APPENDIX C

DESCRIPTION OF TEMPORARY RUNWAY, TECHNICAL PAPER NO. 1

(JUNE 2014)

Technical Paper No. 1

Description of Proposed Temporary Runway

Kahului Airport

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Description of Proposed Temporary Runway
Kahului Airport (OGG)

A "Temporary Runway (T-RWY)" has been proposed to be developed and used for an interim period of time while the existing main Runway 02/20 (E-RWY) is reconstructed. This report is one of a series that describes various aspects of the T-RWY Proposed Plan for the Reconstruction of E-RWY 02/20 that include costs, schedule, East Side Facilities and Operations Accommodations, Runway Extension Options and Alternatives to the proposed project. This report describes the key physical and operational features of the proposed construction and operation of the T-RWY in conjunction with the Reconstruction of the E-RWY. The following are described in this report:

- T-RWY Characteristics and Geometry
- Project Timing Issues
- T-RWY Siting
- T-RWY and E-RWY Operations
- T-RWY and E-RWY Construction Phasing

Each is discussed and described in the Sections that follow.

1. T-RWY Characteristics and Geometry

This section provides a summary listing of the characteristics and geometry of the T-TWY.

Runway Positioning

- Lateral Separation from RWY 02/20 = 400 feet east
- T-RWY 20 threshold located at Taxiway K
- T-RWY 02 threshold located 7,000 south of TXY K (1,530 feet south of E- RWY 02/20 threshold)

Runway Geometrics

- Length = 7,000 feet
- Width = 150 feet
- Shoulders = 25 feet (west side only)
- Runway Entrance/Exits at south threshold, north threshold at TXY G and at intersection with RWY 5/23
- 1,250 feet from TXY K to RWY 05/23 paved (150 foot width)
- Blast Pad = 300 feet by 200 feet
- RSA Area off of south end conforming to grading standards
- T-RWY END 02 Elevation = +/- 60 feet
- T-RWY END 20 Elevation = +/- 15 Feet

Navigational Aids

- Edge lights (HIRL)
- REILs
- Threshold Lights
- Approach Light System (ODALS) T-RWY End 02 only
- Distance to Go Markers
- 4 Box VASI T-RWY 02 End
- E-RWY LOC remains operational for offset approaches
- T-RWY Striping = Non-Precision

Airspace

- T-RWY 02 and 20 Approach = Visual = 20:1
- Departure Surface = 40:1

Materials and Design

- Asphalt Concrete
- Minimum Thickness Design for Use and Duration
- Constant Lateral (transverse) Slope (not crowned)
- Longitudinal Slope similar to E-RWY and East Side Apron Grades

2. Project Timing Issues

The E-RWY condition has deteriorated over the years and the DOT-A has made remedial repairs to maintain operations at a safe level for over 55 years. The frequency of remedial repairs as well as the costs for those repairs has steadily increased over the years to a point where the FAA and DOT-A have agreed that continued remedial repairs are no longer cost effective and a complete reconstruction of E-RWY 02/20 is now a requirement.

Notwithstanding the above, given the current state of disrepair of the E-RWY, and the fact that it will take several years to complete the reconstruction of E-RWY 02/20, the FAA and DOT-A are planning to implement one last remedial repair and resurfacing project. This repair is anticipated to extend the useful life of E-RWY 2/20 for another five years.

The DOT-A expects to begin this project sometime during the summer of 2014. Assuming a design life of approximately five years, reconstruction of E-RWY 02/20 must be initiated on or before summer of 2019. To enable this, the proposed T-RWY must be in operation on or before the start of E-RWY 2-20 reconstruction. The timing of the need for beginning reconstruction of E-RWY 2/20 within the timeframe described above is one of several important aspects for recommending development of a T-RWY as part of the proposed approach to reconstruct E-RWY 02/20.

3. T-RWY Siting

The T-RWY is defined to have a length of 7,000 feet to provide equivalent capability as the E-RWY 02/20 for operational consistency during the reconstruction of E-RWY 02/20.

