include the following:

Runway Configuration

The runway configuration at an airport has a significant impact on the location of the apron-terminal complex. The terminal site should be located to minimize aircraft taxiing distances and times and the number of active runway crossings required between parking aprons and runways. At an airport, such as the Renton Municipal Airport, with a simple runway configuration, this may dictate locating the passenger terminal centrally with respect to the primary runway. However, since seaplanes are a water dependent activity, the proposed terminal should, naturally, have direct access to Lake Washington.

Access to Highway Network

The motor vehicle is and will continue to be the major mode of ground transportation to and from the Renton Municipal Airport. From a cost and efficiency standpoint, the passenger terminal should be located, when possible, to provide the most direct and shortest routing to the access roadway system serving the population center generating the major source of passengers and freight. Adequate area/distance should be provided between the public highway and the primary terminal building to accommodate the ultimate terminal development and necessary future highway interchanges and roadway alignment improvements.

Expansion Potential

To assure the long-term success of an airport terminal facility, potential expansion beyond forecast requirements should always be taken into consideration. In the planning stage, the terminal should be conceived in its ultimate form with reasonable allowance for growth and changes in operation beyond forecast needs. Use of this principal in selecting a terminal site or expansion scheme will

promote the provision of adequate space around the terminal (both on the airside and landside) for orderly construction of succeeding stages.

FAA Geometric Design Standards

Terminal facilities require a location that will assure adequate distances from present and future aircraft operational areas in order to satisfy FAA airport geometric design standards. These standards include such minimum separation distances as those between a runway centerline and aircraft parking aprons, buildings, and airport property lines; and those between a taxiway centerline and fixed/movable objects and other taxiways.

Existing and Planned Facilities

Existing and planned structures and utilities should be carefully inventoried and taken into account when planning new or expanded terminal facilities. In some cases, existing facilities or utilities, which are not related to and are restrictive to terminal development, can be demolished, abandoned, or relocated to a more suitable area. In other instances, existing conditions may limit the number of possible alternative terminal sites. In all cases, existing or planned locations of a FAA control tower, navigational aids, weather equipment, etc., should be analyzed to assure that terminal development will not interfere with line-of-sight or other operational restrictions associated with these facilities.

Terrain

Topographical conditions should be considered in the selection of a terminal building site. For instance, potential drainage problems can be reduced if the terrain lends itself to naturally carrying water away from the building. Developing the terminal site on relatively flat land can prove economically advantageous by reducing grading or quantities of fill.

Environmental Impacts

The location of a terminal facility or major expansion of an existing one may result in significant environmental impacts that must be analyzed and weighed in considering alternative terminal sites.

### 5.2.2 Terminal Building Alternatives

Based upon the criteria identified above, only a limited number of options exist in regard to providing terminal facilities at Renton Municipal Airport. Because of the water-dependent characteristics of the type of commercial air service currently being provided at the airport a site with direct access to the shoreline is preferable. Aside from the no action alternative, the most feasible terminal development alternatives relate to the utilization of the existing restaurant site at the northwest end of the airport. The restaurant is an approximately 12,560 square foot single story woodframe building. The 81,300 square foot lease area includes water, sewer, electricity, paved parking for approximately 80 to 100 automobiles, direct access to the Lake Washington shoreline, and good off airport access to Rainier Avenue. The current lease for this parcel runs to year 2016, with two five year options for renewal extending the lease period to 2026. Exhibit 5-9 identifies the existing restaurant site and potential terminal location.

