

3.13 AIR TRANSPORTATION

The proposed Desert Claim Wind Power Project would involve the construction of 120 wind turbine generators within an area between 2.9 to 7.9 nautical miles (NM) north of Bowers Field, the Kittitas County Airport serving Ellensburg, Washington. (All mileage-based distance references in this section are stated in terms of nautical miles; a nautical mile is approximately 6,076 feet, or about 1.15 statute miles.) The proposed height of each turbine structure, from base to blade tip, would be a maximum of 340 feet (approximately 104 meters) above ground level (AGL). The height of the proposed wind turbines and the location of the project relative to Bowers Field raise issues concerning potential conflicts with the airspace used by air traffic to and from the airport.

3.13.1 Affected Environment

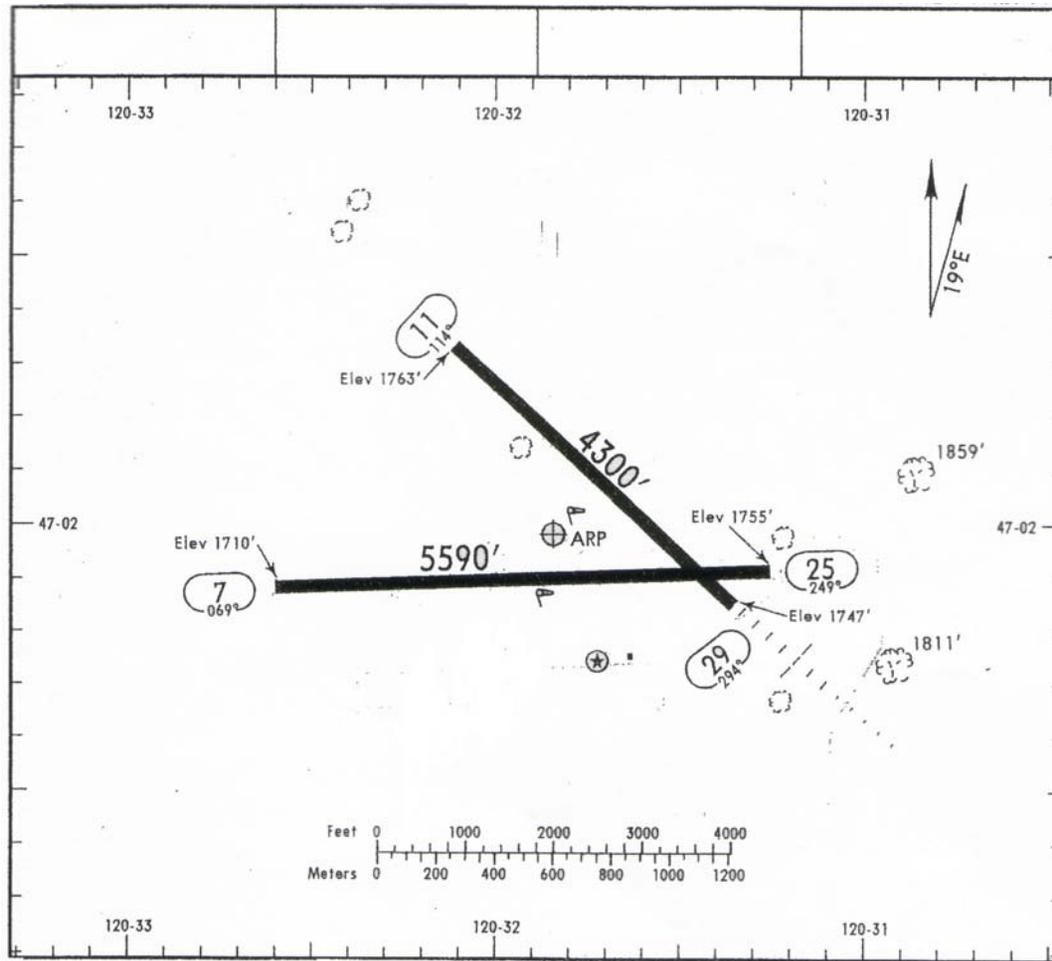
3.13.1.1 Airport Facilities

Bowers Field is a public use, general aviation airport owned by Kittitas County and administered by Kittitas County Public Works (2003). The airport was originally built as a military facility during World War II and was deeded to Kittitas County in 1948. The airport is located 2 miles north of the northern city limits of Ellensburg (at coordinates 47-01-58.900N/120-31-50.500W) at an elevation of 1,763 feet above mean sea level (AMSL). The airport property occupies a total area of 1,240 acres. Ground access to the airport from Ellensburg is via Airport Road and Bowers Road. **Figure 2-2** (see **Section 2.2**) shows the location of Bowers Field relative to Ellensburg and the Desert Claim project area.

Midstate Aviation, a privately-owned firm established as a fixed-base operator (FBO), provides aircraft fueling, parking, maintenance, instruction and charter flight services at Bowers Field (AirNav LLC, 2003). The airport currently serves single-engine, twin-engine, turboprop and business turbojet aircraft. There is no scheduled, commercial flight service at Bowers Field; the nearest available commercial services are located at McAllister Field in Yakima (Kittitas County Public Works, 2003).

The airport has two runway surfaces, both of which are paved, that converge in a V-shaped configuration pointing to the east (see **Figure 3.13-1**). The main runway is designated as Runway 11/29, based on the magnetic heading applicable to an approach/departure course on this runway oriented northwest-southeast. Planes landing or taking off to the northwest on this surface are using Runway 29, while planes landing or taking off to the southeast are using Runway 11. Runway 11/29 has a concrete surface, is 4,300 feet long by 150 feet wide, can accommodate aircraft weighing up to 100,000 pounds, and is equipped with transmitter-activated runway lights that operate from sunset to sunrise (Kittitas County Public Works, 2003). Runway 29 is also equipped with runway end identifier lights (REILs), lead-in lights, distance-to-go markers and Visual Approach Slope Indicators (VASI). A VHF Omni-Directional Range (VOR) transmitter located 2.5 miles east of the airport provides a non-precision approach aid for landing.

Runway 7/25 has an asphalt surface, is 5,590 feet long by 150 feet wide, and follows a west-east orientation (Kittitas County Public Works, 2003). Planes landing or taking off to the west on this surface are using Runway 25, while planes landing or taking off to the east are using Runway 7. This facility is also equipped with distance-to-go markers. Runway 7/25 has a single-wheel weight limitation of 28,000 pounds. This facility is closed from December 15 through February 28 of each year (g.c.r. & associates, inc. 2003), is not maintained during the winter and may be used only during daylight hours the rest of the year. Weeds are reported growing in cracks in the pavement in the first 2,000 feet of Runway 7/25 (AirNav LLC, 2003; g.c.r. & associates, inc., 2003).



Source: Ecology and Environment, Inc.



**Kittitas County
Desert Claim Wind Power
Project EIS**

**Figure 3.13-1
Bowers Field Runway Configuration**

Ground facilities at Bowers Field include a fueling facility, a 20,000 square-foot main hangar, 12 County-owned t-hanger rentals, 10 private t-hanger rentals and 18 tie-downs available from Midstate Aviation. There is no control tower at Bowers Field. Kittitas County has zoned an 80-acre parcel of the airport property for industrial park or commercial development (Kittitas County Public Works, 2003).

Other public air transportation facilities in Kittitas County include the Cle Elum Municipal Airport and the De Vere Field Airport, both located east of Cle Elum. These two public facilities are over 15 miles west of the Desert Claim project area and their areas of protected airspace, as defined by Federal Aviation Administration (FAA) regulations (see discussion below), are well separated from the project area.