3.1 Lateral Separation

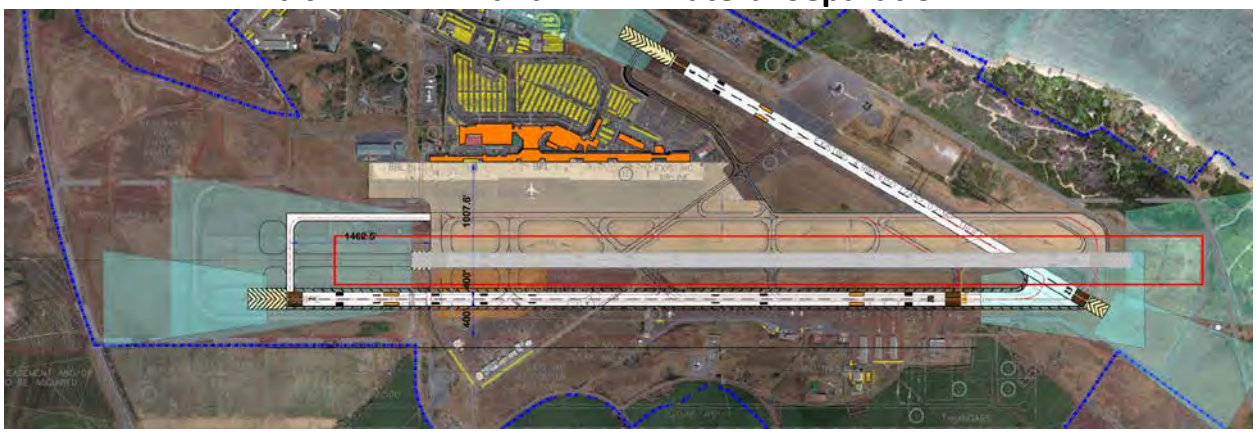
The lateral separation is defined to be 400 feet in recognition of the following key factors:

- Impacts to East Side facilities and operations
- Terrain issues to the east
- Potential reuse of T-RWY investments in paving as a parallel taxiway
- FAA construction standards

Significant among the lateral separation options, are the impacts to the East Side facilities and operations. Lateral separation distances greater than 400 feet negatively impact critical functions such as the existing ARFF Station and the ATCT, necessitating relocation which is both a significant expense but more importantly a significant time requirement.

Lesser lateral separations negatively impact the construction operations area as well as the reuse of pavement following completion of the E-RWY reconstruction. On the positive side, some of the facility and operational impacts to the east side facilities are alleviated by lateral separations less than 400 feet. Exhibit 1 shows the lateral relationship of the E-RWY and the T-RWY, keeping in mind that the two runways are neither proposed nor capable of being operated simultaneously at any time.