*This page intentionally left blank.*

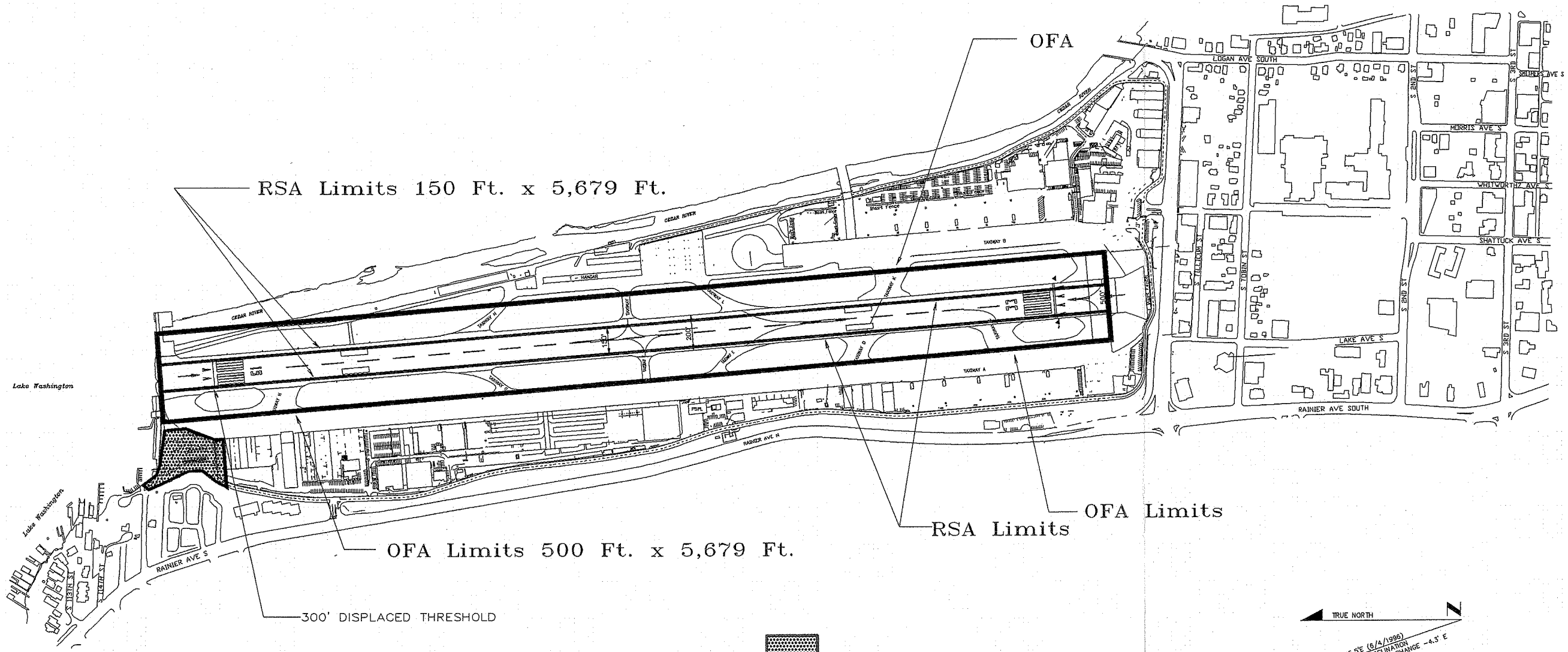



EXHIBIT 5–9

300 FT Reduction of Rwy 15 Threshold

B–II STANDARDS

POTENTIAL TERMINAL LOCATION

BUCHER, WILLIS & RATLIFF CORPORATION

Four terminal building alternatives were identified with regard to the site located at 1011 West Perimeter Road, including the No Action alternative. They include:

- No Action;
- Alternative 1: Basic Terminal Facilities;
- Alternative 2: Build New Terminal;
- Alternative 3: Convert Existing Building to Terminal; and
- Alternative 4: Shared Facility.

No Action

The No Action alternative represents the status quo, and no centralized terminal facilities are programmed for the airport to accommodate air taxi operators, passengers, and U.S. Customs.

Alternative 1: Basic Terminal Facilities

This alternative develops basic terminal area needs without a major disruption to existing uses. The items would be temporary until a long term solution can be found, and include a customs inspection area, restrooms and a small lounge with telephone and flight planning area.

Alternative 2: Build New Terminal

In this alternative, the existing restaurant would be replaced by a new terminal building. This option would involve purchase of the existing lease, demolition of the existing building, and construction of a new seaplane/general aviation terminal building. As outlined in Section 4.2.1 of the Facility Requirements Chapter, the minimum size of new terminal building could range from approximately 6,000 square feet to 13,500 square feet, depending on certain optional design considerations.

Alternative 3: Convert Existing Building to Terminal

In this alternative, the existing restaurant would be closed, and the building would be used for processing enplaning and deplaning seaplane passengers, airport administrative functions, a pilot's flight planning area, waiting area for non-air taxi itinerant pilots and passengers, U.S. Customs, restrooms, food service and/or concession area, and storage area.

Alternative 4: Shared Facility

This alternative represents a short-term solution for providing facilities to service seaplane passengers. In this alternative, existing restaurant operations and facilities would be reduced by about a fourth, and the remaining facilities would be converted to a passenger processing area for air taxi operators and US Customs. At a minimum, approximately 3,000 square feet of space would be needed to accommodate air taxi passengers.

### 5.2.3 Terminal Alternatives Evaluation

At present, there are no sheltered facilities available for accommodating enplaning and deplaning seaplane air taxi passengers utilizing the Renton Municipal Airport. This has been identified as a significant problem by air taxi operators, US Customs officials, and a survey of local aircraft owners and operators done as a part of this Master Plan. As reported in Chapter 2, Aviation Demand Forecasts, it is estimated that there are approximately 10,000 passengers passing through the airport over the course of a year. Most of this activity occurs during the four and a half month salmon fishing season and involves international flights to and from Canada. Each return flight is approximately three to four hours long and passengers must clear U.S. Customs before they can access covered shelter, restrooms, or eating facilities.

Out-bound and in-bound passenger processing takes place at individual operator offices and passengers must be shuttled back and forth between the seaplane ramp and air taxi offices. During peak summer periods congestion occurs on and around the ramp area due to the number of shuttle vans loading and unloading luggage and passengers and the presence of seaplane launch/retrieval vehicles operating on the ramp. Without constant supervision, it is easy for passengers to wander onto the active runway. For afternoon arrivals, peak period congestion is compounded by the need for all international flights to clear U.S. Customs before any aircraft or passengers may leave the area.

To pursue a No Action policy would most likely result in increased ramp congestion, a leveling off of seaplane activity, or even a decrease in activity. Various economic studies (*Estimating the Regional Economic Significance of Airports*, US Dept. of Transportation, 1992) have estimated that an expenditure for an out of town visitor can range from $300 to $618 per person for small consolidated metropolitan statistical areas (CMSAs). Development of a small passenger terminal could act as an anchor for other activities along the northwest end of the airport, such as a restaurant, town meeting hall, marina, and retail shops.

Alternative 1 is presented only to give Renton Municipal Airport a solution that would meet basic needs without the buy-out of the restaurant lease. The measure should not be looked upon as a permanent solution, but rather provides terminal facilities until the long term solution can be implemented.

In Alternative 2, the existing restaurant building would be replaced by a new terminal building. This option would involve the purchase of the existing lease from the primary lease holder and sublease holder, razing of the existing building, and constructing a new 14,000 square foot seaplane/general aviation terminal building. The primary advantage of this alternative is the ability to construct a new terminal building to the specific requirements of the airport and air taxi operators, with the capability to expand in the future. Another advantage to this alternative is that the airport would regain control of a significant land parcel that is currently under long term lease, and which could be more effectively utilized to the airport's advantage. The major disadvantage to Alternative I is the cost of acquiring the leases, razing of the existing structure, and construction and permitting of a new

terminal building. The estimated probable cost of buying out the existing lease and demolishing the existing building is approximately $1.33 million. The probable estimated cost of the construction of a new terminal building is approximately $2 million, for a total estimated cost of $3.35 million.

