3.0 ALTERNATIVES

This EA for the Runway 5-23 Rehabilitation project covers the numerous proposed project elements as previously denoted in the MPU, Phase I and Phase II Feasibility Studies, and the Runway Safety Area Determination. These various project elements were combined to form the Proposed Action. The primary focus of this chapter is to identify and evaluate the various alternatives of each project element that was considered in the making of the Proposed Action, in total.

The presentation of the Runway 5-23 Rehabilitation alternatives is organized as follows:

- Development Constraints
- Evaluation Criteria
- Development Alternatives
- Proposed Action

Each project element – runway paving, drainage system, taxiway relocation, etc. – was evaluated on an individual basis. The preferred alternatives for each of these categories were then combined to create the overall Proposed Action.

3.1 DEVELOPMENT CONSTRAINTS

There are several constraints associated with potential development at MMU, the majority of which relate to its location within a low lying developed drainage area, surrounding development, and roadway infrastructure. The constraints considered during the formulation of the project element alternatives are described below:

**Wetlands:** Approximately fifty percent of the Airport property is classified as wetlands by New Jersey Department of Environmental Protection (NJDEP). When wetland transitional areas, also regulated by NJDEP are included, the land area available for construction of new facilities is very limited. Most impacts to wetlands would require wetland mitigation.

**Flood Hazard Zone:** An additional consideration is the fact that much of MMU property lies below the 100-year flood hazard elevation of Black Brook and the Whippany River. Construction of new aviation facilities on sites below the 100-year flood elevation involves placement of fill material that would require mitigation for loss of flood storage volume.

**Floodways:** Floodways associated with both the Whippany River and Black Brook have been identified on MMU property. Placement of fill material in floodways has the potential to affect water flow and floodwater elevations upstream and downstream from the Airport and is highly regulated and often strictly prohibited.
Flora and Fauna: NJDEP and the U.S. Fish and Wildlife Service (USFWS) have identified a few species of animals that are afforded some level of protection that may be found on MMU property. As part of this EA, the previous studies conducted in 2010 and 2013 relative to the presence of threatened and endangered species have been considered in the evaluation of the alternatives.

Historic Fill Material: While not a constraint per se, any development that would require excavation of historic fill material may incur additional costs due to the need to characterize the historic fill material and any potentially impacted soils that may be encountered during development and, if necessary, remediate or dispose of any impacted excavated material.

Surrounding Development: Columbia Turnpike lies southeast of the Runway 23 Departure End and is a busy thoroughfare. The location of the existing interchange with Route 24 and surrounding wetlands makes the relocation of the roadway prohibitively expensive and disruptive, and therefore, is not an option to address facility requirements. There is also residential development along the western boundary of MMU. DM has worked to minimize the impact of the aviation operations in this area, which would continue to be considered as part of the alternatives assessment.

Maximum Financially Feasible Costs: FAA Order 5200.9, Financial Feasibility and Equivalency of Runway Safety Area Improvements and Engineered Material Arresting Systems, provides guidance on utilizing an EMAS to improve RSAs and in determining the maximum financially feasible costs for RSA improvements, whether they involve an EMAS or not. This guidance aids in evaluating the practicality and feasibility of RSA alternatives, and thus serves as a constraint that must be considered in the development of alternatives for this EA.

3.2 EVALUATION CRITERIA

A set of evaluation criteria was developed to provide consistent assessments of each project alternative throughout the review process. The criteria are defined as follows:

- **Purpose and Need**: Does the alternative meet the purpose and need of the project?

- **Environmental Effects**: What are the potential environmental effects associated with implementation of the alternative? Does the alternative avoid or minimize and mitigate environmental effects?

- **FAA Standards**: Does the alternative meet the design standards of FAA Advisory Circular 150/5300-13A, Airport Design, and others, to the maximum extent feasible?
• **Community Impact:** What are the potential community impacts associated with implementation of the alternative? Does the alternative avoid or minimize and mitigate community impacts?

• **Operational Flexibility:** To what extent does this alternative allow for operational flexibility and efficiency during construction? To what extent does this alternative allow for operational flexibility and efficiency after project completion? In this instance the ratings for “during construction” and “after construction” were weighed equally when determining overall flexibility.

• **Development Cost:** Does the alternative have reasonable development costs in comparison to other alternatives that achieve the same goal? This is a qualitative assessment based on proposed actions.

Each of the evaluation factors above was given a scoring value as follows:

• **Purpose and Need:** Yes, No, Partial
• **Environmental Effects:** None, Minor, Large, Significant, Positive
• **FAA Standards:** Yes, No, Partial
• **Community Impact:** None, Minor, Large, Significant
• **Operational Flexibility:** Poor, Fair, Good, Excellent
• **Development Cost:** None, Low, Medium, High

Thus, alternatives were compared using both qualitative and quantitative criteria. The recommended alternative was selected based on its ability to best meet those measures as compared to other options.

### 3.3 AIRPORT DEVELOPMENT ALTERNATIVES

Following is a description and evaluation of the alternatives that were considered to address the purpose and need for the major project elements.

#### 3.3.1 RUNWAY 5-23 PAVEMENT REHABILITATION

The following alternatives were developed to address MMU’s runway surface requirements. As noted previously, the center 50 feet of the runway is failing as evidenced by the collapsing runway centerline. MMU began construction on a self-funded project to repair this 50 foot wide “keel section” for the length of the runway in 2013. MMU undertook this measure to forestall the imminent risk of damage from Foreign Object Debris (FOD) and to preserve the remaining pavement life until the runway rehabilitation could be completed. For purposes of this EA, it is assumed that the keel section repair would be completed prior to the start of construction of the projects described in this EA. It is important to note that these alternatives were intended to maintain the existing footprint of Runway 5-23, and in no way would an expansion of length or width occur under any of the options described below.
• Runway 5-23 Pavement Alternative I (No-Build):
  o The existing runway surface would remain the same. Alternative I is considered the No-Build Alternative.

• Runway 5-23 Pavement Alternative II (Full-depth, Full-width):
  o The pavement for Runway 5-23 would be reconstructed to its full depth and full width, or 31 inches and 150 feet, respectively.

• Runway 5-23 Pavement Alternative III (Partial-depth, Full-width):
  o The pavement for Runway 5-23 shall be reconstructed to a partial depth of 26 inches and a full width of 150 feet. A full-width overlay would also be provided.

• Runway 5-23 Pavement Alternative IV (Partial-depth, Partial-width):
  o The pavement for Runway 5-23 would be rehabilitated to a partial depth of 26 inches and a partial width consisting of 50 feet on either side of the 150 foot wide runway (not including the 50 foot wide centerline or keel, which is assumed to have undergone rehabilitation prior to the commencement of this project). A full-width overlay of the entire 150 foot width would be provided.

3.3.1.1 Runway 5-23 Pavement Alternative I

The No-Build Alternative proposes that no changes be made to Runway 5-23. The runway pavement would remain as is with no planned development. This alternative is shown on Figure 3-1 Pavement Rehabilitation Alternative I and was assessed as follows:

• Purpose and Need: Runway 5-23 Pavement Alternative I does not address the facility requirements delineated in the previous MPU, Feasibility Studies, or the Purpose and Need Chapter. The No-Build option would not reinforce pavement performance or avoid possible structural failure in the future. This element was given a score of No as it relates to meeting the Purpose and Need of the project.

• Environmental Effects: Since this alternative does not require construction or development, there would be no environmental effects associated with the No-Build option. This component received a value of None.

• FAA Standards: Runway 5-23 Pavement Alternative I would not comply with the standards set forth in AC 150/5320-6E, Airport Pavement Design and Evaluation, as the existing pavement has exceeded its useful life. This element was awarded an assessment of No as it relates to meeting FAA standards.

• Community Impact: With no additional development or construction, the community surrounding MMU would not be impacted by the No-Build Alternative in the short-term. However, this alternative would allow pavement condition to
deteriorate, ultimately resulting in closure of the runway. This would result in a very large impact to the aviation community and the local economy. This factor received an assessment of Large.

- **Operational Flexibility:** In the short-term, operational flexibility and efficiency would remain the same under the No-Build Alternative. However, in the long-term, failure to address the runway pavement condition would ultimately result in closure of the runway or severe restrictions on operations. This factor was given a value of Poor.

- **Development Cost:** There are no costs associated with the No-Build Alternative, and received an evaluation of None. Deferring the project is expected to increase the cost since pavement deterioration would continue, resulting in additional work.

### 3.3.1.2 Runway 5-23 Pavement Alternative II

Alternative II, shown on **Figure 3-2 Pavement Rehabilitation Alternative II** suggests the full length of pavement for Runway 5-23 be replaced to its full depth and full width of 31 inches and 150 feet, respectively. Based on findings from the previous Feasibility Studies, flexible asphalt material would be used for construction.

- **Purpose and Need:** Alternative II would indeed follow the purpose and need of the proposed runway rehabilitation. A value of Yes applies.

- **Environmental Effects:** This alternative would roughly maintain the existing pavement profile. As a result, this pavement alternative would have minimal effect on the flood storage volume. However, this alternative requires excavation and disposal of the entire existing pavement profile increasing the quantity of material to be disposed. Disposal costs and truck trips to and from MMU associated with disposal of the waste material are greatest under this alternative. No other notable environmental effects are associated with this alternative. A factor of Minor was assessed.

- **FAA Standards:** Alternative II recommends full reconstruction for Runway 5-23; this initiative was designed within the parameters of AC 150/5320-6E to ensure that construction would be in accordance with FAA standards. This criterion was given a Yes.

- **Community Impact:** The second pavement alternative has the most potential for risk and impact on the based and transient users operating at MMU, given the lengthy runway closures required for the implementation of this option. Many of the aircraft demand the full available length of Runway 5-23 in order to operate there, which would not be accessible for approximately nine months. Additionally, the lost revenue to MMU and impact on airport businesses would be significant.
during the protracted runway closure. A score of Significant was awarded for this element.

- **Operational Flexibility:** Alternative II lacks flexibility and efficiency during the course of construction, as it would require full closure of Runway 5-23 for approximately nine months, and full closure of both Runway 5-23 and Runway 13-31 for a short period of time so as to reconstruct the intersection of the runways. Additionally, since this option advocates for full-depth reconstruction, there are also risks associated with exposing the underlying subgrade material to weather and construction loads, which could lead to additional costs and longer runway closures. A rank of Poor applies to the operational flexibility and efficiency of this alternative during construction. In contrast, post-construction runway operations would likely benefit from greater operational efficiency throughout the useful life of the new pavement, therefore, a score of Excellent was given.

- **Development Cost:** The full-depth and full-width reconstruction is the most expensive option of the pavement alternatives. Additional costs could be incurred given the high probability of subgrade failures. A grade of High is applicable.

### 3.3.1.3 Runway 5-23 Pavement Alternative III

Alternative III, shown on Figure 3-3 Pavement Rehabilitation Alternative III would remove the top nine inches of the existing pavement section on the outer 50 feet of both sides of the runway (excluding the inner 50 feet that is assumed to have undergone rehabilitation prior to the commencement of this project). The nine inches of new asphalt would be provided, then, the entire runway would be overlaid with five inches of new asphalt for the full width of the runway. This would raise the pavement profile by five inches compared to existing conditions.

- **Purpose and Need:** This alternative supports the purpose and need of the runway rehabilitation as indicated in the previous chapter. A score of Yes is applicable.

