

APPENDIX B

Approach Visibility Minimums Analysis

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Introduction

As part of the master plan study, the consultant has performed a review of the published approach visibility minimums for runway ends 6 and 24. The analysis consists primarily of reviewing available documentation from the FAA regarding the original establishment of the ILS procedures for both runway ends and making specific recommendations as to what can be done to enhance the visibility minimums at the Airport.

Runway 24 Approach Visibility Minimums

The initial analysis focuses on the present Runway 24 ILS Standard Instrument Approach Procedure (SIAP) to Erie International Airport, and includes a brief overview of the minimums, visibility limits and the controlling obstacles.

In addition, this analysis assesses the impacts on the existing CAT I ILS and approach minimums with a potential extension to Runway 24 having the following lengths: 1,000 feet, 1,500 feet or 1,900 feet.

The existing Runway 24 ILS published minimums were determined on the Height Above Terrain (HAT) RWY Elev. 732 feet plus Required Obstruction Clearance (ROC) of 250 feet, which equals a Decision Height (DH) of 982 feet and $\frac{3}{4}$ Statute Mile visibility. The 34:1 approach slope is clear of obstructions. The 7:1 Transition Area does have minor penetrations: 8260-3, paragraph 938b (2) was applied by the FAA, meaning that the penetrations are not considered an impact to the approach minimums.

Runway 24 Category I ILS has the following supporting NAVAIDs:

1. Localizer (LOC) located at 42-04-32.09N/080-11-11.07W (on airport property)
2. Glide Slope (GS) located at 42-05-02.11N/080-10-08.24W (on airport property)
3. Middle Marker (MM) located at 42-05-29.10N/080-09-23.90W
4. Outer Marker (OM) located at 42-07-43.60N/080-05-03.20W.

An analysis of the existing marker beacons was also performed in accordance with FAA Advisory Circular, 150/5300, paragraph 602, d. (1) (a), (b) and (c). Marker beacons radiate cone or fan shaped signals vertically to activate aural and visual indicators in the cockpit marking specific points in the ILS approach. Marker beacons are located on the extended runway centerline at key points in the approach as noted below:

- The outer marker (OM) beacon is located 4 to 7 nautical miles (7.4 to 13 km) from the ILS threshold to mark the point at which glide slope altitude is verified or at which descent without glide slope is initiated.
- A middle marker (MM) beacon is located 2,000 to 6,000 feet (600 to 1800m) from the ILS runway threshold. It marks (approximately) the decision point of a CAT I ILS approach.

- An inner marker (IM) beacon may be located to mark the decision point of a CAT II or CAT III ILS approach. Inner marker beacons are not used for CAT I ILS's.

With an extension of Runway 24, (1,000, 1,500 or 1,900 feet) the MM will have to be relocated 2,000 to 6,000 feet from Runway 24 threshold or removed as it is not a required system component, per FAA Handbook 8260-3, chapter 9, paragraph 910. Based on the AC 150/5300 reference Paragraph 602,d. (1) (a).

The present location of the OM falls within the required distance from Runway 24's threshold (4 to 7 NMs); however the altitude at the OM may have to be lowered and a review of obstacles will be required.

Additionally, with the runway extensions the impact on the NDB RWY 24 approach should be reviewed, because the distance from the approach end of the Runway 24 to the Cascade (CQD) NDB (42-07-09.10N/080-06-16.50W) will get closer, therefore changing the Missed Approach point and possibly the minimums. This may also be the same situation with the VOR/DME or GPS RWY 24 Approaches.

Please find a summary of visibility approach minimums in Table B-1.

**Table B-1
Runway-24 Threshold to NAVAID Distance's Nautical (NM) and Feet (ft)
&
Outer Marker (OM)/Glide Slopes (G/S)
Intercept Altitude & Decision Height (DH)/ Visibility (VIS)**

| NAVAID | Threshold | Present | 1,000ft. Ext. | 1,500ft Ext. | 1,900ft. Ext. | Remarks |
|--------|----------------------------|-------------------------------|---------------------------------|---------------------------------|------------------------------|--|
| OM | NM Feet | 4.39NM 26,666,26' | 4.22NM 25,666,34' | 4.14NM 25,168,38' | 4.08NM 24,466,41' | OM site relocation "Not required" |
| MM | NM Feet Relocate | 0.45NM 2,760.32' #0 ft. | 0.29NM 1,760.32' #240 ft. | 0.21NM 1,260,33' #740 ft. | 0.14NM 860,33' #1,140' | Relocate MM site outward to the northeast by feet denoted # sign or "Decommission MM site, not needed for CAT I ILS |
| GS/OM | Intercept Altitude in Feet | 2,228' | (2,175') | (2,149') | (2,128') | (Approximate Altitude) No change to altitude required in the Intermediate 2,300' segment to the ILS Runway 24 final. The 34:1 & 29,5:1 is clear. |
| DH | Altitude in Feet | 982' | 932' | 932' | 932' | Reference: DOT, FAA, Order 8400.13 |
| VIS | Visibility in Statue Miles | ¾ | 1/2 | 1/2 | 1/2 | Appendix 1, Figure 1 (copy attached) |

Source: C&S Engineers, Inc.