In Alternative 3, the existing lease holders would be bought out and the restaurant would be closed. This action would then allow the building to be converted to a terminal to be used for processing enplaning and deplaning seaplane passengers, airport administration, pilot/flight planning , waiting space for non-air taxi itinerant pilots and passengers, customs, restrooms, food service and/or concession area, and storage area. The primary advantages to this course of action are two fold: first, the existing building could be utilized, thus eliminating the cost of demolition and new construction; and secondly, as in Alternative 2, the airport would regain control of a significant land parcel that is currently under long term lease. This alternative does not preclude the reopening of a reduced size restaurant or lounge, but all leases for terminal space would be of a short term (five years) duration to preserve the airport's future options. The disadvantages to this alternative are having to retrofit the functional areas of the terminal into an existing building, and the cost of remodeling the building, estimated to be approximately $1.5 million, including acquiring the existing lease.

Alternative 4 represents a solution for providing facilities to service seaplane passengers. In this alternative, existing restaurant operations and facilities would be reduced by about a fourth, and the remaining facilities would be converted to a passenger processing area for air taxi operators and US Customs. Approximately 3,000 square feet of space would be needed to accommodate air taxi passengers, and the remaining 9,500 square feet could continue in operation as restaurant/lounge. Advantages to this alternative include the relatively low cost of subleasing a portion of the building as opposed to buying out the entire lease, and relatively short time frame this strategy could be implemented. The disadvantage to this course of action is the lack of a medium to long term strategy to accommodate the forecast growth in seaplane activity, and the lack of control over the entire leasehold.

Summary

To pursue a No Action policy would most likely result in increased ramp congestion, a leveling off of seaplane activity, or possibly a decrease in activity. The No Action approach may also represent a missed opportunity for the City to capitalize on a significant economic generator. Each of the three action alternatives would alleviate the congested and potentially unsafe conditions that currently exist. Each alternative also presents the airport with significantly different advantages and disadvantages.

The primary advantage of Alternative 2 is the ability to construct a new terminal building to the specific requirements of the airport and air taxi operators, with the capability to expand to meet future needs. The major disadvantage to Alternative 2 is the cost of acquiring the leases, demolition of the existing structure, and construction and permitting of a new terminal building.

The two primary advantages to Alternative 3 are: (1), the existing building could be utilized, thus eliminating the cost of demolition and new construction; and (2) as in Alternative 2, the airport would regain control of a significant land parcel that is currently under long term lease. The two primary disadvantages to Alternative 2 are the loss of flexibility in designing the functional areas of the terminal in an existing building and the cost of remodeling the building.

Advantages to Alternative 3 include the relative low cost of subleasing a portion of the building as opposed to buying out the entire lease. The disadvantages to this course of action are the lack of a long term strategy to accommodate the forecast growth in seaplane activity and the lack of control over the entire leasehold.

Both Alternative 2, construction of a new building, and Alternative 3, utilization of the existing building, provide for the purchase of the existing lease on the property where the current airport restaurant is located. This is the major advantage of these two alternatives over the third alternative of subleasing from the current leaseholder. Subleasing from the existing restaurant sublease for space in which to process seaplane passengers constrains future growth potential and give the airport little control over future changes to the use of the remaining portions of the building.

An even more important factor to be considered is that the use of available airport land must be subject to a set of priorities that assure that it is used for its best purpose. (This will be discussed in more depth in Section 5.3). A restaurant/lounge is not considered by the FAA to be a critical aviation dependent use that requires direct access to the airport taxiway-runway system. It is a tertiary use that could be accommodated elsewhere on, or near, the airport. The use of the existing restaurant site for direct aviation use is a key to the development of Renton Municipal Airport into a thriving commercial operation for both commercial and general aviation users. It is of critical importance to the airport to regain control over the area where the restaurant is located in order to fulfill its overall mission of providing a public facility with the capability to accommodate the aviation needs of the City of Renton and the Puget Sound.

The tradeoffs between Alternatives 2 and 3 relate to the cost of demolishing the existing building and constructing a new one versus the lesser cost of remodeling an existing building, but incurring a certain loss of flexibility in design and layout. The estimated probable cost of demolishing the existing restaurant building and constructing a new 6,000 square foot terminal building is approximately $2.2 million; to build a new 13,500 square foot terminal building with restaurant and meeting hall would cost approximately $3.35 million. The estimated probable cost of remodeling the existing building is in the area of approximately $1.5 million.

Based upon an evaluation of the alternatives, the recommended course of action is to, in the short term, pursue Alternative 1 of construction of a small terminal building adjacent to the restaurant to provide basic pilot facilities. In the long term, the airport should acquire the lease for the property and building and convert the restaurant to a passenger terminal.

## 5.3 GENERAL AVIATION AREA ALTERNATIVES

The shortage of general aviation T-hangars, T-hangar apron area, itinerant apron parking, and auto parking at the airport has been well documented in the previous two Master Plans for the airport. As detailed in Section 4.3 of the Facility Requirements, there is a need for an additional 79 T-hangars, 18,433 square yards of hangar apron, and approximately 7,200 square yards of parking apron in the short term planning period.

Developing the proper areas for general aviation hangars, apron, FBO/maintenance, air taxi, auto parking, and kindred facilities was approached using several considerations. In this analysis the following factors were examined:

- Compatibility with other airport facilities;
- Adequacy of land envelope;
- Compatibility with surrounding airport land use;
- Access to runway system; and
- Access from roadways.

Due to the urban nature of the airport vicinity, the expansion of the airport is an unlikely possibility because of physical constraints and prohibitive costs. Any increase in aircraft parking capacity, therefore, must take place within the confines of the existing airport property. Reconfiguration of existing facilities will only yield minimal increases in capacity. To substantially increase capacity in which to accommodate the aviation needs of the airport over the next twenty years, a significant re-examination of current airport land use should be reviewed.

A basic assumption in evaluating general aviation alternatives is that Boeing will relocate the majority of its activities from "Apron C" on the west side of the airport to the southeast corner of the airport when their lease expires in the year 2010. This policy decision was discussed, evaluated, and approved in the 1988 Renton Municipal Airport Master Plan Update.

