SOLAR GLARE HAZARD ANALYSIS

Background

The City of Moreno Valley has a Solar Incentive Program. This program is limited to funds available on a first-come-first-served basis. The Program Requirements, effective July 1, 2015 state that "for commercial customers that fall under the Performance Based Incentive, the incentive is 4 cents per kWh for installations over 30 kWup to 500 kW. For installations over 500 kW up to 1 MW, the incentive will be determined on a case by case basis." In general, the use of solar is encouraged in the City of Moreno Valley. Chapter 9 of the city's General Plan, which outlines goals and objectives has two policies that specifically point to this:

> Policy 2.13.4 – Encourage installation of advanced technology infrastructure, including, but not limited to, infrastructure for high speed internet access and solar energy.
>
> Policy 7.5.5 – Encourage the use of solar power and other renewable energy systems.

Standard of Review

Because of the project's proximity to March Air Reserve Base, the FAA's policies addressing use of solar panels should be considered. The FAA's Interim Policy[1], FAA Review of Solar Energy System Projects on Federally Obligated Airports states that "proponents of solar energy systems located off-airport property or on non-federally-obligated airports are strongly encouraged to consider the requirements of this policy." In certain situations the glass surfaces of the solar energy systems can reflect sunlight and produce glint and glare. This glint and glare could result in an ocular impact to pilots or air traffic controllers and compromise safety. The interim solar policy further states:

- To obtain … a ''no objection'' to a Notice of Proposed Construction Form 7460–1, the airport sponsor will be required to demonstrate that the proposed solar energy system meets the following standards:

  1. No potential for glint or glare in the existing or planned Airport Traffic Control Tower (ATCT) cab, and
  2. No potential for glare or ''low potential for after-image'' (shown in green) along the final approach path for any existing landing threshold or future landing thresholds.

- Ocular impact must be analyzed over the entire calendar year in one (1) minute intervals from when the sun rises above the horizon until the sun sets below the horizon.

- In cooperation with the DOE, the FAA is making available free-of-charge the Solar Glare Hazard Analysis Tool (SGHAT). The SGHAT was designed to determine whether a proposed solar energy project would result in the potential for ocular impact as depicted on the Solar Glare Hazard Analysis Plot. Users must first register for the use of the tool at this web address: www.sandia.gov/glare.

[1] Federal Register, Volume 78, No. 205, Wednesday, October 23, 2013, Department of Transportation, Federal Aviation Administration, Interim Policy, FAA Review of Solar Energy System Projects on Federally Obligated Airports, Pages 63276-63279.

Solar Glare Hazard Analysis Findings

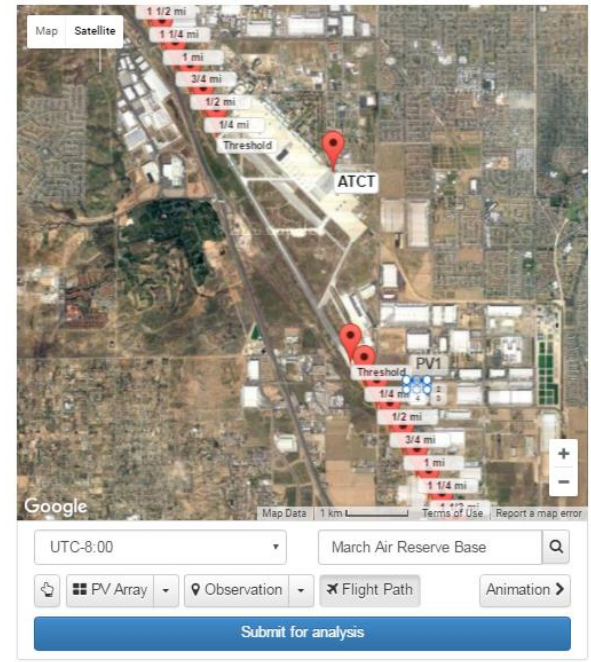
Johnson Aviation performed a solar glare hazard analysis (the "Analysis") using Sandia Labs Solar Glare Hazard Analysis Tool (SGHAT) for a potential solar photovoltaic (Solar PV) site that could encompass the entire roof top of the Project (See Figures 1 and 2). This Analysis is based on the location of the March ARB Airport Traffic Control Tower (ATCT) and for the final approach paths to Runway 32, Runway 14 as encouraged by the FAA.