There is also a private airport facility, identified as JKD Farms, located about 7 miles southeast of the Desert Claim project area. Comments on the Draft EIS also indicate that another private airstrip, identified as the Flying Rock Ranch, is located near Reecer Creek at an unspecified distance from the project area. The FAA does not protect airspace around private airports. If the JKD Farms airfield were to be treated as a public airport, the area that would be considered protected airspace would still be several miles distant from the Desert Claim project area.

3.13.1.2 Air Traffic Operations

Air traffic operations that are relevant to the impact assessment for the Desert Claim project primarily include operating conditions at Bowers Field and airspace considerations relative to en-route air traffic, approach procedures for air traffic arriving at Bowers Field, and departure procedures for air traffic departing Bowers Field. These topics are discussed under separate headings below.

The Federal Aviation Administration (FAA) issues regulations and procedures that govern aircraft operations at both the national and local levels. Those regulations and procedures typically apply to or specify their applicability to different types of aircraft. Aircraft are defined as Category A, B, C or D aircraft based primarily on their design speed range for approaching airports. **Table 3.13-1** summarizes the four categories and examples of the respective types of aircraft in each. Aircraft categories are discussed subsequently with respect to approach and departure procedures and traffic patterns for visual operations.

**Table 3.13-1
Aircraft Categories**

Category	Aircraft Type	Example Aircraft
A	single-engine, propeller	Beech Bonanza, Cessna 172
B	light, twin-engine, propeller, turbo-prop, some business jets	Beech Baron and Kingair Cessna 400 series, Cessna Citation
C	many business jets, some commercial jets	newer Lear jets Boeing 737
D	larger business jets larger commercial jets some military jets	Gulfstream II and IV, older Lear jets Boeing 747 and 777

Bowers Field Operating Conditions

Current reports indicate that 52 aircraft are based at Bowers Field. The distribution of these aircraft includes 45 small, single-engine (Category A) aircraft, 4 multi-engine aircraft (likely Category B, or possibly Category C), 2 helicopters and 1 glider (AirNav LLC, 2003; c.g.r. & associates, inc., 2003). The two helicopters are fire-fighting aircraft operated by the Washington Department of Natural Resources (WDNR). No tanker aircraft are based at or operate out of Bowers Field, primarily because of weight restrictions applicable to the taxiways (personal communication, C. Stivers, Midstate Aviation, Ellensburg, Washington, August 11, 2003).

Total aircraft operations at Bowers Field were estimated by one source at 30,945 per year (c.g.r. & associates, inc. 2003), representing an average of 85 operations per day. Locally-based general aviation accounts for a reported 53 percent of the operations, with transient general aviation accounting for 40 percent and air taxi operations for about 6 percent of the operations (AirNav LLC, 2003). Information in the Airport Master Plan Update for Bowers Field (adopted in July 2004) indicates the level of 30,945 annual operations applied to 1998, while operations were reported at 55,000 for the year 2000 and 51,400 currently (Bucher, Willis and Ratliff, 2003). Midstate Aviation administers a certified flight-training program operated by Central Washington University that has an enrollment of approximately 185 students; the aircraft fleet operated by Midstate accounts for approximately 44,000 annual operations. Local users flying aircraft based at Bowers Field account for another 6,500 flight operations per year.

Over the year it appears that approximately 60 to 70 percent of all Bowers Field aircraft operations occur on Runway 11/29 (Bucher, Willis and Ratliff, 2004), with the bulk of that activity on Runway 29. There are a number of reasons for this. The winds at Bowers Field are predominantly from the north and northwest, and Runway 29 most frequently provides the orientation into the wind that is typically preferred for takeoffs and landings. Runway 29 is also the only Bowers Field runway with lighting of any kind. This includes a 2-box Visual Approach Slope Indicator (VASI), medium intensity approach lights, runway end identifier lights and runway edge lights.

The other three runways (11, 7 and 25) account for the remaining operations at Bowers Field, amounting to about 40 percent or less of the annual total. As indicated previously, Runway 7/25 is closed from December 15 through February 28 and is used in daylight hours only the rest of the year. Runway 25, which provides a westerly orientation for takeoffs and landings, is the most frequently used of these three runways. CWU typically designates Runway 7/25 as the active runway for flight training activity during calm wind conditions. Operations on Runway 7, which involve an easterly approach/departure, occur primarily in summer daylight hours when winds are light and variable. Runway 11 is seldom used because local wind conditions typically preclude its operational utility. Based on their operating limitations, the respective proportions of total annual operations are likely in the range of 20 to 30 percent for Runway 25, 5 to 10 percent for Runway 7, and less than 5 to less than 10 percent for Runway 11.

En-Route Traffic

En-route air traffic consists of aircraft operations that are not actively involved in approach or departure procedures associated with an airport facility. The Desert Claim project area underlies a portion of several low-altitude airways used by aircraft flying over Kittitas County, including airways designated as V187, V2 and V298. The minimum authorized en-route altitude for any of these airways is 6100 feet AMSL, as

depicted on the published sectional and en-route air navigation charts. Aircraft activity in the local area also includes general aviation operations that are not actively using low-altitude airways. These activities are required to observe standard FAA regulations concerning minimum altitudes above the ground or obstructions on the ground.

Approach Procedures for Arriving Traffic

Aircraft landing at Bowers Field can use either instrument flight rule (IFR) or visual flight rule (VFR) procedures for their arrival. Applicability of IFR or VFR procedures depends upon the equipment in each aircraft, the certification of the pilot and the weather conditions at the time. These arrival procedures are discussed below.

Present Instrument Approach Procedures

There are currently three instrument arrival procedures in use for aircraft approaching Bowers Field. They are depicted in **Figures H1, H2 and H3** in **Appendix H**, which are reproductions of the approach plates displayed on the published aeronautical charts. All three procedures are initiated from east of the airport and terminate at the airport, or involve missed approaches for which the aircraft turn left (south) and remain south of the airport while circling for another approach. Additional characteristics for these procedures are summarized as follows:

- Instrument Arrival Procedure 1 is a VOR or GPS-A procedure that can be used by Category A and B aircraft for landing on any Bowers Field runway that is active and open.
- Instrument Arrival Procedure 2 is a VOR or GPS-B procedure that can be used only by Category A aircraft for landing on any Bowers Field runway that is active and open.
- Instrument Arrival Procedure 3 applies to a straight-in GPS approach to Runway 25 and a circling approach to any other active and open runway, and can be used by Category A, B, C and D aircraft.

The third instrument procedure (GPS approach to Runway 25) is unusual in several respects. While the procedure can be used by all four categories of aircraft, larger aircraft cannot land on Runway 25 because of the weight limit (28,000 pounds) on that runway; larger aircraft use this procedure for an initial straight-in approach to Runway 25, then circle to land on Runway 29. In addition, this procedure is the only instrument approach procedure that can be used at night by Category C and D aircraft, even though Runway 25 itself cannot be used in darkness.

FAA Order 8260.3B prescribes the U.S. Standard for Terminal Instrument Procedures (TERPs), which defines the protected airspace associated with instrument approach procedures. Given the characteristics of the existing approach procedures, the protected approach airspace is to the east and south of Bowers Field and is well clear of the Desert Claim project area.

Potential Future Instrument Approach Procedures

The Airport Master Plan adopted by Kittitas County in July 2004 indicates there are four additional instrument approaches to Bowers Field that have been proposed. They include straight-in approaches to Runways 25 and 29 and two airport approach (circling) procedures; all four proposed approaches apply to Category A or Category A and B aircraft (Bucher, Willis and Ratliff 2004).