Without reiterating the exhaustive discussion of alternative strategies for accommodating pent-up and future aviation demand on the Renton Municipal Airport that was the focus of the 1988 Master Plan Update, it is felt that a few basic principles related to the use of the airport should be reviewed.

The primary function of the Renton Municipal Airport is to provide the City of Renton and the Puget Sound with a safe, efficient link to the nation's air transportation system. In order to accomplish this function, the use of available airport land must be subject to a set of priorities that assure that it is used for its best purpose. This priority list is summarized as follows:

- Airport Operations Area: Includes that land required for runways, taxiways, approaches, and related aviation facilities. The amount of land required herein is largely dependent upon the airport designation, safety areas, and FAA criteria.

- Aviation Support Facilities: Includes passenger terminal services, surface access, and general aviation facilities. Demand levels, required (or desired) auxiliary uses, and airfield layout are some of the factors that influence the amount of land required in this category.

- Aviation Related Development: This category includes land uses that are reliant, in some manner, upon the airport for their businesses. Examples include air cargo activities, aircraft manufacturing, remodeling, sales, and repair. Demand levels determine the amount of land specified for this use.

- Industrial/Commercial Development: This includes any business and/or industry that can locate on the airport but doesn't have any requirements to access the airfield. These concerns are compatible with airport operations, and space requirements are determined by demand.

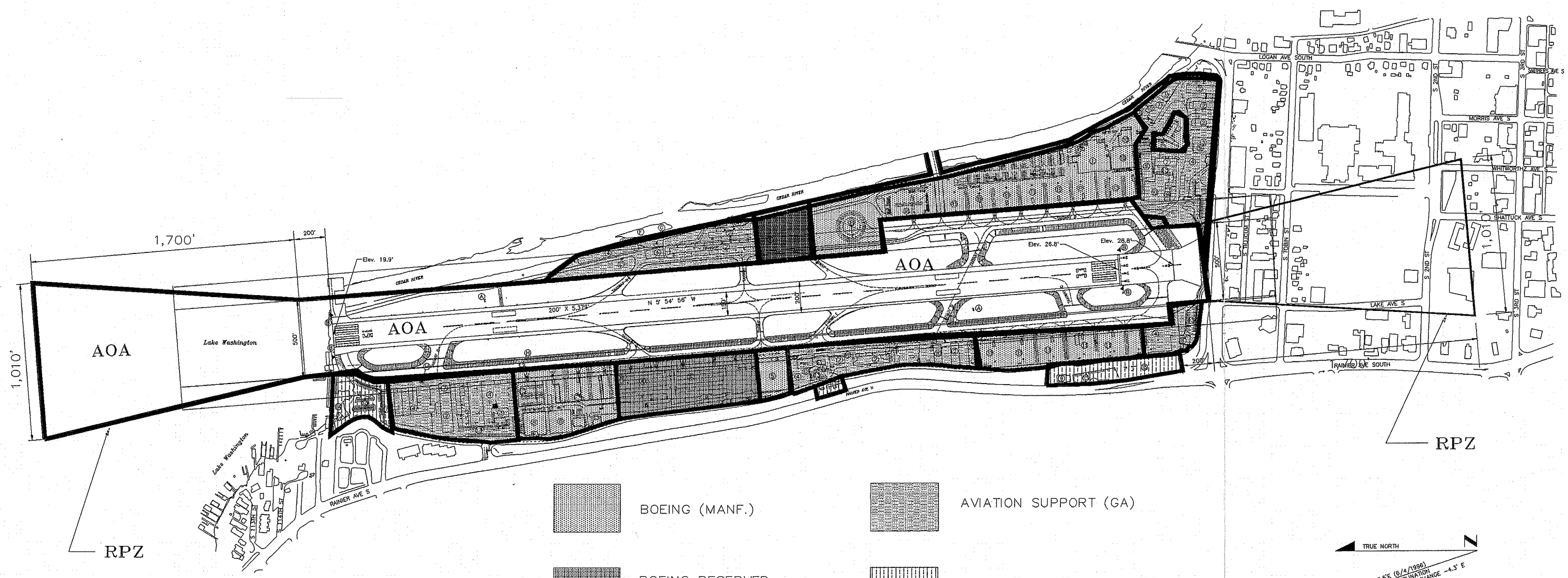
- Vacant or Buffer Areas: Areas that, for any reason, cannot be used for any of the preceding broad uses should be set aside as buffer areas to complement surrounding, possible non-compatible, community land uses.

Conformity to this hierarchy of uses at Renton Municipal Airport is critical in order for the airport to fulfill its obligation to provide facilities and services to accommodate the flying public.

Exhibit 5-10 shows existing land uses on the airport. As is evidenced from this exhibit, many areas on the airport are misappropriated based upon the type of activity being conducted on those areas versus the need for additional land for aviation support facilities with a need for direct airfield access.

While not much can be done to mitigate this situation in the short term, due to current lease obligations, a long-term strategy can, and should be, implemented that will be more restrictive in allowing non-aviation support uses onto areas that better serve the airport's overall mission of providing access to the nation's air transportation system.

# EXISTING LAND USE




BOEING (MANF.)

BOEING RESERVED FOR FUTURE USE

USE BY AIRPORT RESTRICTED BY BOEING

AVIATION SUPPORT (GA)

NON AVIATION RELATED

AIRPORT OPERATION AREA (AOA)

TRUE NORTH

19° 15.5'E (6/4/1996)
MAGNETIC DECLINATION
ANNUAL RATE OF CHANGE -4.3' E

EXHIBIT 5-10

RENTON MUNICIPAL AIRPORT

C-IV STANDARDS

EXISTING LAND USE

BUCHER, WILLIS & RATLIFF CORPORATION

### 5.3.1 Development Options

As stated in the 1978 Airport Master Plan, the rehabilitation or reconfiguration of the FBO area at the southeast corner of the airport will yield only a minimal increase in aircraft storage space. Some economies can be achieved by replacing some obsolete facilities and the redesign of some of the space, however, significant increases cannot be expected. Almost all significant development options for accommodating based and itinerant general aviation aircraft are contingent upon the airport regaining control over currently leased properties on the west side of the airport that are being used to support Boeing operations. Areas currently under lease to Boeing can be converted to aviation support facilities when Boeing's lease expires in the year 2010. Approximately 100 additional aircraft could be supported.

