

## **5.16 VISUAL RESOURCES (INCLUDING LIGHT EMISSIONS AND VISUAL IMPACTS)**

Many airports have runway and taxiway edge lighting to illuminate the boundaries of the airfield pavement, and to supply visual approach navigational aids, which are critical to the safe operation of an airport. This section presents the analysis of the impact of airport-related light emissions and the overall visual impact upon the areas surrounding Gness Field Airport (DVO or Airport) resulting from the project alternatives under consideration in this Supplement to the Final Environmental Impact Statement (SEIS).

### **5.16.1 SIGNIFICANCE CRITERIA**

Federal Aviation Administration (FAA) Order 1050.1F, *Environmental Impacts: Policies and Procedures*, has not established a significance criteria for light emissions, visual resources, or visual character.

FAA Order 1050.1F identifies the following as factors to consider when determining whether an action would have the potential to produce light emission that would have a significant impact. These factors to consider are the degree to which the action would have the potential to:

- Create annoyance or interfere with normal activities from light emissions; and
- Affect the visual character of the area due to the light emissions, including the importance, uniqueness, and aesthetic value of the affected visual resources.

FAA Order 1050.1F also identifies the following as factors to consider when determining whether an action would have the potential to affect the visual resources or visual character of an area in such a way as to result in a significant impact. These factors to consider are the degree to which the action would have the potential to:

- Affect the nature of the visual character of the area, including the importance, uniqueness, and aesthetic value of the affected visual resources;
- Contrast with the visual resources and/or visual character in the study; and
- Block or obstruct the views of visual resources, including whether these resources would still be viewable from other locations.

#### **5.16.1.1 Visual Regulations and Policies**

There are no federal special purpose laws or requirements specific to light emissions and visual effects; although, other special purpose laws, such as the NHPA or Section 4(f) of the DOT Act, have specific provisions for visual impacts to protected resources. In order to determine the potential visual effects, the Proposed Action conditions are compared to the No Action conditions to determine if there is a potential for annoyance or significant change or disruption of visual resources resulting in adverse impacts.

Airport facilities at DVO are illuminated by various types of lighting emanating from any of the following sources:

- Airfield lighting on runways, runway thresholds, taxiways, and ramps (runway lighting);
- Visual approach aids;
- Obstruction lights;
- Hangar and other Airport facilities lighting; and
- Roadway and parking lot lighting.

Generally, lights located at the runway thresholds and in the approach area pose the greatest concern for potential impact due to their intensity and direction the lights are focused. Therefore, the Precision Approach Path Indicator (PAPI) lighting systems were evaluated. The following information is provided in the assessment for each lighting system:

- Location of existing and future runway threshold lights and approach light systems;
- Descriptions of each airfield lighting system as to its purpose, intensity, color, flashing sequence (as appropriate), and beam angle; and
- Assessment of the extent of annoyance caused by the DVO airfield lighting systems.

## **5.16.2 VISUAL RESOURCES CONDITIONS**

### **OVERALL VISUAL CHARACTER**

As shown in Exhibit 1-2, DVO is located in moreless level terrain that slopes very gently from west to east. A mixture of wetland and upland vegetation of the are found to the west, north, and east of DVO, with some agricultural land to south of DVO as described in Chapter 4 of the SEIS. As DVO does not have tall buildings, and the airport pavement is at only a slightly higher elevation than the lands surrounding the airport, DVO tends to blend into the surrounding landscape.

The following paragraphs discuss the existing lighting systems in use at DVO.