Exhibit 1 – E-RWY and T-RWY Lateral Separation

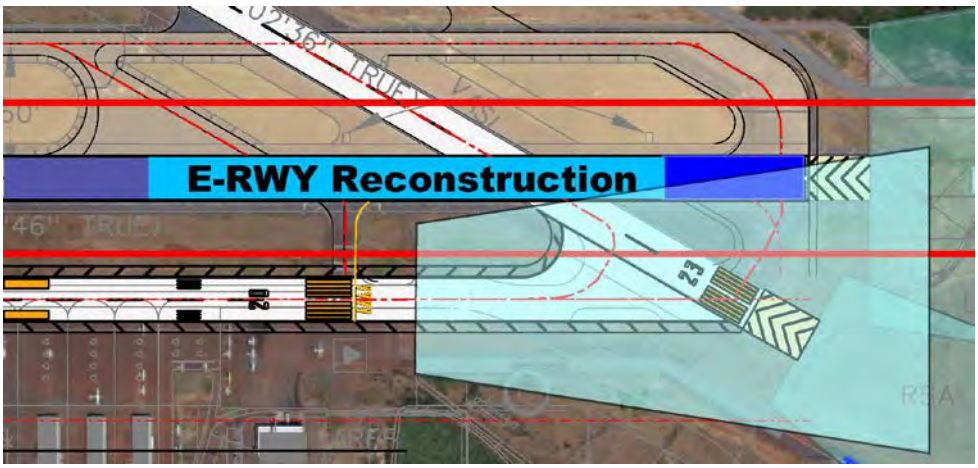


3.2 Longitudinal Placement

Considering the need to provide a totally independent interim operation during the reconstruction of E-RWY 02/20, it is necessary to first consider access to and egress from the proposed T-RWY. For arrivals it is necessary to define an exit location for the dominant north flow arrivals that facilitates clearing aircraft from the T-RWY. TXY K is a logical location for the north end of the T-RWY as it is independent of RWY 05/23 and provides access via TXY G to the passenger terminal and potential interim GA facilities to the west.

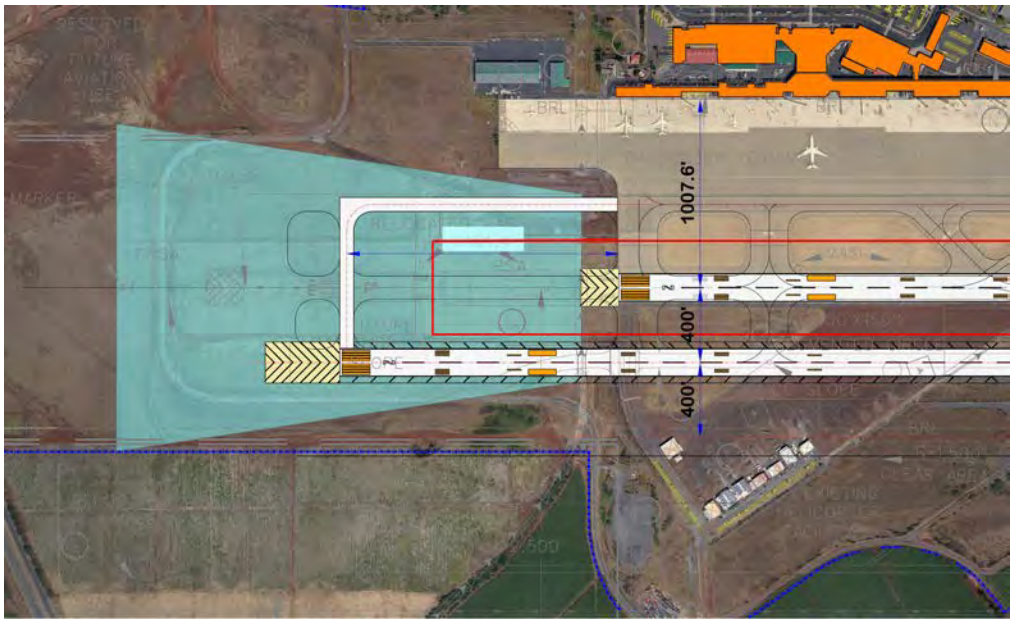
Construction phasing for the E-RWY reconstruction is a factor in this threshold location as well. An alternative location is needed to exit the T-RWY when construction is either at TXY K or at the end of the E-RWY 20 End. As a result of these considerations, the T-RWY is extended to intersect with RWY End 23. This facilitates aircraft exits when TXY K/TXY G is being reconstructed, and maintains exits when E-RWY 2/20 is being reconstructed. Creating an intersection of the T-RWY with RWY End 23 will result in a closure of RWY 05/23 while the T-RWY pavement inside of the RWY 05/23 RSA is being constructed. Exhibit 2 shows the T-RWY south threshold positioning.