## 5.4 COMMERCIAL DEVELOPMENT ALTERNATIVES

An important goal for airport sponsors is to make the airport financially self-sufficient. One strategy to support this goal is to analyze airport property and assure that land not required for aviation purposes is used to its maximum potential. As shown previously in Exhibit 5-10, most land on the airport is being used for aviation-support facilities and aviation related activities. Non-aviation business opportunities may be possible in small interstitial areas on the airport where runway access is limited, or the second floor of some buildings. For both aviation and non-aviation related businesses, all structures should be designed to limit access to the AOA for security reasons and to prevent airfield incursions by surface vehicles. Airport development standards for all airport structures will be discussed in the Airport Plans Chapter.

### 5.4.1 Off Airport Land Acquisition

A primary opportunity for off airport land acquisition and development is the area south of the airport between Airport Way and South Tobin Street within the Runway Protection Zone (RPZ) for Runway 33. As described in Chapter 4, Facility Requirements, "where practical, the airport should own the property under the runway approach and departure areas to at least the limits of the RPZ. It is desirable to clear the entire RPZ of all above ground objects. Where this is impractical, airport owners, as a minimum, shall maintain the RPZ clear of all facilities supporting incompatible activities. Incompatible activities include, but are not limited to, those which lead to an assembly of people." As parcels become available, they should be acquired by the airport. Land acquisition for the purpose of securing the RPZ is eligible for FAA funding.

## 5.5 RECOMMENDED AIRPORT LAND USE

Based upon an examination of the issues and alternatives discussed in the preceding sections, recommended utilization of the airport, from a land use perspective, is shown in Exhibit 5-1 1. The strategy represented by this exhibit is based on the airport being designated as ARC B-II, conversion of the restaurant lease-hold to a passenger terminal area serving both general aviation itinerant and commercial service users, and the relocation of all Boeing activity to the east side of the airport. Development of the airport in this manner over the next 20 years should produce a balanced airside and landside complex to serve existing and forecast aviation demand.

## 5.6 OFF -AIRPORT ALTERNATIVES

Renton Municipal Airport is in an urban setting. Therefore, the impacts of airport activities go beyond the airport property line. The relationship of the airport to its environs should be blended as well as possible. Renton has a comprehensive city planning document that establishes guidelines for future growth and development. The airport should conform to the comprehensive plan as long as compliance does not impede aircraft operations. Failure to bring the airport into the overall plan for the city will result in an estranged relationship that will neither benefit the citizens of Renton nor the users of the airport.

## 5.7 GENERAL ALTERNATIVES

Other alternatives that do not fall into the previous categories includes the flooding of the Cedar River. The airport nor Renton has jurisdiction over the river. At one time the city dredged the river annually. The airport and the Boeing Company has flooded recently in part due to the stoppage of the dredging. Under current conditions, portions of the left bank are overtopped during the 1.6 year interval flood. Flooding over the left bank occurs at a 23 year event for the Boeing property and between 2 and 5 year event for the adjacent city park. In 1990, a 50 year flood event occurred and caused estimated damages of $8 million. The Corps of Engineers is in the process of completing a Section 205 study in which a reduction of flooding can be determined. The city should pursue a solution to the flooding problem and work closely with the Corps of Engineers.