The findings of the Analysis are that there is ***No Glare*** potential for the air traffic controllers in the ATCT cab, ***No Glare*** potential for pilots approaching Runway 14 and a ***"low potential for after-image"*** in two locations along the final approach path to Runway 32 (See Figure 3). These findings meet the requirements recommended by the FAA for off-airport Solar PV installations and would therefore present ***no hazard to air navigation***. Findings from the Analysis are presented in the figures that follow.

Figure 1: Project Site Location – 17845 Indian St., Moreno Valley, CA

Figure 2: Potential Roof Top Solar PV Site

Figure 3: SGHAT Analysis Tool Summary of Results



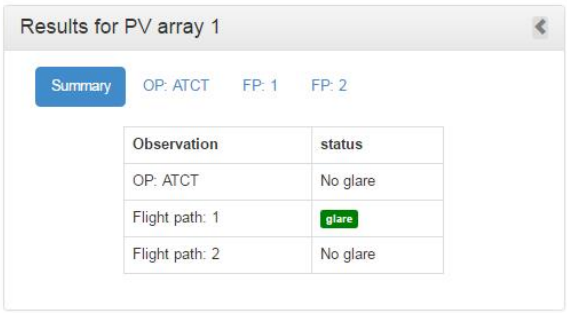


Figure 4: SGHAT Analysis Tool Results for Air Traffic Control Tower (ATCT) Cab

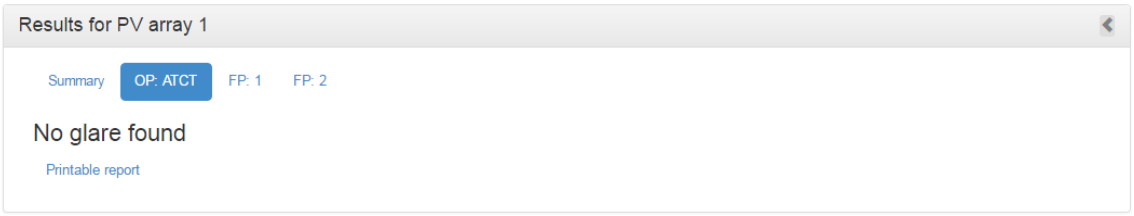


Figure 5: SGHAT Analysis Tool Results for Flight Path 1 – Final Approach to March ARB Runway 32