Because all of the existing and proposed approach procedures are initiated from east of Bowers Field, it is conceivable that approach procedures that are initiated west of the field might be developed in the future. In part because flight restrictions associated with the Yakima Training Center intermittently preclude use of the existing instrument procedures, there is local interest in developing additional approach procedures (Bucher, Willis and Ratliff 2003). Any such approaches from the west would only apply to operations using Runways 7 or 11.

Recent discussions with staff based at Bowers Field and FAA staff indicated there are no known plans to develop an instrument approach to Runway 11. Based on the high terrain west of Runway 11 and the limited use of this runway, it is unlikely that an instrument approach for Runway 11 would be developed. Nevertheless, the Kittitas County Airport Advisory Committee indicated there was some interest in possible future development of an instrument approach to Runway 11.

Similarly, there are no known plans to develop an instrument approach to Runway 7. If the FAA at some time issued a future GPS approach to Runway 07, the protected airspace associated with that approach would be to the west of Bowers Field and would not overlie the Desert Claim project area. In that event, it is possible that a transition or initial approach route would overfly the project area. The high terrain north and west of Bowers Field would require approaching aircraft to use altitudes above 6000 feet AMSL over a large portion of the project area, however, and any required descent from this altitude could be easily accommodated over the lower-elevation portion of the project area.

Visual Flight Rule (VFR) Procedures

All aircraft approaching Bowers Field under visual flight rules (VFR) follow a left-hand traffic pattern for all runways, as prescribed by the FAA. That is, normal turns that must be made on approach, either to line up with the runway or to circle to land, are made to the left rather than to the right. A left-hand traffic pattern is the standard FAA prescription for uncontrolled airports, although there are numerous airports around the U.S. for which a right-hand traffic pattern has been adopted to accommodate local conditions.

As is the case for instrument approach procedures, airspace associated with the VFR traffic pattern is protected. FAA Order 7400.2E is the governing policy document that prescribes the traffic pattern airspace dimensions. The size of the traffic pattern airspace is governed by the categories of aircraft that can operate at a given airport. If only Category A aircraft are operating at an airport, the protected VFR traffic pattern airspace would extend for 1.25 mile from the airport on the maneuvering side of any runway. The airspace protection expands to 1.5 miles for Category B aircraft, 2.25 miles for Category C aircraft and 4 miles for Category D aircraft.

Bowers Field is officially considered capable of accommodating Category D aircraft, the highest of the four categories, based on the 100,000-pound weight capacity of Runway 11-29 (and as indicated by the specifications for the GPS approach procedure for Runway 25). The width of the traffic pattern for Category D aircraft extends for 4 miles from the airfield on the maneuvering (turning) side. Consequently, depending on runway use, the largest area of the traffic pattern would extend 4 miles to the south or to the north of Bowers Field. Staff from the fixed-base operator at Bowers Field indicated that most of the traffic within the pattern actually remains within approximately 1 mile on either side of the airport, because virtually all aircraft using Bowers Field are Category A and B aircraft. Nevertheless, the applicable FAA criteria protect airspace around Bowers Field out to 4 miles to serve the possible or occasional use by the larger aircraft.

Airspace protection within the specified distance range does not extend upward from the ground level throughout the two-dimensional extent of the protected zone. Instead, the protected airspace is a three-dimensional volume that has a floor elevation that reflects a sliding scale based on elevation above the ground and distance from the runway. FAA Order 7400.2E also specifies obstruction standards that apply to tall structures that might penetrate this traffic pattern airspace. The obstruction standard criteria are related to the runway elevation, the distance from the structure to the runway and the total height of the obstacle, as discussed in more detail in **Section 3.13.2**.

Departure Procedures

Aircraft departing under visual flight rules (VFR) can climb, turn and depart the Bowers Field Air Traffic Area in any direction they choose to commence the en-route portion of their flight. However, instrument flight rule (IFR) departures flown under actual instrument conditions must conform to the departure procedures published by the FAA.

The FAA (2003) recently issued Notice to Airmen (NOTAM) FDC 3/9524, effective October 30, 2003, which announced the adoption of a new Instrument Departure Procedure for Bowers Field. An earlier departure procedure had been cancelled through a previous NOTAM issued during 2002. The new procedure adopted by the FAA reads as follows:

(1) **TAKEOFF MINIMUMS:**

RWY 7, 11: 4600-3 or standard with minimum climb of 290 feet per NM to 7800.

RWY 25: 4700-3 or standard with minimum climb of 340 feet per NM to 7800.

RWY 29: 4600-3 or standard with minimum climb of 320 feet per NM to 7800.

(2) **TEXTUAL DEPARTURE PROCEDURE**

RWY 7, 29: Climbing right turn direct ELN VORTAC

RWY 11, 25: Climbing left turn direct ELN VORTAC

All aircraft continue climbing in the ELN VORTAC holding pattern (W, Right Turns, 087.41 inbound) to MEA/MOCA for route of flight.

Under this procedure, aircraft departing to the east on Runway 7 make a climbing right turn to the south, aircraft departing to the northwest on Runway 11 make a climbing left turn to the southwest, and those departing to the west on Runway 25 make a left turn to the south. Consequently, this procedure requires all IFR aircraft departing Bowers Field on Runways 7, 11 and 25 to stay well to the south of the Desert Claim project area.

With respect to Runway 29, the procedure directs aircraft departing to the northwest to make a climbing right turn, taking them to the northeast and over the Desert Claim project area. The procedure includes a minimum climb gradient of 320 feet per mile up to an altitude of 7,800 feet, however, which also requires the aircraft to be above the obstacle clearance minimums specified in the TERPs (see previous and subsequent discussion). The end of Runway 29 is at elevation 1,763 feet. At 3 miles from the end of the runway, for example, the minimum climb gradient restriction for Runway 29 requires all aircraft to be at an altitude of at least 2,723 feet. The prescribed climb gradient essentially defines a floor elevation for the protected airspace associated with the departure procedure, although the TERPs also require a minimum clearance above obstructions in the area.

3.13.1.3 Alternative 1 and 2 Sites

Alternative 1: Wild Horse Site

Baseline conditions with respect to air transportation for the Wild Horse site are, in general, the same as or very similar to those described previously for the Desert Claim project area. The primary difference between the sites concerns their geographic relationship to Bowers Field and air traffic using that facility.

The western edge of the Wild Horse site is located 13 miles due east of Bowers Field. Ground elevations within the site range from approximately 2,700 to 3,700 feet above sea level, or 1,000 to 2,000 feet higher than Bowers Field. The Wild Horse site underlies several low-altitude airways used by aircraft flying over Kittitas County, as discussed previously for the Desert Claim site. Similarly, aircraft traveling to Bowers Field under instrument flight rules typically fly over or near the Wild Horse site on approach to Runways 29 and 25. Aircraft departing Bowers Field under instrument flight rules would make turns to the south, southwest or northeast, and would not overfly the Wild Horse site as a part of the departure procedure. The airspace protected under the existing left-hand VFR traffic pattern extends 4 miles to the east from Bowers Field, and therefore ends approximately 9 miles from the Wild Horse site.

Bowers Field is the closest public airport to the Wild Horse site. The JKD Farms private airfield (discussed previously) is located approximately 8 miles to the southwest of the Wild Horse site. There is no protected airspace associated with this facility.