# ULTIMATE LAND USE
# (YEAR 2015)

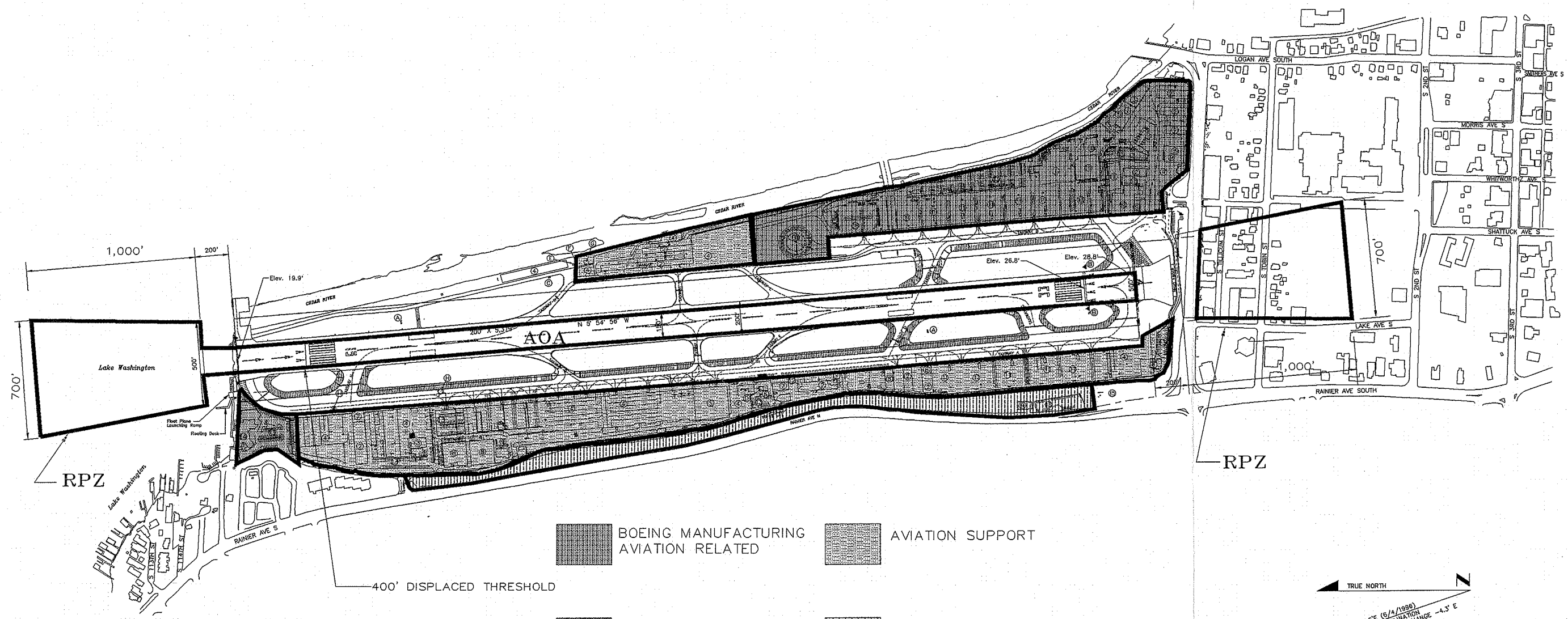



EXHIBIT 5–11

400 FT Reduction of Rwy 15 Threshold

B–II STANDARDS

ULTIMATE LAND USE

BUCHER, WILLIS & RATLIFF CORPORATION

## 5.8 AIRPORT RECOMMENDATIONS

The previous discussion in this chapter is an in depth analysis about the major issues at the airport. To address other important items that are necessary to complete this master plan update, the following text has been prepared to provide the recommendation's issues that do not need a major alternative analysis. Also included are the recommendations on all items at the airport.

*AIRFIELD RECOMMENDATIONS*

1. **Item** - Airfield out of compliance to FAA Airport Reference Code (ARC) separations.

**Recommendation** - Change ARC to B-II, Displace runway 400', change RPZ's to 500' x 700' x 1000'.

**Reason** - This solution solves the immediate FAA design separation criteria while meeting operational issues at the airport. The seaplane loading and temporary tie down area will not have to be moved because the displacement allows for 20' of clearance at the north end of the pavement and 15' of clearance at the north end of the OFA. Finally, the displacement of the threshold will not adversely affect Boeing aircraft operations if the threshold bars are "skip painted" which will not decrease friction of the critical braking areas.

2. **Item** - The Airport Master Plan Update calls for the change of the Renton Airport's Airport Reference Code (ARC) from C-IV to B-II. This change would decrease the pavement strength requirements for the runway and taxiways because B-II aircraft are lighter weight aircraft. Boeing 737 and 757 aircraft would, however, continue to operate on the airport's pavements and, without recognition of this requirement, pavements would be damaged by the excessive weight aircraft. Without FAA approval of the pavement strength requirements, the excess pavement strength would not be eligible for federal funding assistance.

**Recommendation** - That the runway and taxiway pavements utilized by Boeing aircraft be identified and that adequate, currently C-IV pavement strengths be maintained.

**Reason** - To ensure the safety and the long term pavement needs, current strength levels need to be kept in place for those pavements utilized by Boeing aircraft. The FAA has indicated that they will continue to participate in funding the current C-IV level of pavement strength at the airport.

3. **Item** - The airport has an excessive number of taxiways (12), all of which are wider than ARC B-II require. Current general aviation and limited use by Boeing aircraft will allow for less pavement width. Additionally, there are an excessive amount of dust cover pavement areas adjacent to taxiways. The quantity of paved areas are expensive to maintain.

A. Four taxiways (Echo, Golf, Lima and November) are designed with high speed exit angles, with some pavement sections in excess of 200 feet wide. The taxiway lengths are too short before a full stop is required, less than 100 feet, to accommodate high speed exits for large or fast-landing aircraft. Excessive pavement widths are expensive to maintain. Gaps in the runway edge lighting are caused by the wide runway entrances. Asphalt dust covers (non-full strength pavement areas for control of dust and debris blown by jet engines) border these taxiways; however, Boeing does not utilize these taxiways.

**Recommendation -** Realign taxiways to be perpendicular to the runway and reduce the taxiway widths to 50 feet. Bordering dust covers should be removed and converted to grassed areas to further reduce pavement maintenance costs.

**Reason -** Reduces pavement maintenance costs while maintaining taxiing needs for all aircraft.

B. Two taxiways (Foxtrot and Mike) are short, perpendicular taxiways at mid-runway. These taxiways serve no purpose which could not be served by other existing taxiways.

**Recommendation -** Eliminate these two taxiways.

**Reason -** Reduces pavement maintenance costs while maintaining taxiing needs for all aircraft.

C. Six taxiways (Alpha, Bravo, Charlie, Delta, Hotel , and Kilo) are designed for large aircraft with wide turning radii. Taxiways C, H and K are in excess of 150 feet wide. Gaps in the runway edge lighting are caused by the wide runway entrances. Asphalt dust covers border these taxiways; however, Boeing aircraft under engine power do not utilize all the taxiways.

**Recommendation -** Reduce the taxiway widths to 50 feet, realign taxiways to be perpendicular to the runway, remove the dust cover surfaces adjacent to taxiways not utilized by Boeing aircraft under engine power, and convert to grassed areas to further reduce pavement maintenance costs.

**Reason -** Maintains large aircraft (Boeing 757) pavement strengths where necessary, provides adequate widths for Boeing and all general aviation aircraft, and maintains taxiing needs for all aircraft, while reducing pavement maintenance costs where possible.

**4. Item** -Storm water drainage systems do not work effectively.

**Recommendation** - Re-engineer the east and west safety area drainage systems to outfall into Lake Washington, and recontour the grassed safety areas to provide drainage swales. Paved dust covers (non-full strength paved areas of 2" asphalt) in areas not utilized by Boeing aircraft under their own power, should be converted to grass and incorporated into the grassed safety area. Oil/water separators would be required, but fewer would be required than to equip all existing outfalls.

**Reason -** Allows for more efficient and environmentally acceptable disposal of storm water.

**5. Item** - Aircraft run-up areas need to be designated at each runway end.

**Recommendation -** Paint run-up areas inside Taxiway Alpha and Bravo on dust cover areas and strengthen the pavements.

**Reason -** Pilots need to have a place near each runway threshold to complete the final checklist which includes throttling/running up the engines.