Exhibit 2 – T-RWY North Threshold Location



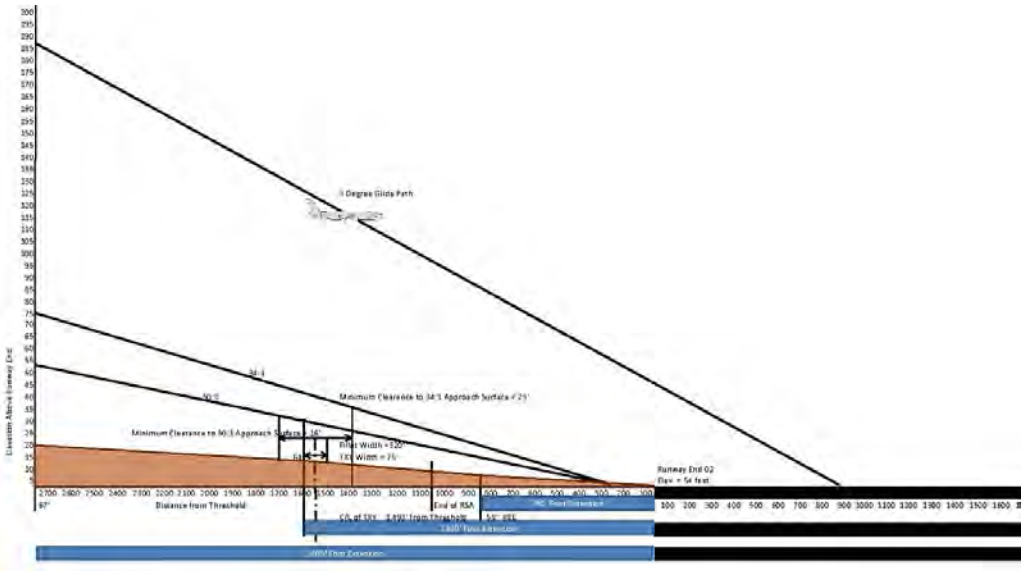
If TXY K is used as the north threshold location for the T-RWY, the south threshold would be located approximately 1,530 feet south of the existing threshold. This is a minimum distance from the E-RWY End 02 threshold to construct needed access taxiways to the T-RWY without altering E-RWY operations for a relocated threshold. The T-RWY south threshold position using TXY K as the north threshold location and a length of 7,000 feet is shown in Exhibit 3. As shown, the south threshold would be 1,530 feet south of the existing threshold, a distance that locates the needed access taxiway outside of the E-RWY 02/20 RSA.

Exhibit 3 – T-RWY South Threshold Location



In addition, the location of the needed crossover taxiway (to connect TXY A extended to the T-RWY), is sufficiently far from the E-RWY 02 threshold to allow construction under the RPZ. Exhibit 4 shows the potential construction clearances under the E-RWY End 02 approach surface (changed from precision to non-precision).

Exhibit 4 – T-RWY South Threshold Location



As shown, the ground elevation rises to the south and is higher than the E-RWY 02 threshold. The change to a non-precision runway alters the applicable approach slope to one that is more beneficial for the construction under the RPZ. The actual flight path

for a 3 degree descent path and a touchdown point about 1,500 feet down the runway is also shown in relation to the RPZ for perspective on the RPZ definition.

All dimensions will require confirmation during the design process. The dimensions defined in this document are planning level values derived from available secondary sources, the accuracy of which is acceptable for this level of planning but not for design. All values are expected to change within a limited range but not enough to affect the viability of the concept.

4. T-RWY and E-RWY Operations

The approach to the proposed project is to construct a "temporary runway" for use only during the time needed to reconstruct the E-RWY 02/20. The T-RWY is positioned such that portions of the investments made in the T-RWY have value as elements usable for future planned projects per the Airport Master Plan. The proposed project includes the following operational phases to implement:

- Phase 1
  - Complete enabling projects
  - Construct T-RWY
- Phase 2
  - Operate T-RWY and Reconstruct E-RWY 02/20
  - Transition operations back to E-RWY 02/20 and close T-RWY
  - Restore East Side Facilities

The operational Phases are described in the sections that follow.