Alternative 2: Springwood Ranch Site

Baseline conditions with respect to air transportation for the Springwood Ranch site are similar to those described previously for the Desert Claim project area. The primary difference between the sites concerns their geographic relationship to Bowers Field and air traffic using that facility.

The eastern edge of the Springwood Ranch site is located 8 miles northwest of Bowers Field. Ground elevations within the site range from approximately 1,700 to 2,300 feet above sea level, or up to about 500 feet higher than Bowers Field. The Springwood Ranch site also underlies low-altitude airways used by aircraft flying over Kittitas County, as discussed previously for the Desert Claim site. Aircraft traveling to Bowers Field under instrument flight rules typically would not fly over or near the Alternative 2 site on approach to Runways 29 and 25. Aircraft departing Bowers Field under instrument flight rules would make turns to the south, southwest or northeast, and would not overfly the Springwood Ranch site as a part of the departure procedure. The airspace protected under the existing left-hand VFR traffic pattern extends 4 miles to the west from Bowers Field, and therefore ends approximately 4 miles from the Springwood Ranch site.

The Cle Elum Municipal Airport and DeVere Field are located approximately 7 miles and 5 miles, respectively, from the northwestern corner of the Springwood Ranch site. Any protected airspace associated with these facilities would not overlap with the project area for Alternative 2.

3.13.2 Environmental Impacts of the Proposed Action

The proposed locations for the 120 turbines to be constructed as part of the Desert Claim project range in elevation from 2,001 feet to 3,629 feet above mean sea level; 96 of the turbines (80 percent of the total) would have a base elevation of less than 2,400 feet. The turbines would all be 340 feet in height, resulting in total above-sea-level structure heights ranging from 2,341 feet to 3,969 feet. **Table H1** in **Appendix H** identifies the site elevation and total height above mean sea level (ground elevation plus structure height) for all proposed Desert Claim wind turbines. The location, base elevation and height of the proposed wind turbines in relation to the FAA obstruction standards would determine whether the project would present a potential conflict with protected airspace. Because of their height, the proposed turbines would also be subject to FAA marking and lighting requirements. The airspace and marking and lighting issues are discussed separately below.

3.13.2.1 Airspace Issues

In the performance of the EIS analysis, regulatory standards were considered pertaining to objects affecting navigable airspace as prescribed by FAA Federal Aviation Regulation (FAR) Part 77. These standards included FAA Order 8260.3B, the U.S. Standard for Terminal Instrument Procedures (TERPs); FAA Order 7400.2E, Procedure for Handling Airspace Matters; and FAA Advisory Circular 70/7460-1K, Obstruction Marking and Lighting.

FAR Part 77 establishes the criteria according to which FAA notification requirements and obstruction standards are determined. The maximum no-notice height (the maximum structure height for which notice to the FAA is not required) is 200 feet above ground level (AGL). Based on this criterion, the Desert Claim project applicant would be required to notify the FAA of the proposed locations for all of the turbines, as all turbines would exceed the notification limit. A few of the turbines (10 total, identified in **Table H1** of **Appendix H**) located within 6 NM of Bowers Field also would exceed the obstruction standards of paragraph 77.23 (a.)(2), which would require the FAA to conduct an extended study of the proposed project.

Exceeding the obstruction standard requires only that the FAA conduct an extended study, however, and in and of itself does not show a negative impact on the protected airspace. Rather, the existence of potential airspace impacts depends on whether any of the proposed structures would penetrate airspace protected by the FAA. Normally, the FAA would classify structures that would require a change to an existing or planned IFR minimum flight altitude, a published or special instrument flight procedure, or an IFR departure procedure for a public-use airport as a “Hazard to Air Navigation.” In this case, the only negative airspace impact from the proposed project is the penetration of the protected VFR traffic pattern airspace by 10 wind-turbine structures, which are also identified in **Table H1**.

Potential airspace impact issues apply to the various components of air traffic operations, which include en-route traffic, arriving traffic and departing traffic. Based on the existing conditions described in **Section 3.13.1**, the following discussion addresses the relationship of the proposed project to these air traffic operations.

En-Route Traffic

As indicated previously, the Desert Claim project area underlies a portion of several low altitude airways. The lowest protected airway level depicted on en-route and sectional charts is 6100 feet AMSL, while the maximum proposed structure height within the project area is 4,078 feet AMSL. Consequently, the minimum authorized en-route altitude for each airway exceeds the maximum structure height by more than 2,000 feet. This margin is well above the obstacle clearance level of 1,000 feet that would be required by FAA regulations, and allows for an additional clearance buffer of more than 1,000 feet. Therefore, there would be no identifiable project impacts on en-route air traffic.

Approach Procedures

Three instrument arrival procedures are currently in use for Bowers Field (see **Figures H1** through **H3**), as discussed in **Section 3.13.1.2**. As indicated, all approaches using these procedures are initiated from east of the airport and terminate at the airport, or have missed approaches that turn left and remain south of the airport. Because all traffic using these existing procedures remains east or south of Bowers Field and well clear of the Desert Claim project area, the proposed wind turbines would be in accordance with TERPs criteria regarding obstructions and would not be in conflict with arriving aircraft operating under existing IFR procedures. Similarly, the four proposed procedures recently identified involve approaches to Runway 25 or 29 from the east or south, and the Desert Claim project would have no influence on the viability of these potential new approaches.

Section 3.13.1.2 also addressed the possibility that new instrument procedures involving approaches to Bowers Field from the west might be developed in the future. One prospective future instrument arrival procedure identified would involve an approach to Runway 7 from the west. While a GPS approach to Runway 7 would not overlie the Desert Claim project area, it is possible that a transition or initial approach route would cross the project area. The surrounding terrain would require aircraft to remain at altitudes above 6,000 feet AMSL over a large portion of the project area, however, indicating the required minimum altitude would provide a clearance buffer of more than 1,000 feet above the elevation of the turbines. Therefore, the proposed turbines would not exceed the TERPs standards and there would not be a potential impact on protected airspace that might be associated with a hypothetical future instrument approaches to Runway 07.

The Kittitas County Airport Advisory Committee indicated there was some interest in possible future development of an instrument approach to Runway 11, and concern over possible influence of the Desert Claim project on such an approach. In response, County EIS consultant staff from Aviation Systems, Inc. investigated a potential instrument approach to Runway 11. Based on professional experience and knowledge of FAA requirements for such procedures, Aviation Systems specified a hypothetical straight-in instrument approach to Runway 11. The analysis concluded that the minimum altitude at a final approach waypoint 5 miles west of the airport would need to be 4,000 feet AMSL, which would be well above the elevation of any of the nearest Desert Claim turbines (see **Figure H4** in **Appendix H**). Therefore, Aviation Systems concluded that the Desert Claim project would have no impact on the airspace for that approach, and would not preclude development of a straight-in instrument approach to Runway 11 based on standard FAA protocol.

In summary, the EIS impact analysis examined prospective future instrument arrival procedures for Bowers Field. Although instrument approaches to either Runway 7 or Runway 11 are considered to be unlikely candidates for future adoption, the Desert Claim Wind Power Project would not have an adverse impact on such approaches to either runway.

Instrument Departure Procedures

A new FAA-approved instrument departure procedure for Bowers Field air traffic became effective October 30, 2003, as discussed in **Section 3.13.1.2**. The FAA previously issued a notice that the former procedure was unusable and cancelled it in 2002.

The protected airspace associated with operations on Runways 7, 11 and 25 under the new procedure is located well to the south of the Desert Claim project area. Therefore, the project would have no impact on operations using the instrument procedure for departures from Runways 7, 11 and 25.