*TERMINAL AREA RECOMMENDATIONS*

**6. Item**- There are no sheltered facilities for accommodating aircraft crew members, enplaning and deplaning passengers, or a place for U.S. Customs to conduct inspections of international passengers.

**Recommendation**

A. **Short-Term -** The number of enplaning commercial passengers should be documented to support the need for an expanded terminal facility. This documentation is currently voluntarily submitted by the air taxi/commuter aircraft operators. Implement a change in the restaurant's leased land area to allow for the placement or construction of a temporary small terminal with a lounge and customs facility which provide a telephone and restrooms. This area could be a modular building or trailer which could be easily removed.

B. **Long-Term -** Upon expiration of the restaurant lease, construct a new terminal facility on the site of the existing restaurant. The size of the facility would be based upon the documented commercial passenger enplanements and associated use requirements.

**Reason**

A. **Short-Term -** Movement of the east fence line of the restaurant's leased area would permit the installation of a small facility. This avoids the expensive proposition of a buy-out of the restaurant lease. This solution allows the restaurant to stay until the lease expires in 2015, provides a facility which is presently needed, and permits time to document passenger traffic, as reported by the air taxi/charter operators, in order to properly size a future terminal facility.

B. **Long-Term -** This solution provides for year-round terminal needs. While the primary passenger operations are a result of the seaplane operators, which occur primarily during a three-month span, terminal facilities are needed throughout the year for U.S. Customs, charter passengers and crew, flight planning, and business meeting space. The terminal would serve both water and land based aircraft operated by commercial and recreational operators.

*GENERAL AVIATION RECOMMENDATIONS*

**7. Item -** There is a shortage of basic general aviation support facilities, especially a centralized fuel storage area and an aircraft washing facility, and a shortage of non-leased or short-term leased areas upon which these facilities may be constructed.

**Recommendation -** Adequate areas on the west side of the airport, now mostly leased by Boeing, which become available prior to 2010, should be converted to general aviation support facilities. A land use strategy should be implemented which, after 2010, will insure that land areas necessary for support facilities are not leased for terms longer than 5 years.

**Reason -** The leasing of the airport's west side and nearly all of the useable land area of the east side of the airport by Boeing seriously restricts the airport's ability to provide basic support facilities. Because the Cedar River borders the east perimeter of the airport, coupled with the lack of required sanitary sewer on the east side, these support facilities cannot be reasonably constructed on the airport's east side. The airport's lack of reserved land for such facilities until such a land use policy can be implemented will result in temporary in-truck fuel storage and improper aircraft washing until adequate land area reverts to the control of the airport.

**8. Item** - General aviation activities and aircraft storage and parking areas are dispersed throughout both the east and west sides of the airport land area. Boeing operations are also located on both sides of the airport. This dispersal requires the towing and taxiing of aircraft and the movement of some types of equipment across the runway. The towing of heavy aircraft across the runway at the same point (Taxiways D and K) has caused bumps in the runway surface. The movement of aircraft and equipment from side to side of the airport should be done on roadways or taxiways and not across the runway. The shortage of adequate airport land area compounds this problem.

**Recommendation -** The land use strategy which requires Boeing to vacate the west side of the airport upon the expiration of their lease in 2010 should be continued. Boeing should be encouraged to reduce equipment transfers across the runway to reduce potential safety problems as soon as possible and to reduce the towing of aircraft across the runway to the minimum essential.

**Reason -** Reduce safety problems and preserve the runway surface.

**9. Item** - Shortage of Maintenance Equipment Storage Space.

**Recommendation -** When suitable space is available construct storage facilities

**Reason -** Equipment is now stored outside, but to protect and prolong the usability the equipment should be kept under cover.

**10. Item -** Seaplane docking areas and launching ramp are in need of reconstruction. A wood seaplane beaching area was severely damaged during heavy 1990 storms and needs to be removed and replaced with up-to-date dock facilities. The floating dock is adequate for current use, but may need to be expanded when air taxi/charter operators document passenger traffic. Facilities are congested during the summer months.

**Recommendation -** That the wood seaplane beaching area be reconstructed to provide modern dock facilities. All environmental permits must be obtained prior to construction.

**Reason -** New dock facilities would relieve congestion of itinerant and air taxi/charter float plane operations by permitting itinerant aircraft to be tied up at the new dock facilities, thus permitting air taxi/charter aircraft to utilize the floating dock to enplane/deplane passengers and to be placed into/removed from the water in a timely manner. Their construction would add to the utilization of a temporary terminal facility.

*COMMERCIAL DEVELOPMENT RECOMMENDATIONS*

**11. Item -** Airport land area which are not suitable for aviation uses, but could be used for non-aviation uses have not been identified on the airport layout plan and land use map.

**Recommendation -** designate the airport land area located between the airports west perimeter road and Rainier Avenue as non-aviation use.

**Reason -** This area has a steep bank and many trees which make it unusable for aviation purposes.

*OFF-AIRPORT RECOMMENDATIONS*

**12. Item** - Aircraft Noise

The FAA environmental handbook 5050.4A (Paragraph 47e [1]) does set basic levels in which a noise analysis should be completed. These include 1) more than 90,000 adjusted propeller operations; 2) more than 700 adjusted jet operations; 3) significant amounts of operations by special aircraft such as helicopters; and 4) a setting of the airport in a densely populated urban area or an area that requires the need for noise analysis. The noise analysis in this report was done in accordance with guidelines established by FAA.

**Recommendations -** (a) The City of Renton should conduct a land use compatibility project (non-federal) which would create an official procedure for registering aircraft noise complaints and establish and enforce aircraft operational procedures to reduce noise impacts; and (b) Establish and encourage compatible land uses within the area encompassed by an area that extends 1,500' from each runway end and 1,600' wide (800' wide each way) from the runway centerline.