- **Environmental Effects:** This option would involve a loss of flood storage volume due to the raised pavement profile. The loss of flood storage volume would be offset by grading and drainage improvements in the RSA. Soil disposal would be less than that of Alternative II but greater than Alternative IV. No other notable environmental effects are associated with this alternative. A factor of Minor was assessed.

- **FAA Standards:** Alternative III would fulfill the criteria set forth in AC 150/5320-6E and restore Runway 5-23 to a more efficient condition. A value of Yes was assigned.
• Community Impact: While operational and economic impacts would still affect airport users and tenants, this alternative suggests phasing the proposed construction in order to reduce runway closures and related impacts on the surrounding communities. An assessment of Minor was awarded.

• Operational Flexibility: With the ability to phase the runway rehabilitation into smaller sections, Alternative III provides greater operational flexibility and efficiency during construction compared to the previous two alternatives and was assessed as Good. Post-construction runway operations would be as flexible and efficient as the full reconstruction option – Excellent.

• Development Cost: Comparatively speaking, Alternative III is less expensive than Alternative II since subgrade material would not be disturbed and the construction can be completed more quickly overall. However, since it includes full-width rehabilitation, this alternative still requires the removal and replacement of 36,000 tons of otherwise functional asphalt material along the outer 50 foot edges of Runway 5-23 which increases project costs and time to complete – Medium.

3.3.1.4 Runway 5-23 Pavement Alternative IV

Figure 3-4 Pavement Rehabilitation Alternative IV presents Pavement Alternative IV. This option involves milling the top 1 inch of asphalt for the entire length and width of the runway, including the repaired keel section and providing a five inch asphalt overlay for the entire runway.

• Purpose and Need: This alternative supports the purpose and need of the runway rehabilitation as indicated in the previous chapter. A score of Yes is applicable.

• Environmental Effects: Alternative IV would maintain an impervious working surface on the runway, which would reduce environmental effects. Still, flood storage volumes would be impacted by the depth of the pavement overlay, as well as the addition of material necessary to raise the earth shoulders and safety area elevations to acceptable grades. The flood storage volume loss would be offset by grading and drainage improvements in the RSA. This alternative would result in the smallest volume of construction waste, and associated truck volume associated with disposal. Impacts to wetlands would not occur. No other notable environmental effects are anticipated. A value of Minor was given.

• FAA Standards: Utilizing the concept of a full-length keel, Alternative IV would fulfill the criteria set forth in AC 150/5320-6E, and restore Runway 5-23 to a more efficient condition. A value of Yes stands.

• Community Impact: While operational and economic impacts would still affect airport users and tenants, this alternative would have the shortest construction
duration therefore the least impact on airport users. An assessment of Minor was awarded.

- **Operational Flexibility:** Accounting for only partial-depth and partial-width reconstruction, Alternative IV provides greater operational flexibility and efficiency compared to Alternatives II and III, particularly when considering the phasing of construction. This alternative would require construction to occur in seven phases. Two of these phases lend themselves to use of a temporary displaced threshold which would keep Runway 5-23 open, albeit at a reduced length which still exceeds that of Runway 13-31. The remaining 5 phases would require a complete closure of Runway 5-23. Estimates of complete closures times at this point should only be considered preliminary, as there are too many unknowns to accurately predict the final construction impacts in advance of final design. Nevertheless, the following closure periods may be considered for planning purposes only:

- Phase A, 120 day displacement plus 30 nights of closures;
- Phase B, 90 day displacement;
- Phases C through F, four week full Runway 5-23 closure plus three weeks of night only closures;
- Phase G, three weeks of full Runway 5-23 closure plus one week of night only; and
- Full airport closures amount to one week in Phase D and one full week in Phase G.

The full airport closure means that both Runway 5-23 and Runway 13-31 will be closed at the same time. This is required in Phase’s D and G because these Phases include work which occurs at the intersection of Runway’s 5-23 and 13-31, on both runways simultaneously. Phase D includes the RSA grading, drainage, and initial paving at the intersection. Phase G includes the final paving and electrical work at the intersection. The magnitude of these operations is such that they cannot be completed under night-only closures or under traffic, but will require a sustained closure to complete. The work cannot be staggered around isolated closure periods because this would provide insufficient time to complete the work and restore surface grades to acceptable safety area criteria in order to re-open either runway on a daily basis. Significant paving is anticipated on Runway 13-31 in order to smooth the transition across Runway 5-23 and this requires both runways to be closed at the same time.

The term "rehabilitation" should be considered to apply not only to the pavement on Runway 5-23, but also to the other system elements which support the pavement: the safety area grading, electrical systems, and drainage systems, all of which contain elements in need of rehabilitation. Any work within the runway safety area (250 feet either side of runway centerline and 1,000 feet beyond the threshold) requires closure of the runway. Phases A and B occur within the
1,000 feet extended runway safety area and thus may be constructed through the use of a displaced threshold to provide the required 1,000 feet in advance of the work area. Phases C through G all have numerous elements (grading, drainage, electrical, paving) which occur within the 500 feet wide safety area, and thus require complete closure of the runway.

Relative to construction, the operational flexibility is **Excellent**. Post-construction runway operations would be as flexible and efficient as Alternatives II and III – **Excellent**.

- **Development Cost:** As Alternative IV does not require full-depth or full-width reconstruction, the partial rehabilitation incurs fewer costs in contrast to the previous construction alternatives. **Low.**

3.3.1.5 **Preferred Runway 5-23 Pavement Alternative**

Pavement Alternative IV is the preferred alternative. This option is the least costly, provides the desired service life and provides suitable flexibility and efficiency during construction. Alternative IV best meets the demands of MMU per the purpose and need of the project, and also imposes the least amount of burden on the community with minimal environmental effects.

3.3.2 GLIDE SLOPE STABILIZATION AREA

Due to frequent flooding degradation of the glide slope signal, the subsequent alternatives were developed:

- **Glide Slope Alternative I (No-Build):**
  - This first option suggests making no changes to the existing terrain or infrastructure that make up the glide slope system. This is considered the No-Build Alternative.

- **Glide Slope Alternative II (Grading):**
  - Alternative II proposes smoothing and steepening the surrounding terrain to reduce degradation and promote better drainage.

These alternatives were evaluated as follows:

3.3.2.1 **Glide Slope Alternative I**

Alternative I, shown on **Figure 3-5 Glide Slope Critical Area Alternative I**, puts forth the notion that no construction or development should take place in regard to the glide slope system. The existing system would remain as is with no changes. The assessment of this alternative is below:

- **Purpose and Need:** This alternative does not meet the purpose and need of the project. A value of **No** was awarded to this element.
• **Environmental Effects:** There would be no environmental effects associated with this alternative. A score of **None** applies.

• **FAA Standards:** Alternative I would not meet the standards outlined in FAA Order 6750.16D, *Siting Criteria for Instrument Landing Systems.* This factor received an evaluation of **No** as it applies to FAA standards.

• **Community Impact:** With no construction or development, this alternative would not result in any community impacts. A value of **None** is applicable.

• **Operational Flexibility:** The existing glide slope system lapses in operational reliability and thus causes greater inefficiency due to changes in the availability of approach procedures at MMU, as well as the related approach minima. The No-Build Alternative also implies the glide slope system would not be improved during the window of construction, which would lead to less flexible options later on. This element received a score of **Poor** both during and after construction.

• **Development Cost:** There are no costs associated with the No-Build Alternative. **None.**

3.3.2.2 Glide Slope Alternative II

Alternative II, shown on *Figure 3-6 Glide Slope Critical Area Alternative II*, suggests the ground area surrounding the glide slope system be smoothed and steepened to reduce uneven terrain, improve drainage capability, and ultimately enhance system performance.

• **Purpose and Need:** Grading of the glide slope area would meet the purpose and need of the project as described in the previous chapter. A score of **Yes** applies.

• **Environmental Effects:** There would be minimal environmental effects under this alternative due to permanent (23,000 SF) and temporary (5,000 SF) impacts to wetlands, although the permanent impacts would be mitigated. Improvements to the glide slope road would require impacts to wetlands including 600 SF of permanent and 1,700 SF of temporary. The permanent impacts would be mitigated. The glide slope area is located adjacent to Runway 23, and much of the land use consists of the Runway Safety Area (RSA) and/or the Extended Runway Safety Area (ERSA). Given that those areas are to be re-graded as well overall, it would be more environmentally friendly to improve the glide slope area simultaneously with these other projects. The grading is expected to result in a small volume of cut within the floodplain, suggesting that this alternative would create additional flood storage volume. This factor received a value of **Minor.**
• **FAA Standards**: Alternative II would meet the standards outlined in FAA Order 6750.16D, *Siting Criteria for Instrument Landing Systems*. This factor received an evaluation of **Yes** as it applies to FAA standards.

• **Community Impact**: It is not anticipated that this alternative would result in any community impacts. An assessment of **None** was awarded.

• **Operational Flexibility**: In the short-term, this alternative would provide operational flexibility and efficiency by allowing the glide slope grading to occur in conjunction with surrounding projects. As such, interruptions to performance and approach procedures would be minimal. In the long-term, glide slope improvements would provide greater reliability to approach procedures with reduced minima at MMU. Consequently, a score of **Excellent** is applicable both during and after construction.

• **Development Cost**: Due to other anticipated projects in and around the glide slope stabilization area, costs incurred should be minimal. **Low**.

### 3.3.2.3 Preferred Glide Slope Alternative

Glide Slope Alternative II is the preferred alternative since it adheres to the scope of the purpose and need and complies with FAA standards.

#### 3.3.3 MEDIUM INSTENSITY APPROACH LIGHTING SYSTEM (MALSR)

The following alternatives were developed to address MMU's aging MALSR system:

• **MALSR Alternative I (No-Build)**:
  o The existing system would remain in its current state, and no changes would be made. This alternative is considered the No-Build option.

• **MALSR Alternative II (Flat Light Plane)**:
  o Alternative II recommends replacement of the MALSR system to incorporate a flat light plane.

• **MALSR Alternative III (Angled Light Plane)**:
  o Alternative III also recommends replacement of the MALSR system, but with an angled light plane.

• **MALSR Alternative IV (Catwalk)**:
  o This alternative also suggests replacement of the MALSR to include an angled light plane, but adds the construction of an elevated catwalk over the final 1,400 feet of the system to eliminate a portion of the MALSR road.
3.3.3.1 MALSR Alternative I

As previously indicated, the No-Build Alternative would require no construction or development to the MALSR system, and no modifications or improvements would be made. This alternative is shown on Figure 3-7 MALSR Alternative I.

The evaluation of this alternative follows:

- **Purpose and Need:** Replacement of the MALSR system was deemed necessary to remedy its aging infrastructure and existing deficiencies, in an effort to improve operational reliability and performance. This alternative does not meet the purpose and need of the project. A value of No was awarded to this element.

- **Environmental Effects:** There would be no environmental effects with this alternative, given the absence of any construction or development. A score of None applies here.

- **FAA Standards:** The current MALSR system is not compliant with multiple FAA criteria. This alternative would not bring the system into adherence with FAA standards. This component received an assessment of No.

- **Community Impact:** Alternative I would not result in any impact to the surrounding community. However, the aviation community could be affected by increased approach minimums as a result of the MALSR’s deteriorating structure and operational performance. A value of None was awarded.