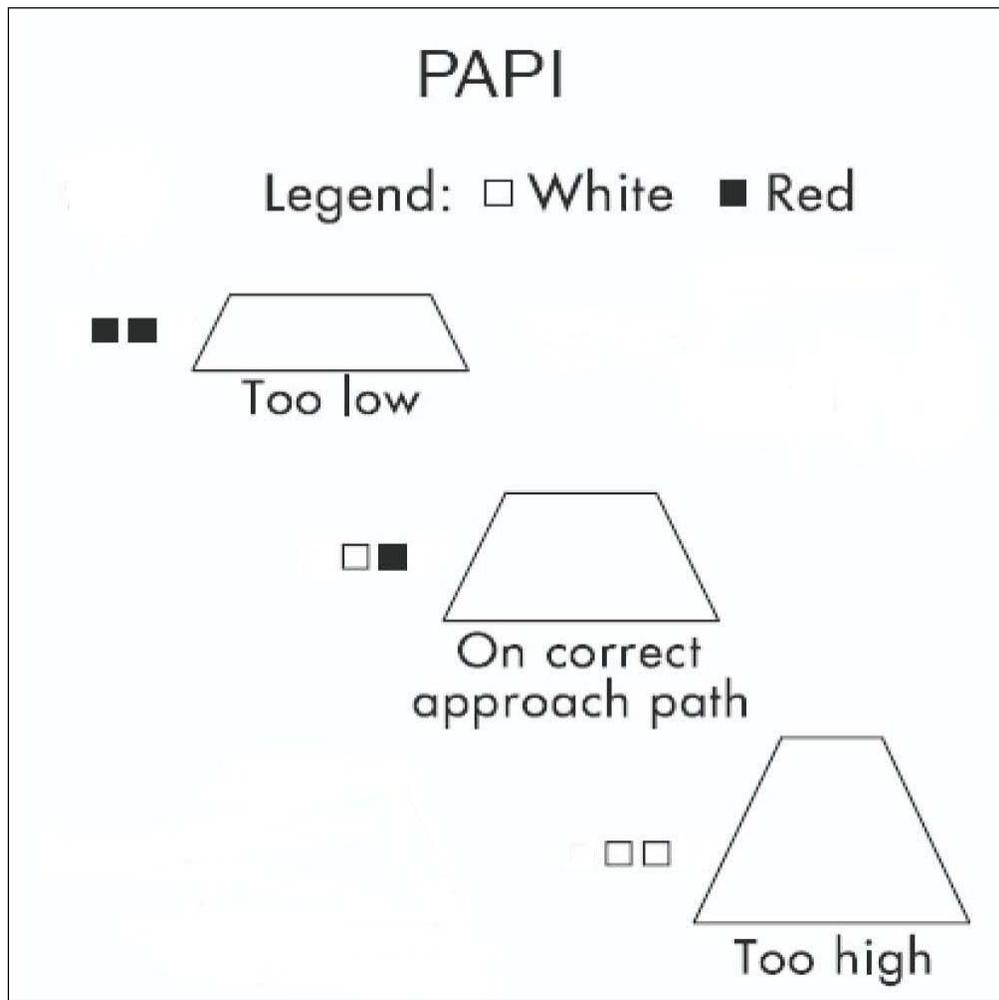
### **PRECISION APPROACH PATH INDICATOR (PAPI)**

The PAPI is a system of lights arranged to provide visual descent guidance information to pilots during the aircraft landing approach.<sup>1</sup> The DVO system provides a specific light pattern when the aircraft is on the desired descent path to the touchdown point. A diagram of a PAPI lighting system is shown in **Figure 5.16-A, PAPI Lighting System.**

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<sup>1</sup> FAA (Advisory Circular) AC 150/5345-52, *Generic Visual Glideslope Indicators (GVGI)*, 9/5/2007.

**Figure 5.16-A  
PAPI LIGHTING SYSTEM  
Gross Field Airport**



A PAPI system includes sets of two or four red-to-white lighting units installed at the approach end of a runway in a single horizontal row.<sup>2</sup> The system is located perpendicular to the runway centerline, at a distance from the threshold that provides the proper threshold crossing height and obstacle clearance.

Each lighting unit projects a split beam of light; the upper segment is white, and the lower segment is red. The transition from white to red, or vice versa, occurs within a vertical angle of five minutes of arc at the beam center and results in a well-defined corridor of light consisting of white (top) and red (bottom) beams. These systems have an effective visual range of about five miles during the day and up to 20 miles at night. The PAPI lights are high-intensity lights that are red and white and are steady burning flashing lights. The lights are installed on poles and the light beam is positioned to project 20 feet above the most critical obstruction in the area.

<sup>2</sup> Federal Aviation Administration, *Aeronautical Information Manual*, Change 3, August 27, 2009. On-line at: [http://www.faa.gov/air\\_traffic/publications/](http://www.faa.gov/air_traffic/publications/), accessed October 8, 2013.

When using a PAPI, pilots operating on the correct glidepath would see one red light and one white light as they complete the approach to landing. Pilots operating above the glidepath would see two white lights, while pilots operating below the glidepath would see two red lights as they complete their approach to landing; appropriate correction would then be applied in order to join the correct glidepath for the landing approach.