A suggested method for registering aircraft noise complaints is to establish a citizen complaint mechanism by which complaints are registered on a phone answering machine that will allow the caller to state name, time, location, duration of noise, etc. Once enough data is collected, "hot spots" within the airport's boundaries can be determined and then procedures can be initiated to change procedures in this area. Beyond the airport's boundary, the collected data can be used by the City Council to establish compatible land use areas. FAA Advisory Circular 150/5020-1 *Noise Control and Compatibility Planning For Airports* deals with noise issues and methods to mitigate noise.

Compatible land uses should be established by the City Council within the area where low altitude aircraft operations will take place. These areas are presently identified in the Ordinances of the City of Renton, Airport Zoning, Section 4-31-17. The title of this section implies that the zoning is in effect only at the airport, whereas it impacts the areas outside the airport perimeter and is enforceable through building codes, etc. The existing zoning ordinances need to be updated to include new language that has been established by FAA since 1960. The new description of areas around the airport that need height and hazard protection are found in Federal Aviation Regulations Part 77. The Part 77 surfaces should be should be identified on City maps to indicate the area where the zoning is in effect.

**Reason -** Aircraft noise varies with the type of aircraft and the quantity of operations performed. The runway length alternatives presented do not increase the aircraft noise distribution in the area. The result of the noise analysis is that Renton does not have a cumulative noise problem and is shown on the noise contour charts, but Renton does need to acknowledge the importance of compatible land uses around the airport. Airport district zoning and building codes, with higher insulation levels to reduce interior noise impacts, should be adopted within the identified noise contours and RPZ areas.

*GENERAL RECOMMENDATIONS*

**13. Item** - A new Exhibit A property map needs to be completed at Renton Municipal Airport.

**Recommendation -** Complete a new survey of airport property boundary.

**Reason -** To receive federal funding a current property map needs to be submitted with a grant application.

**14. Item** - Develop aesthetics plan for the airport

**Recommendation -** Consistent signage, color schemes, plantings and other features should be adopted by the airport.

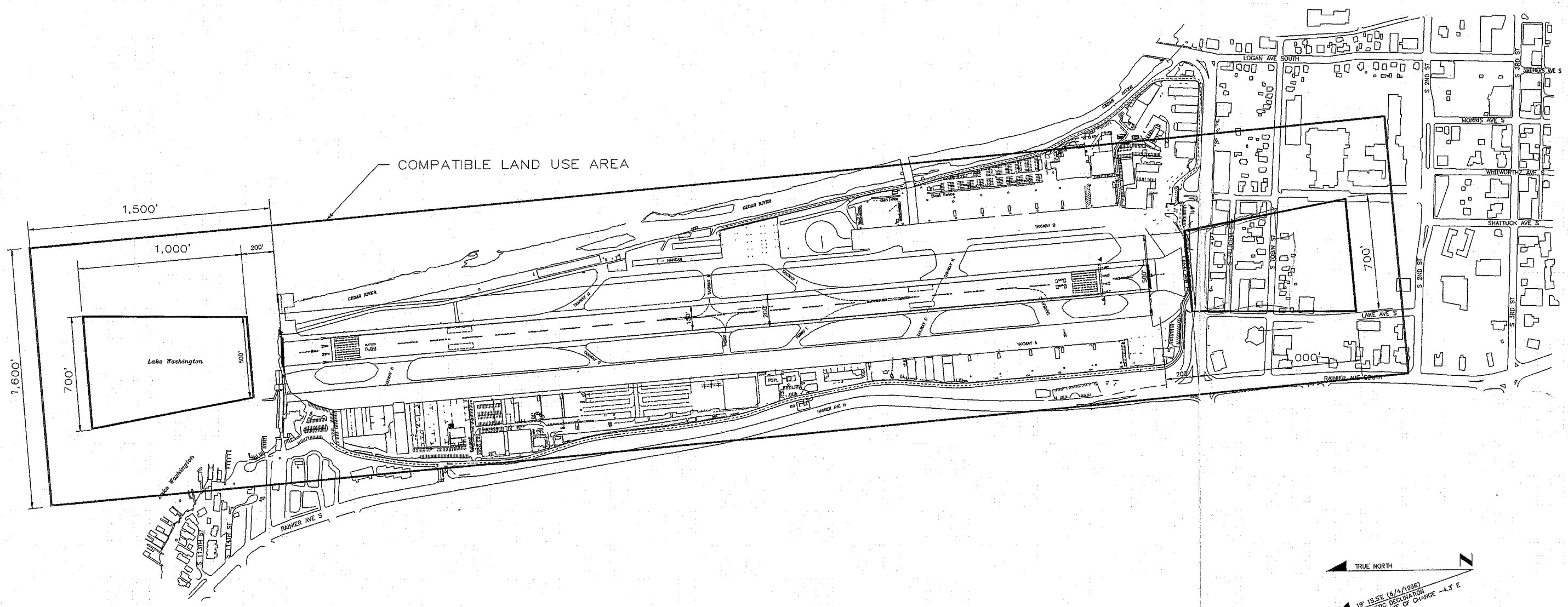
**Reason -** Since the airport is close to downtown Renton and is nearby residential development, the airport should conform to a consistent and higher aesthetic standard. The standard should be contained in the city's comprehensive plan.

**15. Item** - The airports floods during high periods of rain and snow melt off.

**Recommendation -** Maintain close coordination with Corps of Engineers on 205 flood control project.

**Reason -** The potential flooding is a problem to businesses located on the airport and to Renton's ability to provide air transportation services.

# COMPATIBLE LAND USE AREA




TRUE NORTH

19° 15.5'E (6/4/1996)
MAGNETIC DECLINATION
ANNUAL RATE OF CHANGE -4.3' E

EXHIBIT 5-12

CITY OF RENTON, WASHINGTON

RENTON MUNICIPAL AIRPORT

## COMPATIBLE LAND USE AREA

BUCHER, WILLIS & RATLIFF CORPORATION