- **Operational Flexibility:** By refusing replacement of the MALSR while simultaneously addressing other deficiencies, this option would reduce operational flexibility and efficiency if impromptu failure of the MALSR system should occur. As there are existing inefficiencies with the system already, the No-Build Alternative received an assessment of Poor as it relates to operational flexibility and efficiency both during and after construction.

- **Development Cost:** No costs would be incurred – None.

3.3.3.2 MALSR Alternative II

Alternative II recommends replacement of the existing MALSR system with one that employs a flat light plane, implying that the light fixtures would not be angled. Under this alternative, the profile of the existing “MALSR Road”, a service road constructed on historic fill to allow vehicle access to the MALSR, would be lowered and the historic fill section that the existing MALSR system is constructed on would be narrowed where practicable to create additional flood storage volume. In addition, the subsurface power supply line extending from Airport Road would be replaced. Alternative II is shown on Figure 3-8 MALSR Alternative II.
• **Purpose and Need:** Replacement of the MALSR would meet the purpose and need of the project as described in the previous chapter. A value of *Yes* applies.

• **Environmental Effects:** The flat plane option would require the topping or removal of numerous trees which currently obstruct the pilot’s line of sight to the MALSR system. These trees are located in wetlands and floodplain areas as well as the NJDEP’s regulated riparian zone. Some of the trees are on lands owned by the New Jersey Natural Lands Trust. Modifications to MALSR Road would provide the benefit of creating additional flood storage volume. This element received an evaluation of *Large*.

• **FAA Standards:** This alternative would comply with all necessary MALSR criteria, including that related to visibility, slope, and mounting. A score of *Yes* is applicable.

• **Community Impact:** As the MALSR system currently exists, there would be no community impact related to its replacement as proposed. However, the tree-topping and the role of MMU in the environmental stewardship of the surrounding lands could affect community relations. This component was given a value of *Minor*.

• **Operational Flexibility:** MALSR Alternative II would improve operational flexibility and efficiency as it suggests concurrent replacement of the lighting system during rehabilitation of the primary runway – *Excellent*. However, given that this option promotes a flat light plane, there would be ongoing operational issues as tree/obstruction removal would consistently need to be addressed. A post-construction assessment of *Fair* was provided for this factor.

• **Development Cost:** The continued costs of tree-topping and obstruction clearance would increase the overall financial expenditures of this alternative – *Medium*.

### 3.3.3.3 MALSR Alternative III

The third MALSR alternative is similar to the second, in that it also advocates for the replacement of the existing lighting system. However, Alternative III proposes the inclusion of an angled light plane fixture, rather than flat. *Figure 3-9 MALSR Alternative III* depicts this alternative. Under this alternative, the profile of the existing MALSR Road would be lowered and the historic fill section that the existing MALSR system is constructed on would be narrowed where practicable to create additional flood storage volume. In addition, the subsurface power supply line extending from Airport Road would be replaced.

• **Purpose and Need:** Replacement of the MALSR would meet the purpose and need of the project as described in the previous chapter. A value of *Yes* applies.
• **Environmental Effects:** The angled light plane option would be calibrated to the maximum allowable angle/slope. No additional tree removal or topping is required to maintain a clear line of sight to the MALSR system under this alternative. Minimal environmental impact would be incurred to replace the existing system due to permanent (8,200 SF) and temporary (5,400 SF) impacts to wetlands, however permanent impacts would be mitigated. Modifications to the MALSR Road would provide the benefit of creating additional flood storage volume. This factor received a score of Minor.

• **FAA Standards:** This alternative would comply with all necessary MALSR criteria, including that related to visibility, slope, and mounting. A score of Yes is applicable.

• **Community Impact:** As the MALSR system currently exists, there would be no community impact related to its replacement as proposed. This component was given a value of None.

• **Operational Flexibility:** MALSR Alternative III would improve operational flexibility and efficiency as it suggests concurrent replacement of the lighting system during rehabilitation of the primary runway. Also, post-construction operations would be improved by the angled light plane on the new system. Ongoing removal of tree obstructions to the MALSR line of sight would be reduced or eliminated under this alternative. An assessment of Excellent was provided for this factor both during and after construction.

• **Development Cost:** The replacement of the existing system would be high but the long term maintenance costs of the system would be low. An assessment of Medium was provided for this factor.

3.3.3.4 MALSR Alternative IV

The last MALSR alternative also includes replacement of the existing system with that of an angled light plane, but in addition, Alternative IV purports placing an elevated catwalk along the final 1,400 feet of the MALSR lighting system. The subsurface power supply line extending from Airport Road would also be replaced. This solution is intended to provide access to the system for maintenance, and provides the opportunity to remove a portion of existing MALSR Road. *Figure 3-10 MALSR Alternative IV* depicts this alternative.

• **Purpose and Need:** Replacement of the MALSR would meet the purpose and need of the project as described in the previous chapter. A value of Yes applies.

• **Environmental Effects:** The angled light plane option would be calibrated to the maximum allowable angle/slope and thus should not require tree clearing or topping as in Alternative II. Removal of a portion of MALSR Road would allow that area to revert to a natural wetland condition. The removal would also create
additional flood storage volume. This factor received a score of None and would create some environmental benefits.

- **FAA Standards:** This alternative would comply with all necessary MALSR criteria, including that related to visibility, slope, and mounting. A score of Yes is applicable.

- **Community Impact:** As the MALSR system currently exists, there would be no community impact related to its replacement as proposed. This component was given a value of None.

- **Operational Flexibility:** While Alternative IV does benefit from coinciding with other planned projects at MMU, the construction duration is longer than the other build alternatives due to the removal of MALSR road and time associated with building the catwalk. Additionally, access to the MALSR system for maintenance and repair would be more difficult and time consuming. Under Alternatives II and III, personnel, equipment, and parts needed for maintenance and repair can be carried directly to the work site on trucks. Under the catwalk alternative, materials would need to be transported to the work site by another means. Although the completed system would provide the same benefits of providing a reliable system that meets current design standards; however, it was rated as Fair for operational flexibility during construction due to the extended construction time. It was rated as Poor after construction due to the operational and maintenance challenges posed by the catwalk system.

- **Development Cost:** The addition of the catwalk would increase not only construction costs, but the costs associated with maintaining the system after construction – High.

### 3.3.3.5 Preferred MALSR Alternative

MALSR Alternative III is the preferred alternative. This option prevents on-going tree-topping and obstruction clearance, which both reduces environmental impacts and costs related to construction and maintenance. In addition, this alternative would result in additional flood storage volume.

### 3.3.4 Runway Safety Area Alternative – Considered and Dismissed

This alternative involves implementation of Declared Distances and use of Displaced Thresholds to meet RSA criteria for Runway 5-23. The Declared Distance Alternative, shown on **Figure 3-11 Declared Distances**, would consist of limited grading improvements to the extended RSA beyond both runway ends. This would be supplemented with the use of Declared Distances to achieve the FAA standard 1,000-foot long RSA beyond the departure end of runways, and the 600-foot long RSA prior to the landing threshold. RSA grading standards beyond the Runway 5 Departure End would be met for a distance of 240 feet. Beyond the Runway 23 Departure End it is
feasible to meet RSA grading standards for a distance of 365 feet beyond the runway end, up to the position of the localizer.

To provide a standard 600-foot RSA prior to the Runway 5 landing threshold a threshold displacement of 235 feet would be needed. To provide the standard RSA prior to the Runway 23 landing threshold a displacement of 360 feet would be needed. The Displaced Thresholds would be marked and lit in accordance with FAA standards.

The provision of the 1,000-foot RSA beyond the runway ends would be achieved by declaring a portion of the departure runway end unavailable for use in calculating landing distance (LDA) or accelerate stop distance (ASDA). These distances are not marked on the runway or indicated via lighting, but are published in aeronautical publications such as the Airport Facility Directory and available on-line. These distances are used by pilots in their flight planning to assess if the runway is suitable for use by their aircraft. The four declared distances are as follows:

- **Take Off Run Available (TORA):** The distance available to an aircraft during the takeoff prior to lift-off (generally the length of the paved runway) RSA is not required at the end of TORA.

- **Take Off Distance Available (TODA):** The distance available for an aircraft taking off to clear a 50-foot object (generally the length of the runway unless a special clearway is declared). RSA is not required at the end of TODA.

- **Accelerate Stop Distance Available (ASDA):** The distance available for an aircraft taking off to reach lift-off speed and then come to a complete stop. This standard applies to commercial carriers and air charter operators. RSAs and Runway Object Free Areas (ROFAs) are required at the end of the ASDA.

- **Landing Distance Available (LDA):** The distance available for landing, from the landing threshold to the departure end of the runway (unless a special stopway is declared). RSA and ROFA are required at the end of LDA.

At the Runway 5 Departure End, where 240 feet of RSA beyond the runway end is available, the last 760 feet of runway would be declared unavailable for use as LDA or ASDA. At the Runway 23 Departure End, where 365 feet of RSA is available beyond the runway end, the last 635 feet of runway pavement would be declared unavailable for use as LDA or ASDA.

The resulting declared distances are shown below:

<table>
<thead>
<tr>
<th></th>
<th>TORA</th>
<th>TODA</th>
<th>ASDA</th>
<th>LDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway 5</td>
<td>5,999</td>
<td>5,999</td>
<td>5,239</td>
<td>5,004</td>
</tr>
<tr>
<td>Runway 23</td>
<td>5,999</td>
<td>5,999</td>
<td>5,364</td>
<td>5,004</td>
</tr>
</tbody>
</table>
This alternative would provide a standard RSA at both runway ends, thus meeting the purpose and need as described in Chapter 2. It offers the advantages of low cost and minimal to no environmental impact. The only physical changes would include remarking of the runway and modifications to the lighting system. However, Declared Distances would reduce the landing length available to an unacceptable distance. The landing distance available for both runways would be reduced by 995 feet under this alternative. MMU is a major business class airport serving the NY/NJ Metropolitan area. Many of MMU’s based tenants and itinerant users operate high performance Approach Category C aircraft for which such a reduction in available runway length would be unacceptable. This alternative would fundamentally change MMU and would have adverse operational and economic impacts. Based tenants operating the Category C aircraft would likely be forced to relocate to other facilities. Many itinerant operators would likely divert to other airports. As a result, implementation of Declared Distances at MMU would have a ripple effect on the Region’s airport system. This alternative is not a practical solution to improving the RSA at MMU and was not considered further.

The alternative of meeting RSA criteria for Runway 5-23 through the application of Declared Distances was considered and dismissed.

### 3.3.5 Extended Runway Safety Areas

The physical conditions and constraints at each runway end are quite different. The Runway 23 Departure End is bisected by a busy thoroughfare (Columbia Turnpike), which imposes a very significant constraint on the improvement alternatives. The Runway 5 Departure End borders on important wetland, floodplain, and wildlife habitat. The alternatives considered for each runway end were evaluated independently as described further below.

#### 3.3.5.1 Runway 5 Departure End (23 End) Extended Runway Safety Area (ERSA)

The following alternatives were developed to meet the RSA requirements for the Runway 5 Departure End:

- **Runway 5 Departure End ERSA Alternative I (No-Build):**
  - The existing runway layout and safety area would remain the same. There would be no change to the dimensions of the runway or associated safety areas. Alternative I is considered the No-Build Alternative.

- **Runway 5 Departure End ERSA Alternative II (Standard RSA):**
  - This alternative suggests implementing a standard RSA of 1,000 feet long and 500 feet wide on the RW 5 Departure End.