The new procedure directs aircraft departing Bowers Field on Runway 29 to make a climbing right turn, taking them to the northeast and over the Desert Claim project area. The project facilities would represent a conflict with this procedure only if the turbines exceeded a height at which departing aircraft at the minimum altitudes indicated by the procedure would not have sufficient obstacle clearance. The minimum altitudes corresponding to the climb rate prescribed by the new procedure include 2,083 feet at 1 NM from the end of the runway, 2,403 feet at 2 NM, 2,723 feet at 3 NM, 3,043 feet at 4 NM, and so on (increasing at a rate of 320 feet in altitude per NM of distance). At these minimum altitudes, aircraft must still have an obstacle clearance margin calculated at a rate of 48 vertical feet per NM of distance. The total elevation of a wind turbine located 3 NM northeast of the end of the runway, for example, would need to be at least 144 feet (48 feet times 3 miles) below the minimum altitude of 2,723 feet (i.e., no higher than 2,579 feet) to avoid conflicting with the departure procedure.

From the location and elevation data for the proposed wind turbines (in **Table H1**), it can be determined that none of the proposed turbines would conflict with protected departure airspace for operations using Runway 29. Turbine 120 for example, would be located 3.05 NM from the end of Runway 29 and would have a total finished elevation of 2,341 feet; this is well below the maximum allowable height of 2,579 feet relative to the departure procedure airspace at this location (although this turbine would exceed the obstruction standard relative to the VFR traffic pattern, as discussed subsequently). Similarly, Turbine 80 would have a total elevation of 2,459 feet at a location nearly 4 NM from the runway, where the maximum allowable height would be 2,851 feet. In summary, all of the proposed turbines would have a total finished elevation that remained below the maximum allowable height, based on the required clearance margin and minimum altitudes for instrument departures from Runway 29. Therefore, the project would have no impact on Bowers Field operations using the instrument departure procedure.

VFR Traffic Pattern

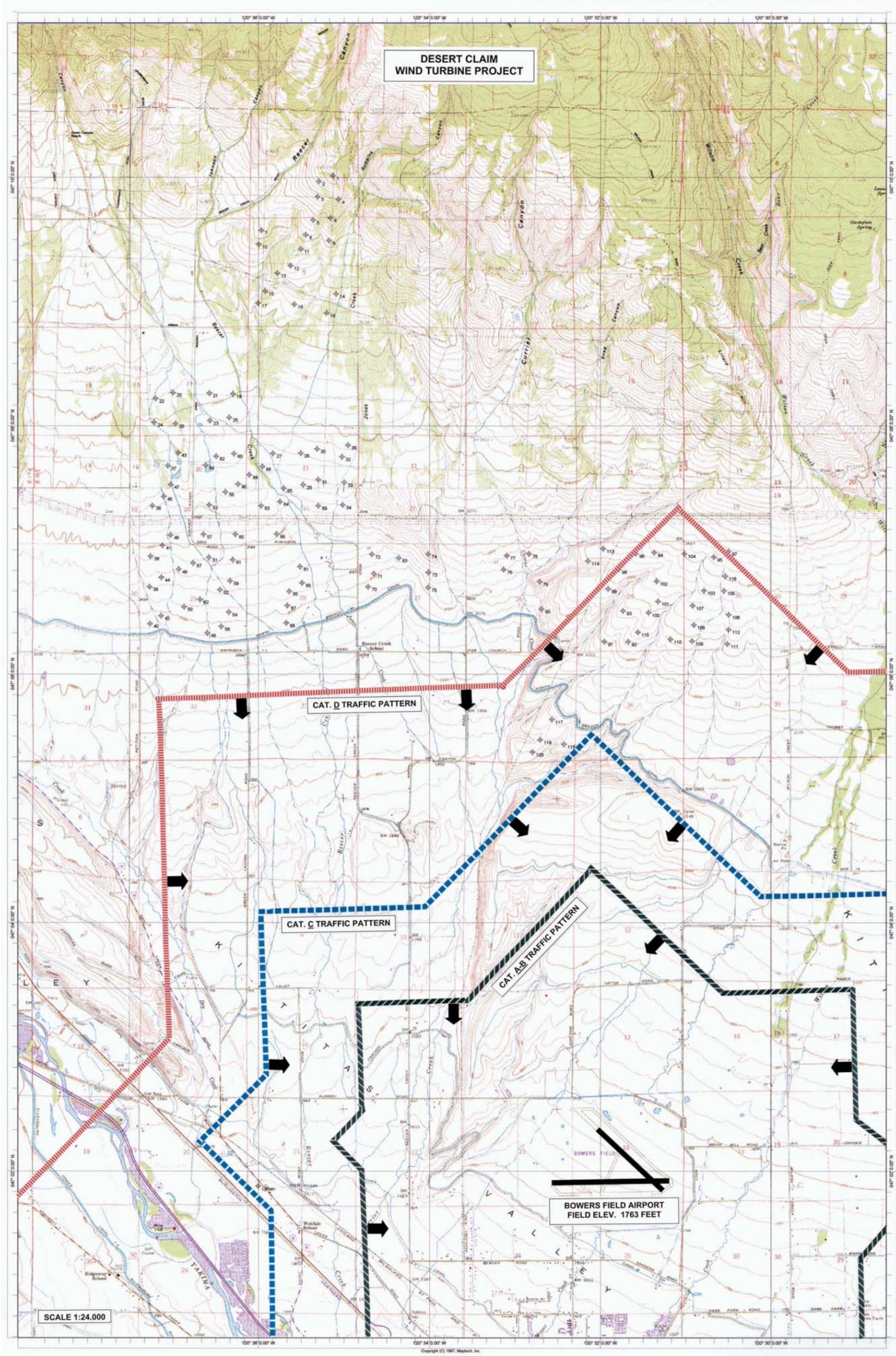
VFR operations at Bowers Field currently use standard left-hand traffic patterns for all runways, as discussed in **Section 3.13.1.2**. **Figure 3.13-2** shows the two-dimensional area around the airport that is within the VFR traffic pattern, based on the type of aircraft that might use Bowers Field. The protection of traffic pattern airspace out to 4 miles is based on the potential or occasional use of the airport by Category D aircraft, as indicated by the weight capacity of Runway 11-29 and the instrument approach procedure for Runway 25 that allows use by all four categories of aircraft. **Figure 3.13-2** also shows the

lateral extent of the Category C and B traffic patterns, which stay within 2.25 NM and 1.5 NM of a given runway, respectively.

Proposed wind turbine locations in the southeastern portion of the Desert Claim project area are indicated in **Figure 3.13-2**. (The remainder of the project area is located to the north and west, and well beyond the range of the VFR airspace.) Twenty-eight (28) of the proposed turbine locations lie within the standard traffic pattern area for Runway 7 and/or Runway 11. The maximum allowable height for those turbines within the VFR traffic pattern is determined by their elevation and distance to the runway, according to FAA Order 7400.2E; this information is shown in **Table H1**. Based on the ground elevations for these locations and the height of the proposed turbines, 10 of the 28 turbines (Turbines 91, 92 109-111, 115, 117-120) would exceed the maximum allowable structure height relative to the VFR traffic pattern and would likely be considered hazards to air navigation. These 10 proposed turbines represent a conflict with protected VFR airspace and a potential adverse impact on air traffic operations (specifically, operations by large aircraft) in the Bowers Field traffic pattern. This condition is a change from the analysis documented in the Draft EIS, which indicated that 27 proposed turbines would exceed the maximum allowable structure height relative to the VFR traffic pattern. The change reflects the modified project configuration, which shifted a number of proposed turbines from the southeastern portion of the project area, and the selection of a turbine model with a total height of 340 feet, which is 53 feet less than the maximum turbine envelope addressed in the Draft EIS.