According to our analysis of the published approach visibility minimums, the only thing preventing the existing Runway 24 CAT I ILS approach from being reduced to ½ mile visibility minimum are additional approach lighting components. Based upon our analysis, no known obstructions (manmade) exist preventing the minimums from being lowered to ½ mile.

An extension of the Runway 24 end would allow the Airport the opportunity to reduce the visibility minimums to ½ mile if additional approach lighting components were installed and if CAT II ILS was implemented. A CAT II ILS approach procedure with ½ mile visibility minimums would require the following:

- Outer Marker beacon
- Middle Marker beacon
- Inner Marker beacon
- Approach Lighting System
- Touchdown Zone Lighting System
- Centerline Lighting System
- High Intensity Runway Edge Lighting System
- All-weather runway markings
- Runway Visual Range (RVR)
- Radar Altimeter Setting Height
- Remote Monitoring
- Manual Inspection
- Critical Areas

Identification of the required components allowing the Airport to enhance the Runway 24 approach to a CAT II ILS are included as part of the Facility Requirements section of the master plan report.

Feasibility of Providing Lower Visibility Minimums for Runway 24

This section considers questions related to the Airport's ability to implement a CAT II Approach and reduce visibility minimums. The feasibility of providing lower visibility minimums is considered under the following circumstances: 1) if the entire project were halted and the no-build alternative became a reality, or 2) if a proposed runway alternative were to include constructing a road within the areas delineated as runway safety area.

No-Build Alternative (Runway 24 is not extended)

Assumptions: Powell Avenue remains as it is today.

Impacts to CAT II Approach:

CAT II is not feasible due to potential visibility line-of-sight issues related to vehicle traffic traveling on Powell Avenue. An ALSF-2 system would require a clear line-of-sight between approaching aircraft and all lights in an ALS. Therefore a CAT II Approach would not be feasible for Runway 24.

Impacts to Reducing Visibility Minimums:

If obstructions were removed (trees and poles) a ½ mile visibility minimum could be achievable with or without the ALSF-2. However, with Powell Avenue remaining, the ability to reduce minimums becomes questionable because the road would be determined an obstruction. Therefore, reduced minimums may not be achievable if the road remains. The FAA would have to make final determination as to the likelihood of achieving the reduction.

Runway 24 Extension (any length)

Assumptions:

- Powell Avenue is relocated to the area delineated as Runway Safety Area (within 1000 feet of the physical pavement end) and is constructed at least 23 feet below the runway end elevation.
- Declared Distances are implemented to achieve the required 1000-foot safety area on the 24 end.

Impacts to CAT II Approach:

CAT II is feasible *as long as* the following are taken into consideration:

- Proposed elevation of the relocated Powell Avenue is at least 23 feet below the elevation of the Runway 6 localizer elevation (similar to what exists today on Asbury Road). By constructing the road at this elevation, the line-of-sight issue is addressed for the ALSF-2.

Impacts to ILS:

The proposed road would be within the critical grading area for the ILS. The critical area requires that nothing be located above grade; in this case the issue is the roadway elevation. As long as the road was below the critical area, it could be allowed.

Other Impacts:

FAA AC 150/5300-13 provides guidance for determining the effects of jet blast. Jet blast from the design aircraft would severely impact vehicle traffic and pedestrians traveling along a relocated Powell Avenue if the road were not lowered (similar to Asbury Road).

Impacts to Reducing Visibility Minimums:

If obstructions were removed (trees and poles) a ½ mile visibility minimum could be achievable provided the road is constructed at least 23 feet below the runway end elevation. If the road were not constructed at this elevation, it would again be an obstruction (as it is today) and the FAA would determine if this condition would prevent the desired reduction in visibility minimums.

Runway 6 Approach Visibility Minimums

The Runway 6 ILS, SIAP is also under review to determine if anything can be done to enhance the approach visibility minimums to the runway end. Presently, the FAA applied 8260-3 (TERPS) paragraph 332 because the 20:1 plane is penetrated by numerous telegraph poles and trees. The ILS 982-foot (250-foot) DH and 3/4 statute mile visibility with ALS was granted by wavier, dated 01-30-1968.

The results of the analysis of the Runway 6 approach indicate that obstructions exist necessitating $\frac{3}{4}$ mile visibility minimums. The known obstructions are trees located along side of the existing railroad tracks. The Obstruction Evaluation, dated January 2002 and prepared by C&S Engineers as part of the Airport Master Plan, highlights obstructions to FAR Part 77 surfaces in more detail. It is reasonable to conclude that if the obstructions are removed, the FAA may consider a reduction to the visibility minimums for Runway 6. The analysis prepared for the Obstruction Evaluation did not identify or evaluate the controlling obstruction that would result should the trees be removed. The final determination of reducing the visibility minimums is made by the FAA.