- **Runway 5 Departure End ERSA Alternative III (Limited Grading):**
Alternative III proposes grading the terrain surrounding the RW 5 Departure End as permitted by the RSA Determination dated June 2013.

In addition to the four alternatives for the Runway 5 Departure End and the three alternatives for the Runway 23 Departure End in the subsequent section, consideration was given to the use ofDeclared Distances at both runway ends in order to meet RSA requirements. After examination, that potential alternative was dismissed from further consideration for the reasons below.

### 3.3.5.1.1 Runway 5 Departure End ERSA Alternative I

The No-Build Alternative, shown on Figure 3-12 Runway 5 Departure End ERSA Alternative I, offers no changes to the existing layout. Runway 5 Departure End ERSA Alternative I was assessed against the six evaluation factors; the results are below:

- **Purpose and Need:** As the ERSA for Runway 5 Departure End does not currently comply with FAA standards, Alternative I does not fulfill the purpose and need of the project. This factor was given a value of **No**.

- **Environmental Effects:** Since this alternative does not require additional development or construction, there are no environmental effects associated with the No-Build. A value of **None** was assessed for this evaluative criterion.

- **FAA Standards:** Runway 5 Departure End ERSA Alternative I does not address the need to provide the maximum feasible RSA improvements. A score of **No** was provided as it relates to meeting FAA design standards.

- **Community Impact:** With no additional development or construction, the community surrounding MMU would not be impacted by the No-Build Alternative. This factor received an assessment of **None**.

- **Operational Flexibility:** In the short-term, operational flexibility and efficiency would remain the same under the No-Build Alternative. However, in the long-term runway operations could be reduced or constrained without an adequate RSA. This factor was given a value of **Excellent** for operational flexibility during construction and a score of **Fair** operations thereafter.

- **Development Cost:** There would be no cost for Runway 5 Departure End ERSA Alternative I – **None**.

### 3.3.5.1.2 Runway 5 Departure End ERSA Alternative II

Runway 5 Departure End ERSA Alternative II, shown on Figure 3-13 Runway 5 Departure End ERSA Alternative II, suggests the implementation of a standard RSA measuring 500 feet by 1,000 feet and proposes filling and grading of extensive wetland areas found within the RSA to comply.
This alternative was evaluated as follows:

- **Purpose and Need:** This alternative would provide a standard RSA, thus meeting the purpose and need as described in the previous chapter. A score of **Yes** was provided for this evaluation factor.

- **Environmental Effects:** The existing non-standard safety area is encompassed by wetlands. Under this alternative, bringing the RSA into compliance would require filling in at least 10 acres of wetlands in order to achieve the required dimensions. This alternative would also require extensive fill in the 100-year floodplain, and corresponding loss of flood storage volume. Given these permanent effects, this component received a score of **Large**.

- **FAA Standards:** As proposed, Runway 5 Departure End ERSA Alternative II complies with FAA AC 150/5300-13A, Orders 5200.8, and the RSA Determination. However, this option does not adhere to Order 5200.9 as it relates to maximum financial feasibility. A value of **Partial** was awarded to this factor.

- **Community Impact:** The wetlands and floodplains on and around MMU are considered public/community services in the form of environmental stewardship according to the land use and activity center maps provided in the MPU. Filling in these areas to achieve RSA compliance would have substantial implications on MMU’s relationship with the surrounding community. A score of **Large** was given to this element.

- **Operational Flexibility:** Runway 5 Departure End ERSA Alternative II provides operational flexibility during construction as it would allow the opposite runway end to remain open and operational. This flexibility and efficiency would continue after project completion given the implementation of a standard RSA that facilitates safe aircraft operations. A value of **Excellent** applies both during and post-construction.

- **Development Cost:** Under this alternative, the grading and filling of the surrounding terrain and wetlands would warrant substantial monetary allocation that is excessive per the RSA Determination – **High**.

### 3.3.5.1.3 Runway 5 Departure End ERSA Alternative III

Runway 5 Departure End Alternative III recommends a non-standard RSA for the Runway 5 Departure End. The safety area would receive limited grading within the first 240 feet of length from the runway end and measure 500 feet wide. However, after that, only a swath of 90 feet wide would be graded to standards for the remaining 760 feet of the 1,000 foot safety area. Although the remaining 760 feet of RSA would not meet grading standards and would support passage by emergency vehicles, it is relatively flat.
and largely free of fixed objects (trees, buildings, roadways, poles) that could increase the chances for a catastrophic incident in the event of an aircraft overrun or undershoot. In addition, MALSR Road provides some access to this area for emergency vehicles. Alternative III can be seen in Figure 3-14 Runway 5 Departure End ERSA Alternative III and was assessed as follows:

- **Purpose and Need:** This alternative would improve RSA standards in compliance with the previous RSA Determination. A score of Yes was provided for this evaluation factor.

- **Environmental Effects:** Due to the grading and removal of wooded growth in the RSA area, there would be minor environmental effects associated with the construction of this alternative, including grading within wetland areas that would necessitate 2,300 SF of permanent impact, which would be mitigated. Temporary wetlands impacts include 5,300 SF. However, the result would be a non-standard RSA of only 240 feet by 500 feet, implying that additional effects have been avoided and mitigated by compromising on the RSA dimensions. This component received an assessment of Minor as it relates to environmental effects.

- **FAA Standards:** While the safety area would be non-standard, the RSA adheres to the stipulations denoted in the MMU RSA Determination. A value of Yes was given for this component.

- **Community Impact:** Construction for Runway 5 Departure End ERSA Alternative III would remain on MMU property and negate the majority of impacts to wetland areas. As such, there should be little to no community impacts. A score of None was assessed for this evaluative component.

- **Operational Flexibility:** Runway 5 Departure End ERSA Alternative III provides operational flexibility as it would enable the opposite runway end to remain open and operational, and allows for efficiency given the comparatively short time required to complete the clearing and grading. An assessment of Excellent was allocated to this alternative criterion during construction. This flexibility and efficiency would be maintained after project completion as a result of compliance with the RSA Determination – Excellent.

- **Development Cost:** The costs associated with this development would be substantially reduced given the smaller area of terrain to be graded and minimal wetlands to be filled - Low.

3.3.5.1.4 Preferred Runway 5 Departure End ERSA Alternative

The preferred Runway 5 Departure End ERSA Alternative is Alternative III. This option can be achieved with lower costs and lessened environmental impacts.
compared to the other selections, while maintaining the existing length of the runway.

3.3.5.2 Runway 23 Departure End (5 End) Extended Runway Safety Area (ERSA)

The following alternatives were developed to meet MMU’s RSA requirements for the Runway 23 Departure End:

- **Runway 23 Departure End ERSA Alternative I (No-Build):**
  - The existing runway layout and safety area would remain the same. There would be no change to the dimensions of the runway or associated safety areas. Alternative I is considered the No-Build Alternative.

- **Runway 23 Departure End ERSA Alternative II (Standard RSA):**
  - This alternative suggests implementing a standard RSA of 1,000 feet long and 500 feet wide and includes the relocation of Columbia Turnpike.

- **Runway 23 Departure End ERSA Alternative III (EMAS):**
  - Alternative III proposes installing an EMAS bed on the Runway 23 Departure End to meet RSA requirements.

3.3.5.2.1 Runway 23 Departure End ERSA Alternative I

The No-Build Alternative, shown on Figure 3-15 Runway 23 Departure End ERSA Alternative I, offers no changes to the existing layout. Runway 23 Departure End ERSA. Alternative I was assessed against the six evaluation factors; the results are below:

- **Purpose and Need:** As the ERSA for Runway 23 Departure End does not currently comply with FAA standards and poses a safety problem in the event of an aircraft undershoot or overrun, Alternative I does not fulfill the purpose and need of the project. This factor was given a value of No.

- **Environmental Effects:** Since this alternative does not require additional development or construction, there are no environmental effects associated with the No-Build. A value of None was assessed for this evaluative criterion.

- **FAA Standards:** Runway 23 Departure End ERSA Alternative I does not address the need to provide the maximum feasible RSA improvements per FAA Order 5200.8. A score of No was provided as it relates to meeting FAA design standards.

- **Community Impact:** With no additional development or construction, the community surrounding MMU would not be impacted by the No-Build Alternative. This factor received an assessment of Minor.
• **Operational Flexibility:** In the short-term, operational flexibility and efficiency would remain the same under the No-Build Alternative. However, in the long-term runway operations could be reduced or constrained without an adequate RSA. This factor was given a value of Excellent for operational flexibility during construction and a score of Fair operations thereafter.

• **Development Cost:** There would be no cost for Runway 23 Departure End ERSA Alternative I - **None.**

3.3.5.2.2 Runway 23 Departure End ERSA Alternative II

This alternative suggests the integration of a standard RSA on the Runway 23 Departure End. The standard RSA dimensions for that runway are based on its critical design aircraft, which is a Gulfstream V. This aircraft falls into the C-III ADG and thus requires an RSA that is 500 feet wide centered on the runway and extends 1,000 feet beyond the runway end. Implementation of this alternative would include relocating the Columbia Turnpike which lies approximately 650 feet from the runway end, and filling in adjacent wetland areas within the standard RSA dimensions. This alternative is shown on Figure 3-16 Runway 23 Departure End ERSA Alternative II.

Runway 23 Departure End Alternative II was evaluated as follows:

• **Purpose and Need:** This alternative would provide a standard RSA, thus meeting the purpose and need as described in the previous chapter. A score of Yes was provided for this evaluation factor.

• **Environmental Effects:** Runway 23 Departure End ERSA Alternative II would require the relocation of the Columbia Turnpike. This is a busy, high-speed thoroughfare that intersects with Route 24 next to the Runway 23 Departure End. The relocation of the highway and nearby interchange would lead to significant environmental effects. Additionally, per standard RSA design requirements, this alternative would require filling approximately 10 acres of wetlands for the RSA alone. Relocation of Columbia Turnpike and other roadway modifications would require extensive additional wetland effects. An assessment of Large was given to this component.

• **FAA Standards:** As proposed, Runway 23 Departure End ERSA Alternative II complies with FAA AC 150/5300-13A and Order 5200.8, but not Order 5200.9. A value of Partial was awarded to this factor.

• **Community Impact:** As the Columbia Turnpike is a heavily traveled arterial highway, it would be infeasible to move the highway without reducing the speed of traffic and without simultaneously affecting NJ Route 24 given the number of exits and entrances in this particular location. The duration of project construction...
would be lengthy. This component received an evaluation of **Significant** as it relates to community impact.

- **Operational Flexibility:** Expansion of the RSA area, including relocating the highways and filling in the wetlands, would require substantial construction time. This in turn would result in extensive approach procedure modifications and runway closures, which affects both MMU and the wider regional airport system. A score of **Poor** was assessed for this component during construction. However, since a standard RSA would facilitate safe aircraft operations after project completion, a value of **Excellent** applies post-construction.

- **Development Cost:** Costs for relocating the Columbia Turnpike and filling in the wetlands raise the financial expenditures required and exceed the maximum financially feasible cost per the RSA Determination – **High**.