The significance of this conflict and potential impact must be evaluated in the context of actual and expected use of Bowers Field by various categories of aircraft, and their use patterns with respect to the four runways. As indicated in **Section 3.13.1.2**, over 85 percent of the aircraft based at Bowers Field are small, single-engine craft that fall into Category A (exemplified by Beech Bonanza and Cessna 172 models), and the remainder are likely to be in Category B. Category B generally encompasses light, twin-engine aircraft (such as Beech Baron and Kingair and Cessna 400-Series models) used for general aviation. Category C includes a variety of business jet aircraft in the mix, as well as commercial jets up to the size and speed of smaller Boeing 737 models. Aircraft in Category D are normally large jet aircraft; this includes commercial jets such as the Boeing 747 and 777, some military jet aircraft, and larger, faster business jets like the Gulfstream.

Category-A aircraft likely account for around 85 to 90 percent of the total aircraft based at Bowers Field, and for approximately 93 percent of current annual aircraft operations (Bucher, Willis and Ratliff, 2003). Category-B aircraft account for almost of the remainder, estimated at about 7 percent of total annual operations. Category-C aircraft currently account for about 0.1 percent of all operations at Bowers Field (53 operations per year, out of 55,000 total). As noted previously, the majority of aircraft operations within the VFR pattern actually stay within about 1 mile of the active runway on their downwind leg, because the aircraft are primarily within Category A or B. Use of Bowers Field by aircraft in Category D is likely to be extremely rare, and is reported at 6 operations per year in the most recent edition of the airport master plan; likewise, operations by these aircraft are expected at the current level in the forecast aircraft mix for the airport (Bucher, Willis and Ratliff, 2004).



Source: Aviation Systems, Inc.



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**Figure 3.13-2
Protected Airspace with Existing
VFR Traffic Pattern**

The traffic pattern area that includes the southeastern portion of the Desert Claim project area applies to VFR operations using Runways 7 and 11; the left-hand traffic pattern airspace for Runway 29 extends to the southwest of the airfield, while the traffic pattern airspace for Runway 25 extends to the south. Runway 11 receives the least use of the four Bowers Field runways, primarily due to its orientation relative to the typical wind directions. Runway 7 is used only when winds are light and variable, which primarily occurs in the summer months, and only in daylight hours. The combined activity on Runways 7 and 11 appears to account for as little as about 5 percent and no more than 15 to 20 percent of total operations at Bowers Field. Means to resolve the potential conflict with VFR traffic pattern airspace are discussed in **Section 3.13.5.1**.

Other Air Traffic Issues

Review comments on the Draft EIS expressed concerns over other aspects of air traffic that the comments maintained were not adequately addressed in the document. Comments specifically mentioned insufficient consideration given to aircraft operating for purposes other than arriving or departing Bowers Field, aircraft used in agricultural practices, helicopter operations, the CWU flight-training program, and activity at facilities such as the Flying Rock Ranch airstrip.

As discussed in **Section 3.13.1**, the EIS analysis for air transportation reasonably focuses on project consistency with air traffic regulations, and specifically with such regulations that create protected airspace. Because regulations for the air transportation system are developed to ensure aviation safety, actions that are consistent with those regulations can reasonably be presumed to be sufficiently safe.

While the EIS analysis focuses on protected airspace associated with Bowers Field, it does not ignore other pertinent air transportation activity. Flights conducted outside the airspace protected for Bowers Field flight procedures require aircraft operation that is consistent with safe and legal flight procedures, as established by the FAA. Among other provisions, the federal aviation regulations require that aircraft outside of other controls (such as instrument arrival or departure procedures or VFR procedures) must at all times maintain a safe minimum flying altitude. This requirement applies to flight training, agricultural operations, helicopter flights, and general overflight activity. The Desert Claim project would be located on private land and the owners of structures on private land are afforded the protection of the federal aviation regulations, as long as the structures are built and maintained consistent with the regulations. The regulations acknowledge that human activity will result in the construction of tall objects that could be obstacles for aviation, which is a primary reason for the FAA safety lighting requirements. Development of the Desert Claim project would result in no aviation safety issue as long as aircraft fly in accordance with the legal requirements of the federal aviation regulations, and the project is built and operated in accordance with the safety lighting requirements.

3.13.2.2 Marking and Lighting Issues

The current standards for marking and lighting structures in the National Airspace System are contained in FAA Advisory Circular (AC) 70/7460-1K, which became effective August 1, 2000. AC 70/7460-1K includes specific marking and lighting standards for wind turbine structures.

Although the AC is clear as to the lighting standards for an individual structure, the number of structures to be lit within a multi-turbine wind energy project is left to the discretion of the FAA Region charged with making hazard determinations for structures exceeding the notification requirement height. After the FAA is formally notified that Desert Claim LLC proposes to build 120 turbines that exceed the 200-foot

notification limit, the agency will request the applicant to furnish a proposed lighting configuration for the project. The FAA will review the proposed lighting configuration relative to the obstruction standards and allowable height limits. If the proposed lighting configuration is found acceptable, the FAA would issue a “No Hazard Determination” for the project with the proposed lighting.

The various FAA regional offices follow a generally similar methodology to determine which structures in a wind power project are to be lit. For instance, the distance between lit structures should normally be no more than 3,000 feet in a straight line. Also, lighting on the perimeter of a large project should not leave large gaps or individual wind turbines that are outside the lit perimeter and unshielded. To a considerable degree, however, determination of the lighting needed to ensure adequate conspicuity of the structures involves professional judgment of the FAA staff reviewing the proposed lighting plan.

Marking and lighting project structures, consistent with the FAA regulations, is a required mitigation measure for wind energy projects. Consequently, the preliminary lighting configuration proposed for the Desert Claim project is described in **Section 3.13.5**.

3.13.3 Impacts of the Alternatives

3.13.3.1 Alternative 1: Wild Horse Site

Zilkha filed a notice with the FAA explaining the pertinent characteristics of the proposed Wild Horse project (including structure heights, locations and proposed marking plans) and requested a determination as to whether any of the turbines would be considered hazards to air navigation. As of October 2003, the company had not received a response from the FAA (personal communication, C. Taylor, Zilkha Renewable Energy, Portland, Oregon, October 21, 2003). Based on the distance between the site and Bowers Field, Zilkha anticipated that the Wild Horse turbines would not be considered obstructions. The EFSEC (2004) Draft EIS on the Wild Horse Power Project does not address potential airspace conflicts and does not provide updated information.

As a private, unregulated facility, there is no protected airspace associated with the JKD Farms airfield. Consequently, it is unlikely that Alternative 1 would result in adverse impacts to air traffic operations.

The FAA standards for marking and lighting tall structures, as discussed in **Section 3.13.2.2**, would also apply to a wind energy facility constructed at the Wild Horse site. Zilkha has submitted a proposed plan for marking and lighting Wild Horse project facilities to the FAA for review; see **Section 3.13.5** for additional discussion.

3.13.3.2 Alternative 2: Springwood Ranch Site

Given the circumstances applicable to a hypothetical wind energy project on the Springwood Ranch site, no notice of potential structure heights and locations has been filed with the FAA and a detailed, site-specific evaluation of potential airspace conflicts (comparable to what has been conducted for the Desert Claim project area) has not been undertaken. Based on the distances from the Springwood Ranch site to both Bowers Field and the Cle Elum Municipal Airport, and the discussion of potential airspace issues provided in **Section 3.13.2**, it does not appear that a wind energy project at the Springwood Ranch site would interfere with protected airspace or air traffic operations associated with either facility.