Figure 6: Glare Occurrence Plot – ¼ Mile from March ARB Runway 32 Threshold

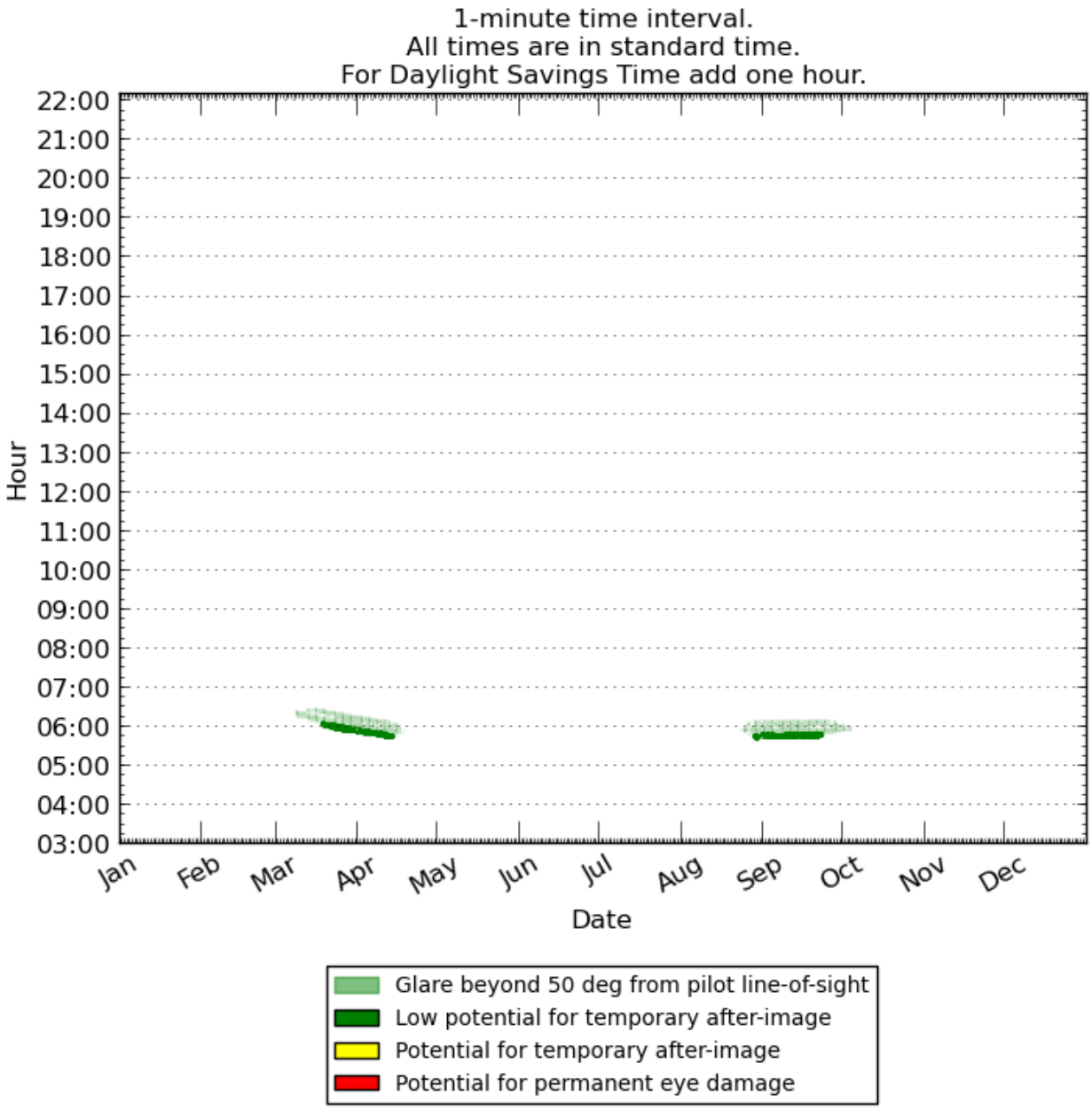


Figure 7: Glare