### 3.3.5.2.3 Runway 23 Departure End ERSA Alternative III

As shown in **Figure 3-17 Runway 23 Departure End ERSA Alternative III**, Runway 23 Departure End ERSA Alternative III proposes the construction of an EMAS on the Runway 23 Departure End to alleviate the non-standard RSA. The overall installation would be approximately 345 feet in length, of which 310 feet would be composed of actual EMAS blocks and 35 feet would consist of a lead-in ramp between the runway end and the EMAS blocks. The existing localizer antenna would remain in its current non-standard location. The localizer antenna is mounted on a wooden platform to provide appropriate vertical clearance. The platform height would need to be raised so that the localizer signal is not affected by the EMAS blocks. Relocation to a standard location, 600 feet from the end of the useable pavement is not feasible due to the presence of Columbia Turnpike approximately 650 feet from the runway end and the extensive wetland and floodplain impacts that would be required to install and maintain a relocated localizer. In addition, relocation of the localizer would require construction of a stream crossing (bridge or large culvert).

The evaluation of Alternative III can be seen below:

- **Purpose and Need:** This alternative would provide a solution substantially improved relative to the existing condition, thus meeting the purpose and need as described in the previous chapter. A score of **Yes** was provided for this evaluation factor.

- **Environmental Effects:** The recommended EMAS installation would impact an estimated 125,000 SFs of wetland transition area with fill and grading required for the installation. However, the EMAS bed length would minimize permanent wetland effects since the wetlands themselves are not impacted. Overall, a value of **Minor** was assigned.
• **FAA Standards:** The RSA recommendations for this runway were developed based on FAA Orders 5200.8 and 5200.9, which provide guidance on the use of EMAS to mitigate non-standard RSA, and a method to determine the maximum financially feasible cost for RSA improvements. The proposed installation is non-standard due to the fact that the distance from the runway end to the back of the EMAS bed is 345 feet rather than the standard 600 feet. In addition, the proposed installation would not completely arrest all aircraft using MMU at the standard 70 knot exit speed, but the performance of the installation does exceed the minimum 40 knot requirement. Reduction of the exit speed to 68 knots is due to the reduction in length of the EMAS bed and is based on large business jet aircraft. This component received an assessment of Yes as this alternative complies with the approved RSA determination.

• **Community Impact:** With construction for this alternative remaining on MMU property, there would be little to no impact to the surrounding community. Additionally, due to the presence of Columbia Turnpike within the RSA, an aircraft overrunning the Runway 23 Departure End could experience catastrophic damage which could include the complete destruction of the aircraft and serious injury or loss of life on the part of aircraft passengers and persons traveling along Columbia Turnpike. Installation of an EMAS bed would greatly reduce the risk of such injuries, and subsequently provide a positive benefit to the community. A value of None was assigned for this alternative factor.

• **Operational Flexibility:** Runway 23 Departure End ERSA Alternative III allows for flexibility and efficiency as the duration and impact of construction activities would be largely reduced compared to Alternative II. A score of Good was given to this component during construction, and per the RSA determination, a value of Excellent is applicable to post-construction flexibility and efficiency.

• **Development Cost:** Installation of the non-standard EMAS bed is less costly than Alternative II because it does not require relocation of Columbia Turnpike. – Medium.

3.3.5.2.4 Preferred Runway 23 Departure End ERSA Alternative

The preferred alternative is Runway 23 Departure End ERSA Alternative III, which recommends construction of an EMAS bed. This option provides the best compliance with FAA standards for the amount of fiscal expenditure allowed by the maximum financial feasibility determination with minimal environmental effects.

3.3.6 RELOCATION OF TAXIWAY E

The following alternatives were developed with regard to Taxiway E, which connects Taxiway A and Runway 5-23:
• **Taxiway E Alternative I (No-Build):**
  o No changes would be made to the location or dimension of Taxiway E. This is considered the No-Build Alternative.

• **Taxiway E Alternative II (Remove Apron Access):**
  o Alternative II recommends removing, or narrowing, the Taxiway E section of pavement that connects the FBO Apron to Taxiway R.

• **Taxiway E Alternative III (Relocate):**
  o This alternative suggests relocating Taxiway E closer to the Runway 23 Departure End and reducing the existing taxiway location to serve as an access road for ARFF and ground vehicles.

3.3.6.1 **Taxiway E Alternative I**

The No-Build option, shown on Figure 3-18 Taxiway E Relocation Alternative I, would not make any alterations to the existing taxiway. It would remain in its current state.

This alternative was evaluated as follows:

• **Purpose and Need:** The preceding feasibility reports identified the need to relocate Taxiway E in accordance with new design standards. The No-Build Alternative does not meet the purpose and need of the project so an assessment of **No** should apply.

• **Environmental Effects:** There are no wetlands or environmentally sensitive areas in the present locale of Taxiway E, and no effects would result from the No-Build Alternative. A value of **None** is applicable.

• **FAA Standards:** The revisions to AC 150/5300-13A take issue with the direct path Taxiway E facilitates for aircraft traveling between the FBO Apron and Runway 5-23. The FAA requires that such routing be altered in order to limit the occurrence of runway incursions and increase safety. The No-Build Alternative does not comply with this criterion and received a score of **No**.

• **Community Impact:** As there would be no construction or development, this alternative would not result in any community impacts and received a grade of **None**.

• **Operational Flexibility:** In the short-term, this alternative neglects to take advantage of the window of opportunity for development given the anticipated runway rehabilitation and other related projects. As such, the No-Build received a ranking of **Poor** for operational flexibility and efficiency during the construction period. Additionally, because the No-Build does not adhere to FAA taxiway standards, long-term flexibility and efficiency could be impacted by potential taxiway closures and/or reduced Federal funding. A score of **Poor** applies post-construction.
3.3.6.2 Taxiway E Alternative II

Alternative II seeks to address the direct access Taxiway E provides between the FBO Apron and Runway 5-23 by reducing the width of the taxiway segment which connects the apron to Taxiway R, constructing a new apron connection and demolishing the existing Taxiway E apron connection. This would enable the remainder of Taxiway E to stay in its present location, but eliminate any usage of the narrowed taxiway by aircraft. The reduced pavement could still be used for ground and ARFF vehicles as necessary. This alternative layout, shown on Figure 3-19 Taxiway E Relocation Alternative II was evaluated as follows:

- **Purpose and Need:** Alternative II does bring Taxiway E into compliance with the new design standards. A value of Yes is applicable.

- **Environmental Effects:** There are no wetlands or environmentally sensitive areas in the present locale of Taxiway E. A value of None is applicable.

- **FAA Standards:** Taxiway E Alternative II does adhere to the new design criteria found in the recently revised AC. A result of Yes applies to this component.

- **Community Impact:** The relocation of Taxiway E would not result in any community impacts. An assessment of None was awarded.

- **Operational Flexibility:** Removal of the taxiway segment that connects the apron to Taxiway R could alter the flow of aircraft traffic on the FBO Apron. Essentially, this would reduce the number of apron access points from Runway 5-23 and restrict them to only the western side. This would likely result in congestion from “choke points”. A score of Poor applies both during and after construction.

- **Development Cost:** Given the number and size of pavement segments to be removed and narrowed, the cost of this alternative should be economical. Low.

3.3.6.3 Taxiway E Alternative III

According to the third alternative, the portion of Taxiway E on the east side of Taxiway A would be reduced in width to become an access road for ARFF and ground vehicles, while an additional stub would be constructed to serve as the new Taxiway E for aircraft. Figure 3-20 Taxiway E Relocation Alternative III depicts this option. However, the exact site of the future stub within this area is open to further consideration. There are no operational or environmental constraints that would impact or impede construction in this area, lending the new taxiway location to be a matter of preference and open to interpretation.
• **Purpose and Need:** This option complies with FAA standards and meets the purpose and need of the project. A value of **Yes** was awarded.

• **Environmental Effects:** There are no wetlands or environmentally sensitive areas in the present locale of Taxiway E or the section of the taxiway system where its new location is proposed. A value of **None** is applicable.

• **FAA Standards:** Taxiway E Alternative III does adhere to the new design criteria found in the recently revised AC. A result of **Yes** applies to this component.

• **Community Impact:** As the layout of MMU would vary only slightly from this selection, no community impacts are anticipated. **None**.

• **Operational Flexibility:** Since this alternative takes into account the construction of other anticipated projects, and provides runway access for both aircraft and ground vehicles, this option offers **Excellent** operational flexibility and efficiency both during and after construction.

• **Development Cost:** Because a new taxiway would need to be constructed, costs for this alternative would be slightly higher than the previous. **Medium**.

### 3.3.6.4 Preferred Taxiway E Alternative

Taxiway E Alternative III is the preferred development choice, as it provides the most efficiency, while meeting the purpose and need.

### 3.3.7 DRAINAGE SYSTEM AND CULVERT REPLACEMENT

The drainage system components included in this alternatives analysis consist of the following:

- Closed drainage system located under Taxiway A and Runway 5-23
- 54-inch Corrugated Steel Pipe (CSP) located 250 feet from the Runway 23 End Threshold
- 54-inch CSP located 990 feet from the Runway 23 End Threshold

Alternatives were developed to assess the drainage system holistically, while assuring the individual components were each addressed. Those alternatives are described below:

- **Drainage System Alternative I (No-Build):**
  - The current drainage system at MMU would remain as is, with no changes to layout or capacity. This is considered the No-Build Alternative.

- **Drainage System Alternative II (Replace In Kind):**
This alternative recommends replacing the existing system with components of the same size and capacity as those currently in place.

- **Drainage System Alternative III (Redesign To NJDEP Standards):**
  - Alternative III suggests redesigning the drainage system to be larger in size and capacity in order to comply with NJDEP criteria.

3.3.7.1 Drainage Alternative I

Drainage Alternative I offers no changes to the drainage configurations at MMU. The system would remain in its present state under this alternative. These alternatives are shown in *Figure 3-21 Closed Drainage System Alternative I* and *Figure 3-24 Culvert Replacement Alternative I*.

- **Purpose and Need:** Replacement of the drainage system was deemed necessary to remedy existing deficiencies including inadequate capacity and adverse grading. The No-Build Alternative does not meet the purpose and need of the project. A value of **No** was awarded to this element.

- **Environmental Effects:** There would be no environmental effects associated with this selection. A score of **None** applies.

- **FAA Standards:** The existing drainage system does not currently comply with AC 150/5320-5C, *Surface Drainage Design*, or the NJDEP *Flood Hazard Area Control Act Rules*. This alternative would not adhere to those standards; an assessment of **No** is appropriate.

- **Community Impact:** The No-Build Alternative could affect the surrounding community in the event MMU should experience a five-year storm event. As the existing drainage configuration does not meet capacity requirements for such weather phenomenon, both MMU and neighboring communities could be affected by stormwater runoff and flood storage volumes. Encroachment of these waters on taxiway and runway pavements could result in premature failure of those surfaces, and nearby bodies of water and land usage could be similarly impacted. These flood events also adversely affect the ability of MMU to operate during these events. This element received an evaluation of **Large**.

- **Operational Flexibility:** By neglecting to address the drainage issues at hand, the No-Build Alternative provides little operational flexibility or efficiency during the time of construction and a grade of **Poor** is appropriate. Moreover, because the No-Build Alternative does not remedy the existing drainage deficiencies, long-term flexibility and efficiency are likely to be affected by anticipated failures of the already under-performing drainage system. A rank of **Poor** is again applicable.
• Development Cost: There are no development costs associated with the No-Build Alternative. **None.**

### 3.3.7.2 Drainage Alternative II

The second alternative suggests replacing the existing drainage system in-kind, insinuating that the new elements would be of the exact same size and capacity. The current layout would remain identical to its present state and is shown on **Figure 3-22 Closed Drainage System Alternative II** and **Figure 3-25 Culvert Replacement Alternative II**. These alternatives were evaluated below:

- **Purpose and Need:** Replacement of the drainage system was deemed necessary to remedy existing deficiencies including inadequate capacity and adverse grading. An in-kind replacement does not meet the purpose and need of the project. A value of **No** was awarded to this element.