4.1 Phase 1 Operations

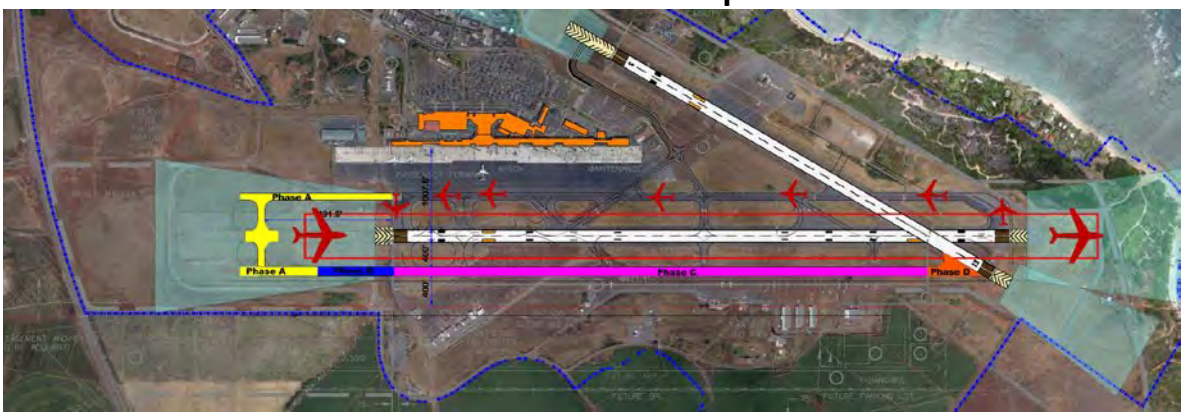
In order to construct the T-RWY, operations on the E-RWY 02/20 will be impacted by the need to construct taxiway and T-RWY pavements adjacent to and under the E-RWY 02 RPZ. These T-RWY pavement areas can be constructed while the E-RWY is operated with some limitations. These limitations are that the existing E-RWY 02 glide slope (GS) and the approach light system (ALS) will be taken out of service, resulting in a loss of precision approach capability to a non-precision approach capability. The existing localizer will remain in operation and offer non-precision arrival capability with vertical guidance provided by the existing VASI/PAPI.

Runway operations with the exception of the loss of precision arrival capability will remain largely unchanged on E-RWY 02/20 but RWY 05/23 will be either closed or restricted at some point in time during the Phase 1 operational period. The following impacts will be incurred by the users of OGG:

- Air Carrier operations – no change
- Commuter operations – RWY 05 closed for departures, increased taxi distance to E-RWY End 02
- Helicopter Operations – amended procedures to relocated TLOF
- Large GA – altered taxi patterns from interim relocation, increased taxi distance to E-RWY End 02
- Small GA (Tie-down and transient) - altered taxi patterns from interim relocation, increased taxi distance to E-RWY End 02
- T-Hangar Users – altered taxi patterns

Construction of the T-RWY north of TXY C will be phased to maintain aircraft access/egress to the E-RWY by the users permitted to remain on the East Side. Exhibit 5 shows the Phase 1 arrival/departure and taxi patterns.