Occurrence Plot – 1/2 Mile from March ARB Runway 32 Threshold

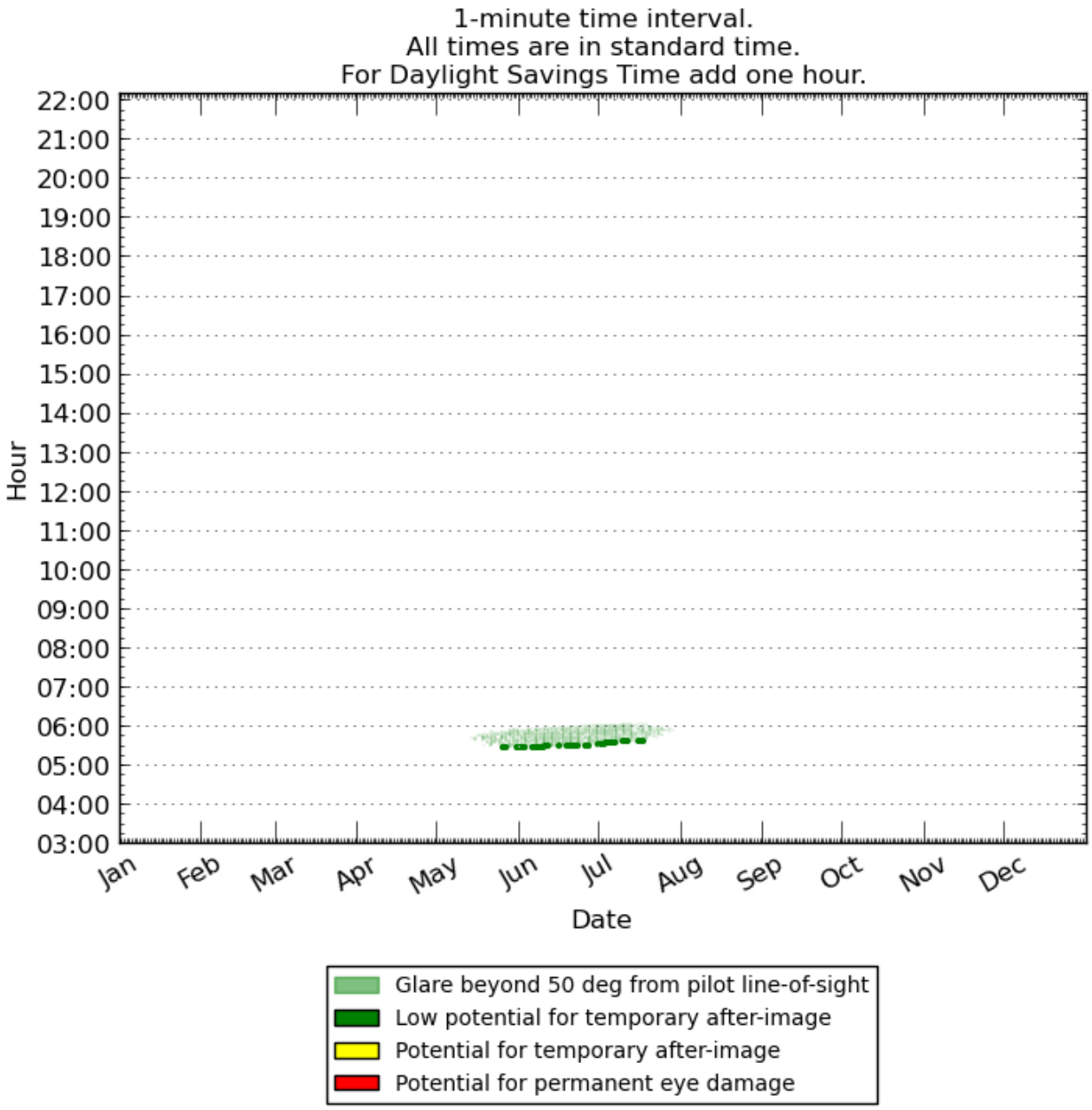
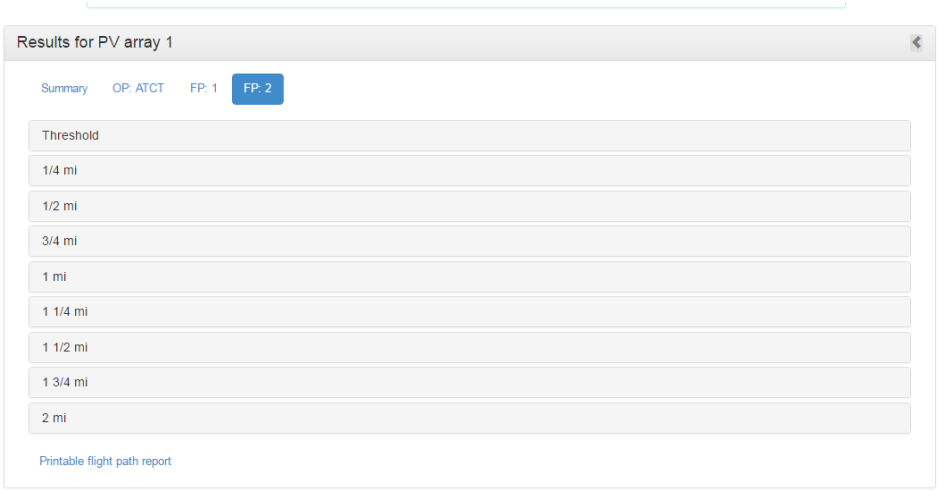