Runway 13 has a two-light PAPI located on the right side of the runway as the pilot approaches from the north. This PAPI provides guidance for a 3.5 degree glide path, which clears any obstacles and the terrain north of the Airport. Runway 31 has a two-light PAPI located on the left side of the runway as the pilot approaches from the south. This PAPI provides guidance for a 4.0 degree glide path, which clears any obstacles, including the elevated terrain approximately one mile south of the Airport.

### **OTHER AIRPORT LIGHTING**

An airport rotating beacon identifies the location of the Airport at night and is identified by projecting a green and white beam of light 180 degrees apart.

Obstructions in the vicinity of the Airport are also marked or lighted to warn pilots of their presence. These obstructions may be identified by a steady-red, flashing-red, or white strobe light. These obstructions are identified for pilots on approach and sectional Visual Flight Rules (VFR) charts and on the official Airport Obstruction Chart, published by the National Oceanic and Atmospheric Administration (NOAA).

### **5.16.3 FUTURE CONDITIONS: 2024**

The following section describes the conditions that would result from the lighting required by each of the proposed runway alternatives during the first full year in which the proposed runway extension is anticipated to be operational. While the same types of lighting systems described for the existing conditions are expected to be used for each of the proposed runway alternatives, the location of lighting equipment in relation to homes would change due to the proposed relocation of the runway approach ends.

#### **Alternative A: No Action**

Under this Alternative, Runway 13/31 would remain in its current location; therefore, no changes to the existing lighting equipment or locations would occur.

**Alternative B:  
Extend Runway to the Northwest by 1,100 Feet (Sponsor's Proposed Project)**

Alternative B (Sponsor's Proposed Project) includes the extension of Runway 13/31 1,100 feet to the northwest. As implementation of Alternative B would result in the extension of Runway 13/31 at just a few feet in elevation above the surrounding land, the additional runway pavement would blend into the surrounding visual features of the area, just as the north portion of the existing Runway 13/31 does today.

Under Alternative B, the approach end of Runway 13 would move 1,100 feet to the northwest, along with the existing runway's current PAPI lighting system. With the existing PAPI location, the nearest residential area to the PAPI lighting system at the approach end of Runway 13 is located in the City of Petaluma, approximately 5.5 miles away. Under Alternative B, the PAPI would now be located approximately 5.3 miles away from the closest residential area, located in the City of Petaluma. As with the existing condition, it is extremely unlikely that residents of this area would be able to see the PAPI lighting system due to the distance and angle of the lights. The nearest residential area to the PAPI lighting system at the approach end of Runway 31 (south of the Airport) is located 1.1 miles away in the City of Novato. The angle of the PAPI on the south side of the Airport is set at 4.0 degrees, which is a steeper angle than the typical 3.0 degree approach. The reason for this increased angle is to provide an additional margin of safety for pilots approaching over the elevated areas south of the Airport. Therefore, the PAPI lights are directed above the residential areas located on the elevated terrain. It is possible that residents at the highest points of this residential area may be able to see the PAPI lights, but given the angle and the distance, these lights would not be intrusive.

Taxiway and runway lights would also be added to the Airport, but these lights are directed in a way to illuminate specific areas of pavement. These lights would likely be visible by the residential areas to the south that has a view of the Airport, but due to their intensity and distance from the residential areas, the lights would not significantly increase the overall intensity or amount of light emissions created by the Airport. Additionally, other lighting exists along the taxiways and ramps for low visibility purposes and to assist aircraft movement on the airfield, such as hold position lights, stop bar lights, and runway and taxiway signage. Each of these additional light systems are located within the Airport complex and represent no impact upon neighboring communities. Therefore, these light emissions would not create an annoyance among people in the vicinity of DVO or interfere with their normal activities.

Given these conditions, implementation of Alternative B would not result in significant impacts due to additional light emissions from airfield lighting or result in blocking current views or creating disruptive additional features that would result in a significant adverse impact on visual resources.

**Alternative D:  
Extend Runway to the Southeast by 240 Feet and to the Northwest by 860 Feet**

Alternative D includes the extension of Runway 13/31 860 feet to the northwest and 240 feet to the southeast. As implementation of Alternative D would result in the extension of Runway 13/31 at just a few feet in elevation above the surrounding land, the additional runway pavement would blend into the surrounding visual features of the area, just as the north portion of the existing Runway 13/31 does today.