The FAA standards for marking and lighting tall structures, as discussed in **Section 3.13.2.2**, would also apply to a wind energy facility constructed at the Springwood Ranch site. Lighting plans for Alternative 2 would be similar to those discussed in **Section 3.13.5.2**, although considerably fewer towers would be lit.

3.13.3.3 No Action Alternative

Under the no-action alternative the Desert Claim Wind Power Project would not be developed and no wind turbines would be constructed in the project area. Under this alternative there would be no changes to current air traffic operations based on conditions in the project area (although relevant conditions elsewhere in Kittitas County could change), and no conflicts that are foreseeable at this time. No obstructions associated with the proposed project would be introduced and no mitigation measures associated with corresponding airspace issues would be required. Existing uses in the project vicinity, and any hazards to air navigation that might be associated with them, would be expected to continue generally as at present.

3.13.4 Cumulative Impacts

Cumulative impacts for all elements of the environment are addressed in **Chapter 4**.

3.13.5 Mitigation Measures

The location and physical characteristics of the Desert Claim Wind Power Project raise issues relating to potential impact on one air traffic condition at Bowers Field. This involves the visual flight rule (VFR) traffic pattern, as discussed in **Section 3.13.2.1**. Available measures to mitigate this potential impact are discussed below. Mitigation measures are also necessary to comply with FAA structure marking and lighting requirements.

3.13.5.1 VFR Traffic Pattern

As discussed in **Section 3.13.2.1**, some of the proposed Desert Claim wind turbines in the modified project layout would conflict with the current use of standard left-hand traffic patterns for VFR traffic at Bowers Field; the number of conflicting turbines has been reduced as compared to the layout analyzed in the Draft EIS. Specifically, 10 of the proposed wind turbines would exceed the VFR traffic pattern maximum allowable obstruction height and would represent potential hazards to Category D VFR traffic near Bowers Field (see **Figure 3.13-2**). There are two general options to resolve this conflict. One would be to further modify the proposed project in such a manner that no turbines would exceed the maximum allowable height in relation to VFR traffic. The other would be to consider modifications to the VFR traffic pattern that would direct the traffic away from the portion of the project at issue.

Project Modifications

Possible measures to eliminate the VFR traffic conflict by modifying the physical characteristics of the proposed project include the following:

1. remove the 10 turbine locations at issue from the proposed project layout, reducing the scope of the project to approximately 110 turbines and the project capacity to approximately 165 MW;

2. shift some or all of the 10 proposed turbine locations to other locations that would not be in conflict with the VFR traffic pattern; or
3. revise the capacity and height of the turbines to be installed at some or all of the 10 turbine locations, to result in structure elevations that did not exceed the VFR traffic pattern allowable height limits.

To a degree, the modified project configuration that is evaluated in the Final EIS reflects implementation of items 2 and 3 above. A number of turbine locations that were originally proposed for the southeastern part of the project area were shifted to other areas within the project boundary, reducing the potential for conflict with the VFR traffic pattern. The applicant also selected a turbine model with a lower total height of 340 feet (rather than the 393 feet analyzed in the Draft EIS). Both of these actions reduced the number of turbines exceeding the maximum allowable structure height from 27 (per the layout evaluated in the Draft EIS) to 10 in the modified layout.

The modified project layout optimizes the generation potential of the land area included within the proposed project (based upon computer modeling using updated meteorological data), and retains the total capacity of the project at 180 MW, which is a project objective. With respect to the first option listed above, it is possible that elimination of the 10 turbine locations potentially conflicting with the VFR traffic pattern would also make some of the other proposed locations (such as Turbine 93) non-viable, and result in fewer than 110 total turbines in the project layout. It is unlikely that many (if any) of the 10 subject turbine locations could be shifted to other sites within the existing project-area boundary based upon the computer modeling. Consequently, implementing the second option (to a greater degree than reflected in the modified layout) would likely require the applicant to obtain development access to additional lands in the vicinity, but not currently within the proposed project area.

The 10 proposed turbine heights and locations exceed the maximum allowable heights by a range of 5 feet to 95 feet; the maximum allowable heights above ground level at these locations range from 245 feet to 335 feet. Based on the market availability of smaller generating units, it would be physically possible for the applicant to install smaller-capacity turbines at the subject locations that did not exceed the VFR traffic pattern allowable height limits. It is not known whether the equipment purchase, construction and operational consequences of installing multiple turbine types and sizes within the same project would have an effect on the viability of this option, but doing so would likely not achieve one of the applicant's project objectives of developing a project with at least 180 MW capacity.

Traffic Pattern Modification

An alternative approach to resolving the potential conflict between the 10 wind turbine locations and the existing VFR traffic pattern would be to modify the traffic pattern. As discussed in **Section 3.13.2.1**, a left-hand traffic pattern is now used for VFR traffic operating from all four Bowers Field runways. This results in the protected airspace for the VFR traffic patterns extending up to 4 miles north from Bowers Field and overlapping with the southeastern portion of the Desert Claim project area.

As discussed in the Draft EIS, by prescribing right-hand traffic patterns for both Runways 7 and Runway 11, effectively all visual traffic using these runways would operate to the south and/or west of Bowers Field. The protected airspace under this pattern would therefore remain at least 1 mile from the nearest wind turbine location. With such a revision, none of the proposed turbine locations would conflict with the VFR traffic pattern. Modifying traffic patterns in this manner is frequently proposed as a way of avoiding precipitous terrain and obstructions present near airports. However, comments on the Draft EIS

maintained that a change to a right traffic pattern would have an unnecessary impact on the overwhelming majority of small aircraft that operate to and from Bowers Field.

In response to this concern, Kittitas County and the EIS team investigated other options for procedural modifications that would resolve the potential project conflict with the VFR traffic pattern. This investigation indicated that existing procedures specified the same traffic pattern altitude (TPA), approximately 2,600 feet AMSL or 840 feet above the elevation of the airport, for all categories of aircraft in the Bowers Field VFR traffic pattern. This condition is contrary to typical practice used in many airports across the nation, in which one TPA is specified for small (piston-driven) aircraft and a higher-level TPA is established for turbojet and large aircraft. Consequently, raising the Bowers Field traffic pattern altitude for large/jet-powered aircraft would take into account the higher terrain north of the airport, would be consistent with standard practice at other airports and would improve safe operating conditions for large/jet-powered aircraft using Bowers Field (i.e., it would reduce noise impacts from such craft by raising their approach elevation), and would be a more logical solution to the VFR traffic pattern conflict.

In conjunction with adoption of its updated airport master plan, Kittitas County requested the FAA to raise the Traffic Pattern Altitude for large/jet-powered aircraft using Bowers Field to 3,300 feet AMSL (1,540 feet above the airport elevation), while retaining the TPA of 2,600 feet for smaller aircraft. Kittitas County did this for health and safety reasons (i.e., to provide a safer approach for jet-powered aircraft and to reduce the noise impacts from such aircraft). One benefit of this change, however, is that it places the few large/jet aircraft that might utilize a Category D VFR traffic pattern well above the obstructions created by the 10 wind turbines in question, thereby resolving this issue. This revised Traffic Pattern Altitude proposal is also consistent with current aviation safety practices nationwide.