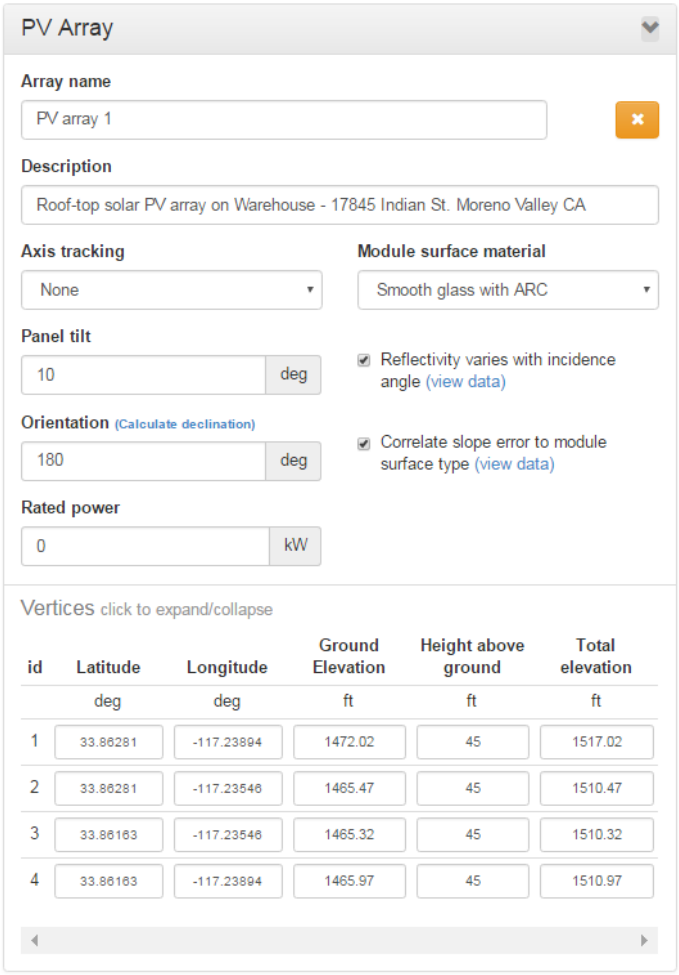
Figure 8: SGHAT Analysis Tool Results for Flight Path 2 – Final Approach to March ARB Runway 14



Solar Glare Hazard Analysis Technical Input Parameters

The following figures provide detailed technical input parameters to the SGHAT model that produced the findings of the Analysis. The PV Array is assumed in the Analysis to be a roof top solar array on the Project site. Figures 9 through 12 provides the SGHAT input parameters.

Figure 9: PV Array Input Parameters



id	Latitude	Longitude	Ground Elevation	Height above ground	Total elevation
	deg	deg	ft	ft	ft
1	33.86281	-117.23894	1472.02	45	1517.02
2	33.86281	-117.23546	1465.47	45	1510.47
3	33.86163	-117.23546	1465.32	45	1510.32
4	33.86163	-117.23894	1465.97	45	1510.97

Figure 10: Flight Path 1 Input Parameters – March Air Reserve Base Runway 32

Flight Path(s)