- **Environmental Effects:** Construction to replace the drainage components would not likely result in noteworthy environmental effects, particularly since the changes would take place in conjunction with other runway projects. A score of **None** was given.

- **FAA Standards:** The existing drainage system does not currently comply with AC 150/5320-5C, *Surface Drainage Design*, or the NJDEP *Flood Hazard Area Control Act Rules*. Because the system would be replaced in-kind, the new components would not adhere to those standards either. An assessment of **No** is appropriate.

- **Community Impact:** Similar to the No-Build Alternative, failure to address the FAA and NJDEP standards for stormwater and flood control could have an impact on the community. This component received an evaluation of **Large**.

- **Operational Flexibility:** With the intent to make the drainage system modifications coincide with the runway rehabilitation, Alternative II provides flexibility and efficiency during the construction period and a value of **Excellent** was awarded. However, as the capacity and ability of the system to handle stormwater would not be augmented, in the instance of a storm or flood event, operational efficiency could be hindered later on especially when considering runoff and pavement failure. A grade of **Poor** was applied to this factor.

- **Development Cost:** Costs for this alternative would be economical - **Low**.

### 3.3.7.3 Drainage Alternative III

Alternative III suggests redesigning the drainage system to be larger in size and capacity in order to comply with NJDEP criteria. These alternatives are shown on **Figure 3-23 Closed Drainage System Alternative III** and **Figure 3-26 Culvert Replacement Alternative III**.
Replacement Alternative III, The specific dimensions for the three drainage locations are as follows:

- **Closed system near Taxiway A and Runway 5-23:**
  - The re-designed alternative proposes a new trunk line consisting of twin horizontally elliptical Reinforced Concrete Pipes (RCPs) with a 34-inch rise by 54-inch span.

- **Culvert located 250 feet from Runway 5 Departure End:**
  - This alternative consists of a precast concrete arch structure with a minimum 14-foot span and 4.1-foot rise.

- **Culvert located 990 feet from Runway 5 Departure End:**
  - This alternative also consists of a precast concrete arch structure with a minimum 14-foot span and 4.1-foot rise.

The evaluation of this alternative is below:

- **Purpose and Need:** Replacement of the drainage system was deemed necessary to remedy existing deficiencies including inadequate capacity and adverse grading. Alternative III does meet the purpose and need of the project. A value of Yes was awarded to this element.

- **Environmental Effects:** Similar to Alternative II, construction to replace the drainage components would not likely result in noteworthy environmental effects, particularly since the changes would take place in conjunction with other runway projects. Wetland impacts would be minimal and mitigated. A score of Minor was given.

- **FAA Standards:** This alternative would allow the drainage system to meet the criteria of both AC 150/5320-5C, Surface Drainage Design, and the NJDEP Flood Hazard Area Control Act Rules. An assessment of Yes applies.

- **Community Impact:** Alternative III provides for better stormwater runoff and flood volume control on MMU, which is a positive impact for the community. A grade of None was bestowed for this component.

- **Operational Flexibility:** With the intent to make the drainage system modifications coincide with the runway rehabilitation, Alternative III provides flexibility and efficiency during the construction period. A level of Excellent is applicable to this criterion. Similarly, since this alternative would provide greater capacity and efficiency after project completion, a value of Excellent also applies post-construction.
• Development Cost: The costs associated with this alternative may be slightly higher than Alternative II as the drainage areas would need to be renovated to accommodate larger drainage pipes and related configuration. Medium.

3.3.7.4 Preferred Drainage Alternative

Alternative III is the Preferred Drainage Alternative because it meets the purpose and need of the project and complies with FAA standards.

3.3.8 CONNECTOR TAXIWAY AND FILLET CONSTRUCTION

Two alternatives were devised to address construction of MMU’s connector taxiways and fillets. They are as follows:

• Connector Taxiway Alternative I (No-Build):
  o The existing connector taxiways and fillets for Runway 5-23 would remain in their current state. No changes to their layouts or dimensions would be made. This is considered the No-Build Alternative.

• Connector Taxiway Alternative II (Build):
  o The existing connector taxiways and fillets for Runway 5-23 would be reconstructed to coincide with the runway rehabilitation and to comply with changes to FAA design standards.

3.3.8.1 Connector Taxiway Alternative I

The No-Build Alternative would require no construction or development to the connector taxiways or fillets, and no modifications or improvements would be made. This alternative was evaluated below:

• Purpose and Need: This alternative does not meet the purpose and need of the project. A value of No was awarded to this element.

• Environmental Effects: There would be no environmental effects associated with this alternative. A score of None applies.

• FAA Standards: Alternative I would not meet the new taxiway design criteria outlined in AC 150/5300-13A, Airport Design. This factor received an evaluation of No as it applies to FAA standards.

• Community Impact: With no construction or development, this alternative would not result in any community impacts. A value of None is applicable.

• Operational Flexibility: The No-Build Alternative indicates that no adjustments or revisions would be made to the taxiways and fillets during the phases of construction. This would lead to uneven surfaces between Runway 5-23 and its connecting taxiways, which would remain an issue for safety and efficiency in the
long-term. Consequently, this component was awarded an assessment of Poor both during and after construction.

- **Development Cost:** There are no costs associated with the No-Build Alternative—None.

### 3.3.8.2 Connector Taxiway Alternative II

Alternative II recommends reconstructing the existing connector taxiways and fillets for Runway 5-23 as the runway overlay would create unevenness between the two surfaces. Additionally, recent changes to the geometric layout and engineering design of taxiways require that airports amend their taxiway system as necessary. This alternative suggests making these modifications in conjunction with the runway rehabilitation project in order to facilitate efficiency.

- **Purpose and Need:** Adjusting the connector taxiways and fillets meets the purpose and need of the project as described in the previous chapter and feasibility studies. A score of Yes applies.

- **Environmental Effects:** The improvements proposed in this alternative take place in existing areas of development, and consequently should not result in any environmental effects. A value of None was awarded.

- **FAA Standards:** Alternative II would meet the new taxiway design criteria outlined in AC 150/5300-13A, Airport Design. This factor received an evaluation of Yes as it applies to FAA standards.

- **Community Impact:** The proposed taxiway and fillet changes are minor in nature and should not have an impact on the surrounding community. This element was given an assessment of None.

- **Operational Flexibility:** This alternative promotes flexibility and efficiency both during and after construction by phasing the taxiway and fillet modifications to coincide with the runway rehabilitation project. A score of Excellent is applicable.

- **Development Cost:** Given the additional projects that are anticipated at MMU, the costs incurred from this alternative should remain economical. Low.

### 3.3.8.3 Preferred Connector Taxiway Alternative

Alternative II is the Preferred Connector Taxiway Alternative since it fits the purpose and need of the project and complies with FAA design standards.

### 3.3.9 REHABILITATION OF AIRPORT LIGHTING

Projects evaluated in this section include those lighting components that would need to be rehabilitated to coincide with the anticipated runway construction. These lighting
components are not new factors to be considered, but rather existing systems which would require modification. The related lighting systems are as follows: Runway Edge Lighting, Runway Threshold Lighting, Runway Guard Lights, and Taxiway Edge Lighting. Alternatives developed for this section are below:

- **Airport Lighting Alternative I (No-Build):**
  - The existing systems would remain in their current state, with no changes made. This is considered the No-Build Alternative.

- **Airport Lighting Alternative II (Build):**
  - This option advocates for rehabilitation of the lighting systems in conjunction with the runway project. This is the Build Alternative.

### 3.3.9.1 Airport Lighting Alternative I (No-Build):

The No-Build Alternative proposes that the lighting systems not be updated along with the runway rehabilitation. The lights would stay in their present conditions and locations. This alternative was evaluated as follows:

- **Purpose and Need:** The previous chapter identified deficiencies in the lighting systems such as irregular spacing, reaching the end of their useful life, and FAA requirements, not to mention the disturbances to occur with the runway construction. As such, the No-Build Alternative does not meet the purpose and need. A score of **No** applies.

- **Environmental Effects:** There would not be any environmental effects with the No-Build Alternative. A value of **None** is applicable.

- **FAA Standards:** This alternative would not satisfy FAA requirements regarding runway and taxiway lighting, including placement and spacing. A grade of **None** was awarded.

- **Community Impact:** No community impacts would result under the No-Build Alternative. This component received an assessment of **None**.

- **Operational Flexibility:** By not accommodating for changes to the runways and taxiways, this alternative fails to promote flexibility and efficiency both during construction and after project completion. In particular, long-term effects from misaligned lighting systems could include aircraft damage and personal injury. A rank of **Poor** is appropriate for the duration of construction and thereafter.

- **Development Cost:** There are no costs associated with the No-Build Alternative – **None**.
3.3.9.2 Airport Lighting Alternative II (Build):

The second alternative for airport lighting recommends pursuing the development necessary to align the runway and taxiway lighting systems with the anticipated changes to the runway and taxiway pavements. The systems would be upgraded and repositioned as required by the runway overlay and FAA standards. This option was evaluated in the following manner:

- **Purpose and Need**: Alternative II addresses the purpose and need of the project. A value of **Yes** was applied.

- **Environmental Effects**: The proposed development sites do not contain environmentally sensitive areas and would not result in any effects. Moreover, with regard to the utilization of Light Emitting Diode (LED) taxiway lighting, Alternative II would actually provide improved energy efficiency. This component received a score of **None** and would create some environmental benefits.

- **FAA Standards**: This alternative would be in accordance with the runway and taxiway lighting criteria specified by the FAA. This element was awarded an assessment of **Yes**.

- **Community Impact**: The intended modifications to the airport lighting systems would not be considerably different from the existing lighting configurations as to create any community impacts. An evaluation of **None** stands.

- **Operational Flexibility**: Alternative II promulgates making essential adjustments to the airport lighting systems in conjunction with changes to the runway and taxiway pavements. This enables operational flexibility and efficiency both during and after construction, as additional development should not be warranted after completion. The result is a ranking of **Excellent**.

- **Development Cost**: The completion of these lighting projects in tandem with other airport developments makes the cost required significantly less. **Low**.

3.3.9.3 Preferred Airport Lighting Alternative

Airport Lighting Alternative II is the preferred alternative since it fits the purpose and need and reduces the cost of implementation.

3.3.10 PAPI INSTALLATION

While the Precision Approach Path Indicator (PAPI) is also an airport lighting system, the installation of the visual aids would be new to MMU and thus separated from the aforementioned lighting alternatives. Two alternatives were developed for the PAPI at MMU:

- **PAPI Installation Alternative I (No-Build):**
There would be no PAPI installed at MMU. This is considered the No-Build Alternative.

- **PAPI Installation Alternative II (Build):**
  - Two four-box PAPI systems would be installed for Runway 5-23, one on each end.

The assessment of these alternatives is below:

### 3.3.10.1 PAPI Installation Alternative I (No-Build):

Under the No-Build option, the PAPI systems would not be constructed. The navigation aids for Runway 5-23 shall remain the same.

- **Purpose and Need:** It was previously determined that PAPI systems for Runway 5-23 were warranted given obstacles and terrain that surround MMU, as well as the high student-pilot traffic that occurs. The No-Build Alternative is not in adherence with the purpose and need of the project and received a score of **No**.