Exhibit 5 – Phase 1 E-RWY Operations



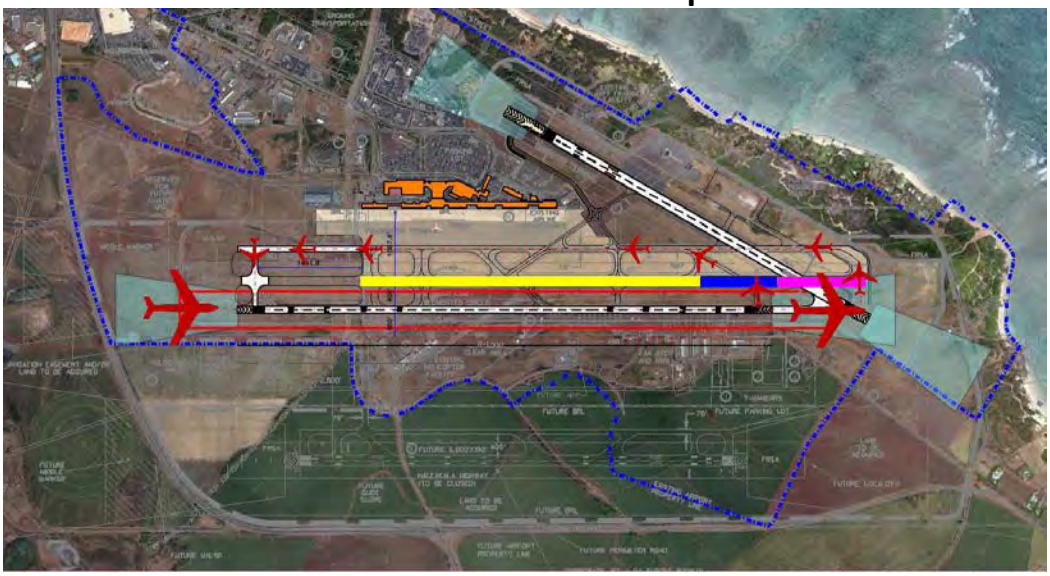
4.2 Phase 2 Operations

Upon completion and commissioning of the T-RWY, operations will be transferred to the T-RWY and E-RWY 02/20 will closed for reconstruction. Operations on the T-RWY will, at a minimum, be limited to a visual approach. Day and night operations are expected. The following impacts will be incurred by the users of OGG:

- Air Carrier operations – nominally longer outbound and inbound taxi distances
- Commuter operations – increased taxi distance to T-RWY
- Helicopter Operations – amended procedures to include amended separation requirements to relocated TLOF, may result in delays not experienced today
- Large GA – altered taxi patterns from interim relocation, increased taxi distance to T-RWY
- Small GA (Tie-down and transient) - altered taxi patterns from interim relocation, increased taxi distance to T-RWY
- T-Hangar Users – altered taxi patterns, and potential outbound delays for taxi clearance

Exhibit 6 shows the arrival/departure and taxi patterns for the Phase 2 operations.

Exhibit 6 – Phase 2 T-RWY Operations



5. T-RWY and E-RWY Construction Operations and Phasing

Considering the operational phases defined in Section 4 of this Report, the construction phases are consistently defined. The Phase 1 and Phase 2 preliminary definition of the construction phasing and issues are discussed in the sections that follow.

5.1 Phase 1 Construction Phasing

Phase 1 includes the completion of the enabling projects as well as the construction of the T-RWY and all related support structures and systems, including all Navigational Aids and associated aircraft operational procedures. The construction phasing also requires consideration of all aircraft movements. Construction for the T-RWY requires new pavement area south of the E-RWY 02 threshold and its operational surfaces to maintain continuous operations while construction is completed. Key elements of the T-RWY construction south of the E-RWY 02 threshold included:

- Extension to TXY A
- Crossover from TXY A to T-RWY south threshold
- T-RWY segment up to TXY C

Also included are enabling projects that include the infill of low terrain south and east of the E-RWY 02 threshold. This low area accommodated drainage structures that tunnel under the E-RWY 02 RSA. An extension of the drainage structure to be located under

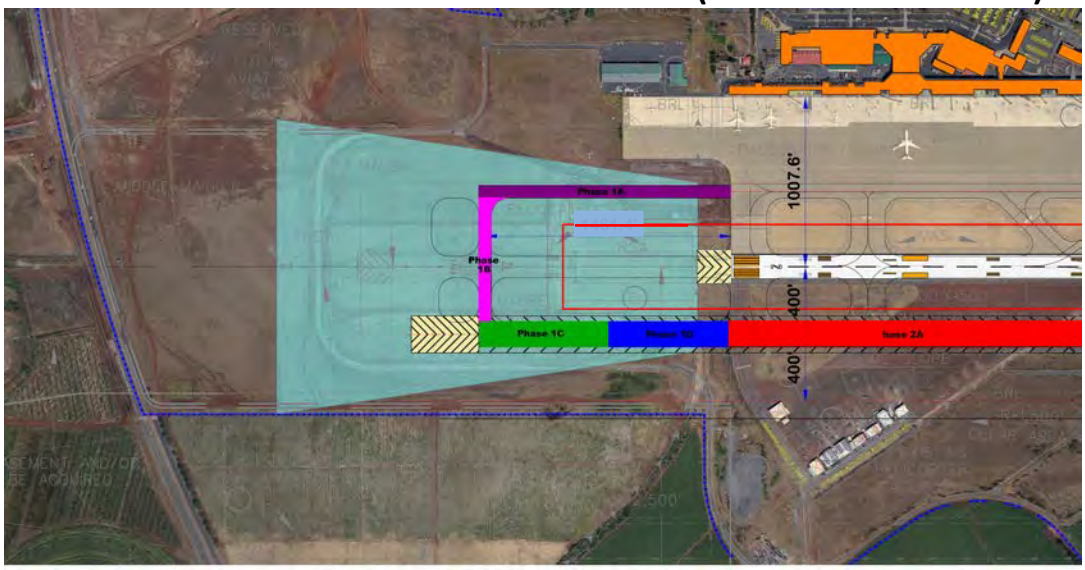
the T-RWY RSA is needed before the area of the T-RWY RSA is filled to grade. Also included as an enabling project are:

- Closure of Haleakala Road
- Terrain Excavation to the east (adjacent to the ASR and RTR)

These projects are more fully described in the East Side Facilities and Operations Report.

The pavement construction phases for the south end T-RWY under the RPZ are shown in Exhibit 7.

Exhibit 7 – T-RWY Pavement Construction (South End under RPZ)



As shown, the pavements are defined into segments for the purposes of FAA reviews:

- Phase 1A (dark purple) is the extension of TXY A to the south – This pavement segment is located outside of the ROFZ and a ROFA does not apply to a non-precision runway. Construction should be permissible day and night during E-RWY 02 operations. The tie into the existing pavement can be accomplished due to the added width of the TXY A and TXY C intersection.

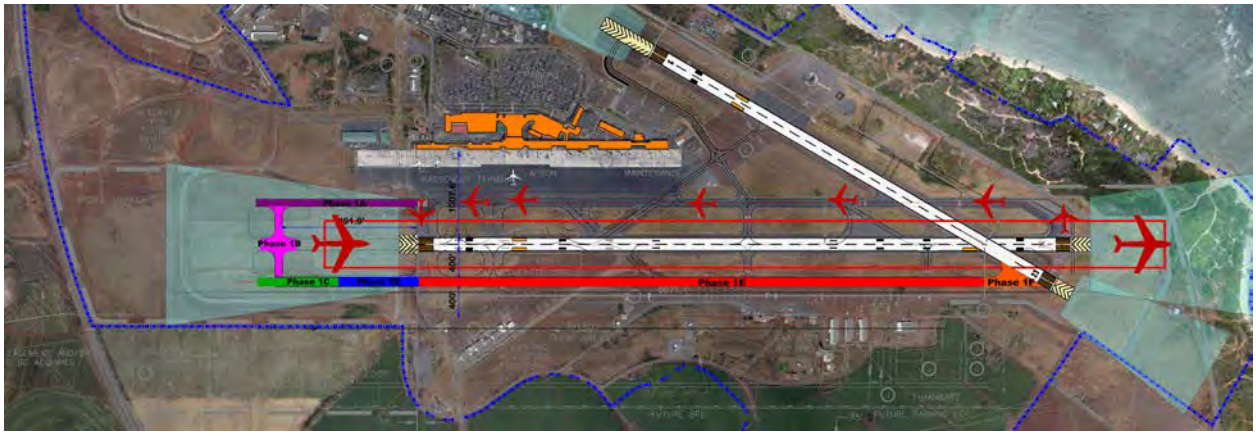
- Phase 1B (magenta) is the construction of the Connector/Crossover TXY between TXY A and the T-RWY. This pavement is sufficiently south of the E-RWY 02 threshold to be beyond the RSA and under the 34:1 non-precision approach surface. Construction day and night is expected. Note that if a runway extension is approved, transition areas will also be constructed in this phase such that aircraft access can be maintained to the T-RWY when (and if) the extension to E-RWY 2/20 is constructed.

- Phase 1C (green) includes the end portions of the T-RWY to include the blast pad and the runway segments up to the location where workers and equipment no longer remain under the RPZ. Construction day and night is expected.

- Phase 1D (blue) includes the area under the RPZ up to TXY C, and within the ROFA. This area is likely to require the E-RWY to be closed and construction conducted as night work.