Under Alternative D, the approach end of Runway 13 would move 860 feet to the northwest and the approach end of Runway 31 would move 240 feet to the southeast, along with each runway's current PAPI lighting system. With the existing PAPI locations, the nearest residential area to the PAPI lighting system at the approach end of Runway 13 is located in the City of Petaluma, approximately 5.5 miles away; while the nearest residential area to the PAPI lighting system at the approach end of Runway 31 is located 1.1 miles away in the City of Novato. Under Alternative D, the PAPI at the approach end of Runway 13 would now be located approximately 5.4 miles away from the closest residential area, located in the City of Petaluma. As with the existing condition, it is extremely unlikely that residents of this area would be able to see the PAPI lighting system due to the distance and angle of the lights.

The PAPI at the approach end of Runway 31 would now be located approximately 1.04 miles away from the closest residential area, located in the City of Novato. Due to the elevation of the terrain south of the Airport, it is likely that the angle of the PAPI would increase to 4.25 or 4.5 degrees to provide the necessary guidance to pilots approaching from the south of the Airport. As a result, the PAPI lighting system may still be visible to residential areas, but would not create a significantly different lighting situation that exists today. Taxiway and runway lights would also be added to the Airport to provide lighting for the taxiway and runway extensions. The area to the south of the Airport where the southern extension would be located would have additional taxiway and runway lights. These lights are directed in a way to illuminate specific areas of pavement; however, they would likely be visible by the residential areas to the south that have a view of the Airport. However, other lighting exists along the taxiways and ramps for low visibility purposes and to assist aircraft movement on the airfield, such as hold position lights, stop bar lights, and runway and taxiway signage. Each of these additional light systems are located within the Airport complex and represent no impact upon neighboring communities. Therefore, the overall view of an Airport setting would be similar to the existing condition. Given the intensity of the Airport lighting and its distance from the residential area south of the Airport, the additional lighting would not be anticipated to annoy people in the residential area or interfere with their normal activities.

Additionally, other lighting exists along the taxiways and ramps for low visibility purposes and to assist aircraft movement on the airfield, such as hold position lights, stop bar lights, and runway and taxiway signage. Each of these additional light systems are located within the Airport complex and represent no impact upon neighboring communities. Given these conditions, implementation of Alternative D would not result in significant impacts due to additional light emissions from airfield

lighting or result in blocking current views or creating disruptive additional features that would result in a significant adverse impact on visual resources.

**Alternative E:**  
**Extend Runway to the Northwest by 300 Feet**

Alternative E includes the extension of Runway 13/31 300 feet to the northwest with a shift of Runway 13/31 106 feet to the north. As implementation of Alternative E would result in the extension of Runway 13/31 at just a few feet in elevation above the surrounding land, the additional runway pavement would blend into the surrounding visual features of the area, just as the north portion of the existing Runway 13/31 does today.

Under Alternative E, the approach end of Runway 13 would move 406 feet to the northwest, along with the existing runway's current PAPI lighting system. With the existing PAPI location, the nearest residential area to the PAPI lighting system at the approach end of Runway 13 is located in the City of Petaluma, approximately 5.5 miles away; while the nearest residential area to the PAPI lighting system at the approach end of Runway 31 is located 1.1 miles away in the City of Novato. Under Alternative E, the PAPI would now be located approximately 5.4 miles away from the closest residential area, located in the City of Petaluma. As with the existing condition, it is extremely unlikely that residents of this area would be able to see the PAPI lighting system due to the distance and angle of the lights.

The PAPI at the approach end of Runway 31 would now be located farther away from the closest residential area in the City of Novato. As a result, the PAPI lighting system may still be visible to residential areas, but would not create a significantly different lighting situation than exists today. Taxiway and runway lights would also be added to the Airport to provide lighting for the taxiway and runway extensions. These lights would likely be visible by the residential areas to the south that have a view of the Airport, but due to their intensity and distance from the residential areas, the lights would not significantly increase the overall intensity or amount of light emissions created by the Airport. Additionally, other lighting exists along the taxiways and ramps for low visibility purposes and to assist aircraft movement on the airfield, such as hold position lights, stop bar lights, and runway and taxiway signage. Each of these additional light systems are located within the Airport complex and represent no impact upon neighboring communities. Therefore, these light emissions would not create an annoyance among people in the vicinity of DVO or interfere with their normal activities.

Given these conditions, implementation of Alternative E would not result in significant impacts due to additional light emissions from airfield lighting or result in blocking current views or creating disruptive additional features that would result in a significant adverse impact on visual resources.

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