- **Environmental Effects:** There are no environmental effects associated with the No-Build Alternative. A value of **None** should apply.

- **FAA Standards:** MMU currently operates according to FAA standards and would remain in compliance under the No-Build Alternative – **Yes**.

- **Community Impact:** With no development or construction proposed, there would be no community impacts. An evaluation of **None** is relevant.

- **Operational Flexibility:** The No-Build proposition does not take advantage of anticipated runway projects, including grading, obstruction clearance, and the installation of other lighting systems. By passing up these other construction projects and phases, the No-Build Alternative fails to provide operational flexibility and efficiency in the short-term. Additionally, long-term operational efficiency would be impacted by the lack of glide slope guidance available to both student-pilots and pilots as they maneuver the surrounding obstacles and terrain. A ranking of **Poor** was awarded both during construction and after.

- **Development Cost:** There are no costs associated with the No-Build Alternative – **None**.

### 3.3.10.2 PAPI Installation Alternative II (Build):

Alternative II suggests the placement of a four-box PAPI on each end of Runway 5-23, in order to provide glide slope and approach guidance. The lighting system would be installed in conjunction with the additional runway and lighting improvements for greater efficiency.
• **Purpose and Need:** Alternative II does meet the purpose and need of the PAPI project and received a score of *Yes*.

• **Environmental Effects:** The sites where the PAPI systems are to be installed do not contain wetlands, bodies of water, or other environmentally sensitive areas which would lead to any environmental effects. A ranking of *None* applies.


• **Community Impact:** An existing PAPI system for Runway 13-31 is in place. The establishment of an additional PAPI system would not have any negative impacts on the community, as it is intended to enhance the instrument approaches and facilitate aircraft traffic to Runway 5-23. An assessment of *None* was awarded.

• **Operational Flexibility:** By taking advantage of other anticipated projects at MMU, including grading, obstruction clearance, and the installation of additional lighting systems, Alternative II allows for flexibility and efficiency during construction. Moreover, the facilitation of aircraft operations via approach guidance and obstacle avoidance enables this operational flexibility and efficiency to continue after project completion. A grade of *Excellent* is appropriate both during and post-construction.

• **Development Cost:** Given the proposed siting and additional projects, the costs of installing additional PAPI units at MMU would remain economical – *Low*.

### 3.3.10.3 Preferred PAPI Alternative

The Preferred PAPI Alternative is Alternative II as it complies with the purpose and need and would have positive operational efficiency.

#### 3.3.11 INSTALLATION OF RUNWAY TOUCHDOWN AND CENTERLINE LIGHTING

Similar to the proposed PAPI, the runway touchdown and centerline lighting would also be new system installations at MMU, and were evaluated separately from those only needing to be rehabilitated. The following alternatives were devised to address this lighting system:

• **Touchdown and Centerline Lighting Alternative I (No-Build):**
  - No runway touchdown or centerline lighting would be installed. This is considered the No Build Alternative
- **Touchdown and Centerline Lighting Alternative II (Build):**
  - Runway touchdown and centerline lighting would be implemented for the entire span of Runway 5-23.

### 3.3.11.1 Touchdown and Centerline Lighting Alternative I (No-Build)

The current runway lighting configuration would remain as is, with no proposed changes. This alternative is assessed as follows:

- **Purpose and Need:** The MPU, Feasibility Studies, and previous chapter identified the demand for runway touchdown and centerline lighting given the approach speeds of various aircraft within MMU’s fleet mix. The No-Build option does not meet the purpose and need as described and received a value of **No**.

- **Environmental Effects:** There would be no environmental effects associated with this alternative – **None**.

- **FAA Standards:** Touchdown zone and centerline lighting is required for certain precision approaches and/or approach speeds over 140 knots. This alternative does not adhere to the criteria set forth in AC 150/5340-30G, *Design and Installation Details for Airport Visual Aids*. An assessment of **No** applies.

- **Community Impact:** The No-Build Alternative would not affect the community surrounding MMU; however, the aviation community could be affected if certain aircraft are prevented from utilizing MMU due to the absence of appropriate touchdown and centerline lighting. A grade of **None** is applicable.

- **Operational Flexibility:** The Feasibility Studies identified the most efficient and cost-effective time to install the touchdown and centerline lights would be concurrent with the pavement and lighting rehabilitation projects. Since the No-Build Alternative does not propose any new development, this alternative was awarded a rank of **Poor** both during and after construction, with post-construction aircraft operations being negatively impacted by the lack of touchdown and centerline lights.

- **Development Cost:** There are no costs associated with the No-Build Alternative – **None**.

### 3.3.11.2 Touchdown and Centerline Lighting Alternative II (Build)

Alternative II recommends installing runway touchdown and centerline lighting for Runway 5-23 in conjunction with the runway pavement rehabilitation and other lighting system installation.
• **Purpose and Need:** The second alternative is agreeable to the purpose and need of the project as identified in the MPU and previous Feasibility Studies. An assessment of *Yes* was provided.

• **Environmental Effects:** The runway touchdown and centerline lighting would be constructed within the disturbed areas of Runway 5-23. As this area would already be under development, no additional environmental effects would occur from the added installation of this lighting system. A value of *None* is applicable.

• **FAA Standards:** This alternative does adhere to the criteria set forth in AC 150/5340-30G, *Design and Installation Details for Airport Visual Aids*. An assessment of *Yes* applies.

• **Community Impact:** There would be no additional community impacts due to this alternative. A factor of *None* is appropriate.

• **Operational Flexibility:** Alternative II takes advantage of the surrounding development and construction phasing as an ideal opportunity to install the runway touchdown and centerline lighting. Furthermore, the new lighting systems would facilitate operations for those aircraft above certain approach speeds, thus enabling greater flexibility and efficiency. An assessment of *Excellent* was given as it relates to operational flexibility and efficiency during and after construction.

• **Development Cost:** Implementing this alternative in conjunction with the runway rehabilitation would reduce the financial expenditures related to installing touchdown and centerline lighting – *Low*.

### 3.3.11.3 Preferred Touchdown and Centerline Lighting Alternative

Alternative II is the Preferred Touchdown and Centerline Lighting Alternative as it meets the purpose and need and complies with FAA standards. This is in contrast to the No-Build Alternative which would result in some aircraft being turned away based on their approach speeds and FAA criteria.

### 3.3.12 Runway 13-31 RSA

Similar to the ERSAs for Runway 5-23, the safety areas for Runway 13-31 need to be brought into compliance with the RSA Determination. The following alternatives were developed:

• **Runway 13-31 RSA Alternative I (No-Build):**
  o No changes would be made to the terrain or dimensions of the existing RSAs for Runway 13-31. This is considered the No-Build Alternative.

• **Runway 13-31 RSA Alternative II (Build):**
This alternative recommends the use of Declared Distances and a Displaced Threshold for the Runway 13 Departure End ERSA and relocating the Runway 31 Departure End to achieve compliance with the RSA Determination and FAA Orders.

3.3.12.1 Runway 13-31 RSA Alternative I (No-Build):

The existing RSAs for Runway 13-31 would remain unchanged and in their present condition under the No-Build Alternative. The assessment of this option is as follows:

- **Purpose and Need:** The No-Build Alternative does not act in accordance with the purpose and need as it relates to the RSA Determination. A score of **No** was given.

- **Environmental Effects:** No environmental effects would occur as a result of this alternative. A ranking of **None** applies.

- **FAA Standards:** The No-Build Alternative would not adhere to RSA criteria articulated in AC 150/5300, Orders 5200.8/5200.9, or the RSA Determination for MMU. A value of **No** was awarded.

- **Community Impact:** In the absence of any construction or development, there are no community impacts associated with this alternative. An assessment of **None** was provided.

- **Operational Flexibility:** In the short-term, operational flexibility and efficiency would remain the same under the No-Build Alternative. However, in the long-term, MMU’s operations could be hindered by runway length restrictions and reduced Federal funding related to the non-compliant RSAs. This factor was given an evaluation of **Excellent** during construction and a grade of **Poor** thereafter.

- **Development Cost:** There are no costs associated with the No-Build Alternative – **None**.

3.3.12.2 Runway 13-31 RSA Alternative II (Build):

The second alternative for the RSAs to Runway 13-31 incorporates Declared Distances and a Displaced Threshold of 123 feet to the Runway 13 Departure End, and suggests relocating the end of Runway 31 Departure End by 100 feet. The only physical changes that would occur under this alternative would involve remarking of the runway and modifications to the airfield lighting and signage so that they conform to the new runway configuration. These changes would alter the RSA dimensions enough to comply with FAA standards.
• **Purpose and Need:** This alternative does meet the purpose and need as described in the MPU and Feasibility Studies and it aligns with the intentions of the RSA Determination. A grade of **Yes** is applicable.

• **Environmental Effects:** The areas of development in this alternative do not contain environmentally sensitive land uses and should not result in any effects to the environment. A ranking of **None** was awarded.

• **FAA Standards:** Alternative II is in accordance with the RSA Determination. This component received a score of **Yes**.

• **Community Impact:** This alternative proposes construction in areas of MMU that have already been developed and suggests minimal alterations. It is not anticipated to impact the surrounding community. Additionally, Runway 13-31 is the crosswind runway, which implies less usage compared to Runway 5-23. As such, the slight modification to the runway layout is not anticipated to impact the aviation community that uses MMU. An assessment of **None** applies.

• **Operational Flexibility:** The second alternative for the Runway 13-31 RSAs offers operational flexibility and efficiency both during and after construction as it capitalizes on the phasing and development of additional projects at MMU. This implies fewer disruptions to aircraft operations and reduced costs overall. This flexibility and efficiency would continue after project completion given the implementation of a standard RSA that facilitates safe aircraft operations. An evaluation of **Excellent** is appropriate.

• **Development Cost:** The cost of shifting the RSAs on each end of Runway 13-31 would be more economical than those discussed for Runway 5-23 – **Low**.

### 3.3.12.3 Preferred Runway 13-31 RSA Alternative

The Preferred Runway 13-31 RSA Alternative is Alternative II, the Build option. This selection addresses the purpose and need of the project and complies with FAA standards.