Flight path name

1

Description

Final approach to March Air Reserve Base Runway 32

Direction

330 deg

Consider pilot visibility from cockpit

Glide slope

3 deg

Max downward viewing angle

30 deg

Threshold crossing height

59 ft

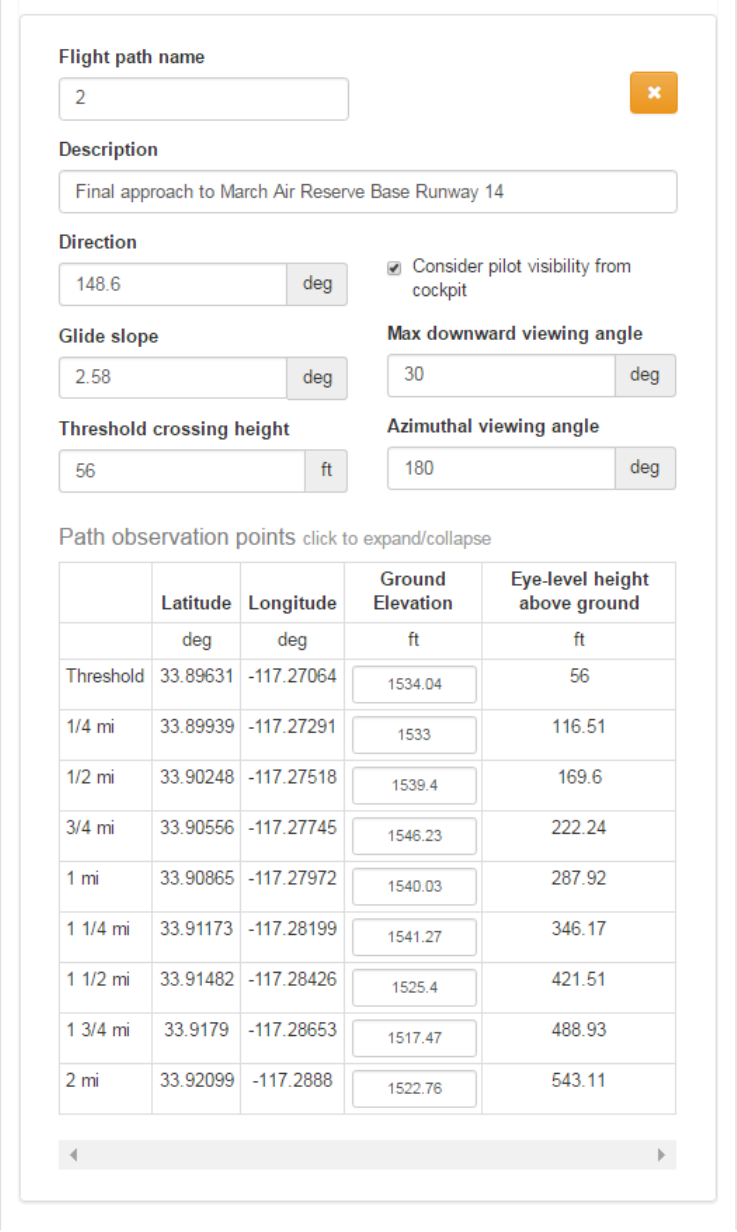
Azimuthal viewing angle

180 deg

Path observation points click to expand/collapse

	Latitude	Longitude	Ground Elevation	Eye-level height above ground
	deg	deg	ft	ft
Threshold	33.86514	-117.2483	1495.81	59
1/4 mi	33.86201	-117.24613	1480.86	143.13
1/2 mi	33.85888	-117.24395	1472.29	220.89
3/4 mi	33.85575	-117.24177	1470.35	292
1 mi	33.85262	-117.23959	1471.48	360.04
1 1/4 mi	33.84949	-117.23742	1468.53	432.17
1 1/2 mi	33.84636	-117.23524	1469.07	500.81
1 3/4 mi	33.84323	-117.23306	1476.67	562.4
2 mi	33.8401	-117.23089	1461.03	647.21

Figure 11: Flight Path 2 Input Parameters – March Air Reserve Base Runway 14



Flight path name: 2

Description: Final approach to March Air Reserve Base Runway 14

Direction: 148.6 deg

Consider pilot visibility from cockpit

Glide slope: 2.58 deg

Max downward viewing angle: 30 deg

Threshold crossing height: 56 ft

Azimuthal viewing angle: 180 deg

Path observation points click to expand/collapse

	Latitude	Longitude	Ground Elevation	Eye-level height above ground
	deg	deg	ft	ft
Threshold	33.89631	-117.27064	1534.04	56
1/4 mi	33.89939	-117.27291	1533	116.51
1/2 mi	33.90248	-117.27518	1539.4	169.6
3/4 mi	33.90556	-117.27745	1546.23	222.24
1 mi	33.90865	-117.27972	1540.03	287.92
1 1/4 mi	33.91173	-117.28199	1541.27	346.17
1 1/2 mi	33.91482	-117.28426	1525.4	421.51
1 3/4 mi	33.9179	-117.28653	1517.47	488.93
2 mi	33.92099	-117.2888	1522.76	543.11

Figure 12: March Air Reserve Base Airport Traffic Control Tower (ATCT)