3.13.5.2 Marking and Lighting

Marking and/or lighting of the proposed wind turbines would be required to meet FAA safety requirements, as mitigation for the potential safety hazards represented by tall obstructions. Proposed measures to meet these requirements are incorporated into the project description, as indicated in **Section 2.2.2**, and are discussed in more detail below.

Daytime conspicuity can be achieved through painting the structures in accordance with AC 70/7460-1K. Wind energy project developers typically do not prefer this daytime conspicuity method, however, because it has higher initial (construction) and maintenance costs than other methods. Rather, white medium-intensity flashing lights (the L-865 lights specified in AC 70/7460-1K) are normally preferred to meet the daytime conspicuity requirements.

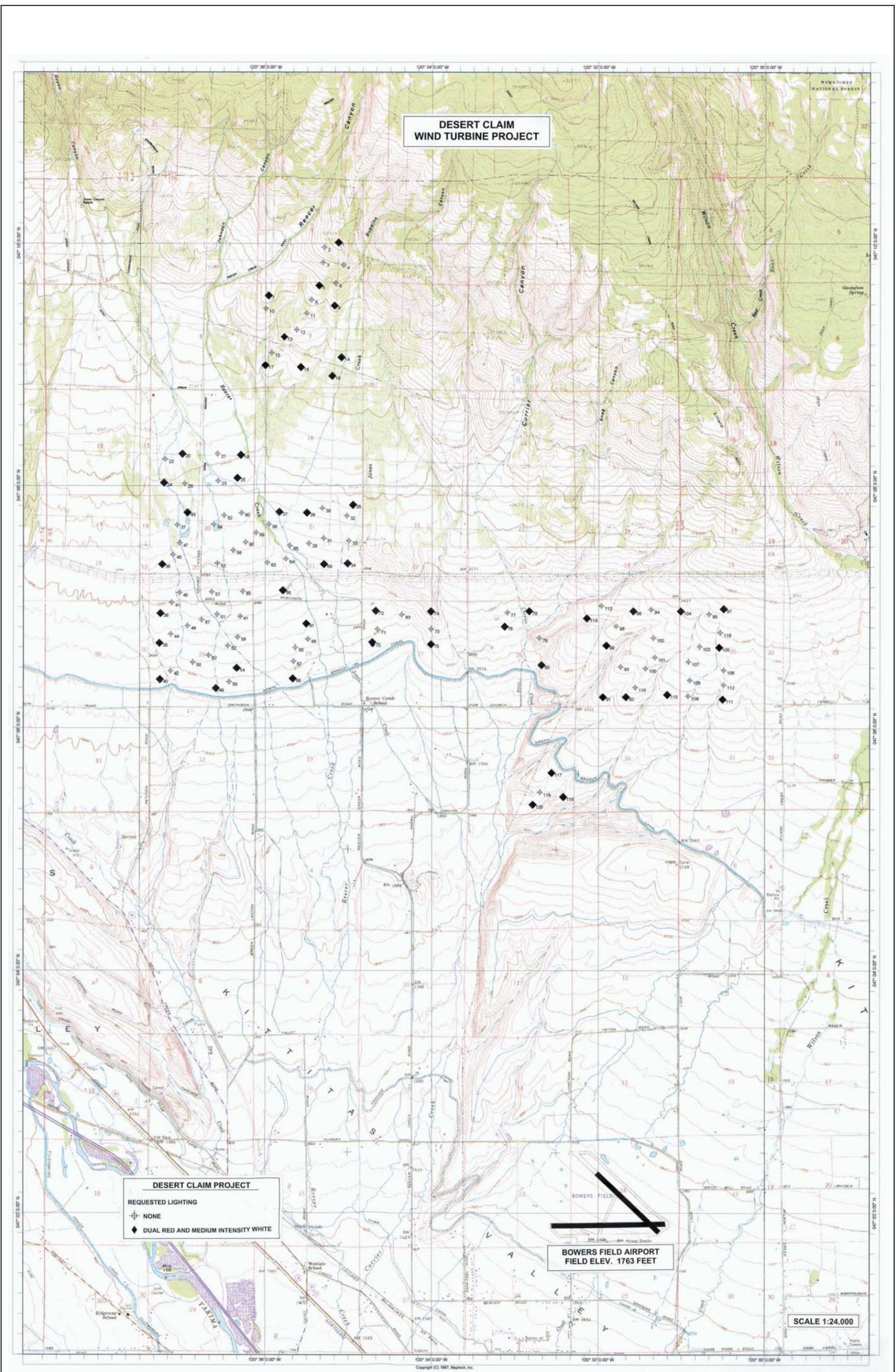
Chapter 8 of AC 70/7460-1K describes the preferred lighting system for wind turbine structures. This is a dual lighting system with red flashing lights (L-864) for nighttime use and medium-intensity flashing white lights (L-865) for daytime and twilight use. This dual system, purchased as a single unit, is the most cost-effective and reliable lighting system providing both day and night conspicuity. Two of these systems are to be mounted on top of the generator housing to flash simultaneously. The entire wind-turbine development project may also have a synchronized lighting system designed so all lights on all turbines flash at the same instant.

Figure 3.13-3 shows the proposed lighting configuration for the Desert Claim project. The wind turbine structures indicated by the large, solid symbols are proposed for lighting with flashing, white medium-intensity lights for use during daylight hours and flashing red lights for evening/night hours. Under this plan 48 of the total 120 wind turbines, or 40 percent, would be equipped with dual lights. Experience with FAA reviews of prior lighting plans indicates this configuration should meet the FAA requirements and provide safe lighting for both daytime and nighttime use.

If the FAA determines the proposed lighting plan to be acceptable, the agency would issue a no-hazard determination on that basis. In that event, the project lighting configuration would be consistent with FAA safety requirements and would not have an adverse impact on air navigation. The safety lighting on the turbines could affect other resources, however, as discussed in **Section 3.10**.

3.13.6 Significant Unavoidable Adverse Impacts

Some of the proposed turbine locations within the Desert Claim project area would conflict with the protected airspace currently associated with the existing VFR traffic pattern. Specifically, 10 of the proposed turbines would exceed the maximum allowable height for structures within the traffic pattern airspace, and represent a potential adverse impact on those air traffic operations. The significance of the potential impact is unclear, because in practical terms the conflict involves operation by a category of aircraft that rarely use Bowers Field and which are not included in the critical family of aircraft identified in the County's current Airport Master Plan. The airspace conflict could be resolved and the potential operations impact could be avoided through several possible means. Those include further modifying the project plan to remove or relocate the remaining 10 turbines and/or to install smaller turbines in selected locations. Changes of this type are already reflected to a degree in the modified project configuration evaluated in the Final EIS, which relocated 17 of the 27 turbines that were identified in the Draft EIS as creating a conflict, and by selecting a smaller turbine as compared to the maximum turbine envelope. Another option for resolving the remaining conflict would be to raise the VFR Traffic Pattern Altitude (TPA) for large/jet-powered aircraft. The available mitigation measures are discussed in detail in **Section 3.13.5**. Because either set of mitigation measures would result in insignificant impacts, there are no significant unavoidable adverse impacts to air transportation associated with the project. Independent of this project, Kittitas County airport management has taken action to raise the TPA for large/jet-powered aircraft. Upon acceptance by the FAA, this action would result in satisfactory resolution of the potential penetration of the 10 wind turbines into the currently-defined Category D VFR traffic pattern, with no adverse effects on aircraft operations or the community.



Source: Aviation Systems, Inc.



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**Figure 3.13-3
Proposed Desert Claim Lighting
Plan**