### 3.4 SUMMARY OF PREFERRED AIRPORT ALTERNATIVES

A summary of the preferred alternatives for each element of the Runway 5-23 Rehabilitation project evaluated in this EA are presented in *Table 3-1 Summary of Preferred Alternatives*. These alternatives make up the Proposed Action.
<table>
<thead>
<tr>
<th>Project Element</th>
<th>Preferred Alternative</th>
<th>Evaluative Criteria and Performance</th>
<th>Operational Flexibility*</th>
<th>Development Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Purpose and Need</td>
<td>Environmental Effects</td>
<td>FAA Standards</td>
</tr>
<tr>
<td>Runway 5-23 Pavement</td>
<td>IV</td>
<td>Yes</td>
<td>Minor</td>
<td>Yes</td>
</tr>
<tr>
<td>Glide Slope</td>
<td>II</td>
<td>Yes</td>
<td>Minor</td>
<td>Yes</td>
</tr>
<tr>
<td>MALSR</td>
<td>III</td>
<td>Yes</td>
<td>Minor</td>
<td>Yes</td>
</tr>
<tr>
<td>Runway 5 Departure End ERSA</td>
<td>III</td>
<td>Yes</td>
<td>Minor</td>
<td>Yes</td>
</tr>
<tr>
<td>Runway 23 Departure End ERSA</td>
<td>III</td>
<td>Yes</td>
<td>Minor</td>
<td>Yes</td>
</tr>
<tr>
<td>Taxiway E</td>
<td>III</td>
<td>Yes</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>Drainage</td>
<td>III</td>
<td>Yes</td>
<td>Minor</td>
<td>Yes</td>
</tr>
<tr>
<td>Taxiways and Fillets</td>
<td>II</td>
<td>Yes</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>Airport Lighting</td>
<td>II</td>
<td>Yes</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>PAPI</td>
<td>II</td>
<td>Yes</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>Touchdown and Centerline</td>
<td>II</td>
<td>Yes</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>Runway 13-31 RSA</td>
<td>II</td>
<td>Yes</td>
<td>None</td>
<td>Yes</td>
</tr>
</tbody>
</table>

* During and Post-Construction
PAVEMENT REHABILITATION ALTERNATIVE I
MORRISTOWN MUNICIPAL AIRPORT

EXISTING GROUND

PAVEMENT KEEL HAS FAILED ON CENTERLINE

VARIES (1% - 1 1/2%)

150'

50'

VARIES (1% - 1 1/2%)

LIMITS OF KEEL REPAIR BEING COMPLETED 2013 THRU 2017

15"

6" LARGE BASE STONE

15"

ASPHALT

JUNE 2014
PAVEMENT REHABILITATION ALTERNATIVE II
MORRISTOWN MUNICIPAL AIRPORT
EXISTING GROUND

NEW 14" P-401

7" EXISTING ASPHALT

EXISTING 6" AGGREGATE BASE COURSE

KEEL PAVEMENT REPLACED WITH NEW P-401 BETWEEN YEARS 2013 & 2017

5" MIN

1 1/2%

7" EXISTING ASPHALT

1" MILL & REPLACE

5" MIN

1 1/2%

PROPOSED GROUND

EXISTING GROUND

ASPHALT OVERLAY FABRIC

UNDISTURBED SUBGRADE

FIGURE 3-3

PAVEMENT REHABILITATION ALTERNATIVE III
MORRISTOWN MUNICIPAL AIRPORT
KEEL PAVEMENT REPLACED WITH NEW P-401 BETWEEN YEARS 2013 & 2017

1" MILL AND REPLACE
ASPHALT OVERLAY FABRIC
EXISTING 6" AGGREGATE BASE COURSE
UNDISTURBED SUBGRADE

MIN 3" AT PAVEMENT EDGE
5" MIN AT KEEL EDGE

1 1/2% 150' 50'

PROPOSED GROUND
EXISTING GROUND

FIGURE 3-4
PAVEMENT REHABILITATION ALTERNATIVE IV
MORRISTOWN MUNICIPAL AIRPORT
GLIDE SLOPE CRITICAL AREA ALTERNATIVE II
MORRISTOWN MUNICIPAL AIRPORT

RUNWAY 5-23

AIRPORT PROPERTY LINE (TYP)
150' WETLAND TRANSITION AREA

GLIDESLOPE ANTENNA

GLIDE SLOPE CRITICAL AREA
PERMANENT IMPACTS = 23,300 SF
TEMPORARY IMPACTS = 5,000 SF

EXISTING WETLAND BOUNDARY (TYP)

FIGURE 3-6
EXISTING WETLAND BOUNDARY (TYP)

AIRPORT PROPERTY LINE (TYP)

150' WETLAND TRANSITION AREA

50' WETLAND TRANSITION AREA

BASELINE "MALSR CENTERLINE"

LEGEND

EXISTING GLIDE SLOPE CRITICAL AREA

IRREGULAR PLANE

OBSTRUCTING TREES

STA: 2+00  ELEV: 182.97
STA: 4+00  ELEV: 183.77
STA: 6+10  ELEV: 184.61
STA: 8+20  ELEV: 185.45
STA: 10+30  ELEV: 186.29
STA: 12+20  ELEV: 187.05
STA: 14+10  ELEV: 187.81
STA: 16+00  ELEV: 188.80
STA: 18+00  ELEV: 189.95
STA: 20+00  ELEV: 190.90
STA: 22+00  ELEV: 191.95
STA: 24+00  ELEV: 193.00

MALSR ALTERNATIVE I
MORRISTOWN MUNICIPAL AIRPORT

FIGURE 3-7

www.deltaairport.com
APPROACH LIGHT PLANE
(400' W x 1,000' L)
RAIL PRIMARY PLANE
(LEVEL WITH APPROACH LIGHT PLANE)
(100' W x 1,600' L)
RAIL SECONDARY PLANE (7:1)
(150' W x 1,600' L, BOTH SIDES)
EXISTING WETLAND BOUNDARY (TYP)
AIRPORT PROPERTY LINE (TYP)
150' WETLAND TRANSITION AREA
50' WETLAND TRANSITION AREA
PERMANENT IMPACTS = 8,200 SF
TEMPORARY IMPACTS = 5,400 SF
RW 23 DEPARTURE ERSA
PERMANENT IMPACTS = 7,500 SF
TEMPORARY IMPACTS = 700 SF
BASELINE "MALSR CENTERLINE"

PROPOSED APPROACH LIGHT PLANE
PROPOSED RAIL PRIMARY PLANE
PROPOSED RAIL SECONDARY PLANE
EXISTING WETLAND
EXISTING GLIDE SLOPE CRITICAL AREA
PROPOSED MALSR BAR, STEADY BURNING, GREEN
PROPOSED APPROACH LIGHT, STEADY BURNING, WHITE
PROPOSED APPROACH LIGHT, FLASHING, WHITE

TREE GROUP A
STA: 16+11
ELEV: 224'
TREE GROUP B
STA: 17+48
ELEV: 224.28'
TREE GROUP C
STA: 19+14
ELEV: 228.5'
TREE GROUP D
STA: 20+99
ELEV: 226.1'
TREE GROUP E
STA: 22+48
ELEV: 225'
TREE GROUP F
STA: 27+26
ELEV: 249'

FRANGIBLE EMT POST STA 2+00
FIBERGLASS MASTS <= 40' (TYP) (STA 4+00 TO STA 18+00)
STEEL TOWER BASE FOR FIBERGLASS MASTS (TYP) (STA 20+00 TO STA 24+00)

FIGURE 3-9

MALSR ALTERNATIVE III
MORRISTOWN MUNICIPAL AIRPORT
FIGURE 3-12

RUNWAY 5 DEPARTURE END ERSA ALTERNATIVE I
MORRISTOWN MUNICIPAL AIRPORT
RUNWAY 5 DEPARTURE END ERSA ALTERNATIVE III
MORRISTOWN MUNICIPAL AIRPORT

FIGURE 3-14

- 50' WETLAND TRANSITION AREA
- 100' STANDARD ERSA
- AIRPORT PROPERTY LINE (TYP)
- 500' STANDARD ERSA
- EXISTING WETLAND BOUNDARY (TYP)
- LIMITED ERSA GRADING
- RW 5 DEPARTURE ERSA
   PERMANENT IMPACTS = 2,300 SF
   TEMPORARY IMPACTS = 5,300 SF
- 150' WETLAND TRANSITION AREA
- EXITING FENCE (TYP)

DRAWN BY: JRS  CHECKED BY: ADS  SCALE: 1"=200'  DATE: JUNE 2014
RUNWAY 23 DEPARTURE END ERSA ALTERNATIVE III
MORRISTOWN MUNICIPAL AIRPORT

50' WETLAND TRANSITION AREA
EXISTING WETLAND BOUNDARY (TYP)
LIMITED GRADING

500' STANDARD ERSA
1,000' STANDARD ERSA
PROPOSED EMAS
AIRPORT PROPERTY LINE (TYP)

RWY23 DEPARTURE ERSA
PERMANENT IMPACTS = 7,500 SF
TEMPORARY IMPACTS = 700 SF

FIGURE 3-17
TAXIWAY E RELOCATION ALTERNATIVE II
MORRISTOWN MUNICIPAL AIRPORT

CONSTRUCT NEW APRON CONNECTION

TW 'E' REMAINS IN EXISTING LOCATION

186' NO PARKING IN TOFA

EXISTING WETLAND BOUNDARY (TYP)

DEMOLISH TAXIWAY CONNECTION

RESCUE ROAD

FIGURE 3-19
TAXIWAY E RELOCATION ALTERNATIVE III
MORRISTOWN MUNICIPAL AIRPORT

RELOCATE TW "E"

50' WETLAND TRANSITION AREA

EXISTING WETLAND BOUNDARY (TYP)

DEMOLISH TW "E", LESS RESCUE ROAD PORTION

RESCUE ROAD

FBO APRON

FBO APRON

TW 'A'

TW 'R'

TW 'B'

TW 'D'

RUNWAY 5-23

400'

1402'

FIGURE 3-20

McFarland Johnson
CLOSED DRAINAGE SYSTEM ALTERNATIVE I
MORRISTOWN MUNICIPAL AIRPORT
CLOSED DRAINAGE SYSTEM ALTERNATIVE II  
MORRISTOWN MUNICIPAL AIRPORT
CLOSED DRAINAGE SYSTEM ALTERNATIVE III
MORRISTOWN MUNICIPAL AIRPORT

PROPOSED 24" RCP
PROPOSED 8" UNDERDRAIN
PROPOSED (2) 34"x54" HORIZONTAL ELLIPTICAL RCP
EXISTING WETLAND BOUNDARY (TYP)
PROPOSED CHANNEL GRADING LIMITS
50' WETLAND TRANSITION AREA
SUBSURFACE DRAINAGE (TYP)

FIGURE 3-23

DRAWN BY: JRS
CHECKED BY: ADS
SCALE: 1"=200'
DATE: JUNE 2014
EXISTING WETLAND BOUNDARY (TYP)

CULVERT 1
REPLACE EXISTING
54" CSP IN-KIND

CULVERT 2
REPLACE EXISTING
54" CSP IN-KIND

AIRPORT PROPERTY LINE (TYP)

EXISTING MALSR ELEV
FLOW

PROPOSED MALSR ELEV
FLOW

CULVERT 1 X-SECTION A-A

CULVERT 2 X-SECTION B-B

CULVERT REPLACEMENT ALTERNATIVE II
MORRISTOWN MUNICIPAL AIRPORT

FIGURE 3-25
INSTALL 3-SIDED CONCRETE BOX CULVERT PER NJDEP STANDARDS

PROPOSED AREA OF DISTURBANCE

EXISTING WETLAND BOUNDARY (TYP)

INSTALL 3-SIDED CONCRETE BOX CULVERT PER NJDEP STANDARDS

50' WETLAND TRANSITION AREA

AIRPORT PROPERTY LINE (TYP)

PROPOSED AREA OF DISTURBANCE

TW ' A'

150' WETLAND TRANSITION AREA

RUNWAY 5-23

EXISTING WETLAND BOUNDARY (TYP)

INSTALL 3-SIDED CONCRETE BOX CULVERT PER NJDEP STANDARDS

50' WETLAND TRANSITION AREA

AIRPORT PROPERTY LINE (TYP)

PROPOSED AREA OF DISTURBANCE

CULVERT REPLACEMENT ALTERNATIVE III
MORRISTOWN MUNICIPAL AIRPORT

CULVERT 1 - X SECTION A-A

CULVERT 2 - X SECTION B-B

FIGURE 3-26

DRAWN BY: JRS
CHECKED BY: ADS
SCALE: 1"=200'
DATE: JUNE 2014

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