The T-RWY portions north of TXY C are expected to be constructed in not fewer than two segments labeled Phase 1E and 1F as shown in Exhibit 8. There are no time of day limitations on these construction areas with the exception that phasing must allow for ARFF vehicle access to E-RWY 02/20 at all times, and that aircraft access/egress to/from the T-Hangars and E-RWY 02/20 via TXY F and/or TXY K must be maintained. See East Side Facilities and Operation Plan Report for details of the T-hangar access requirements and accommodations.

Exhibit 8 – T-RWY Pavement Construction North of TXY C



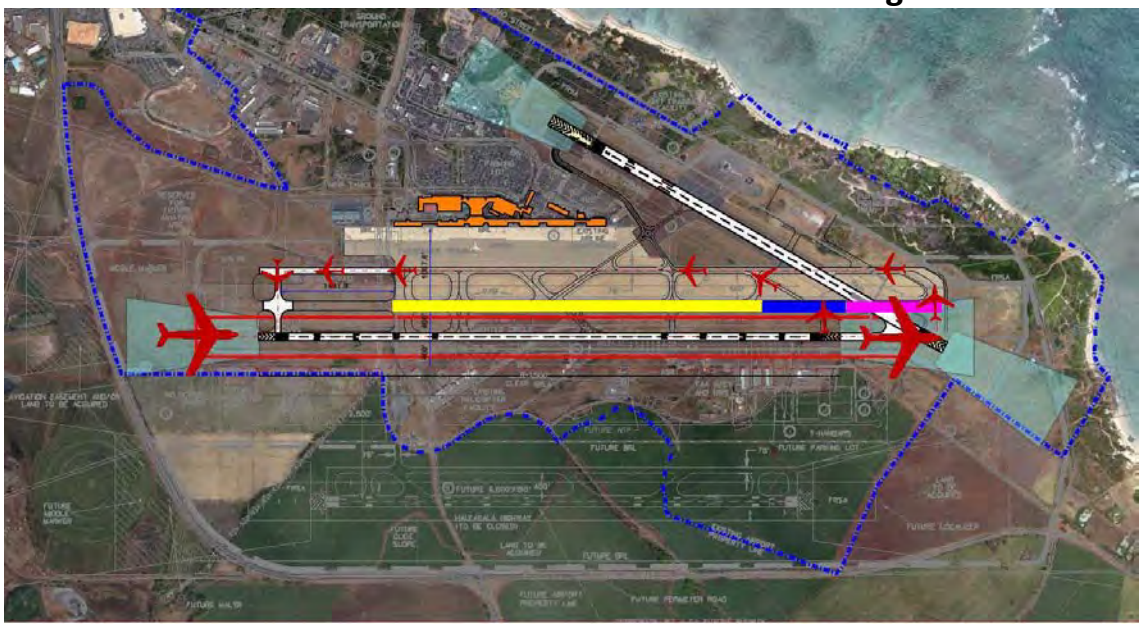
5.2 Phase 2 Construction Phasing

Phase 2 construction includes the reconstruction of E-RWY 02/20. An extension to E-RWY End 02 may be included in this Phase of the project. See Runway Length Report for details on the issues related to a runway extension. Exhibit 9 shows the phasing for E-RWY 02/20 reconstruction.

As shown, the reconstruction of E-RWY 02/20 is largely unconstrained, meaning that the construction contractor has few constraints to defining the most expeditious and cost effective construction means and methods. The lone limitation is the need to provide aircraft egress from the T-RWY at the north end. At least 2 phases of work will be needed to provide for aircraft exits either at TXY K or the connecting pavement to RWY

End 23/TXY A at end of the T-RWY when the reconstruction requires closures for reconstruction through these intersections.

Exhibit 9 – E-RWY Reconstruction Phasing



6. T-RWY Conversion to a Parallel TXY

The existing east apron parallel taxiway (un-named) is located with a lateral separation of 400 feet from the E-RWY. The TXY is 50 feet in width and has a 35 foot wide shoulder. The distance from the centerline to the clearance limit line is 80 feet adjacent to the Large GA parking area and only 70 feet adjacent to the GA Tie-down area. The transition in clearance limit line is north of TXY F. The 81 foot dimension is acceptable for a 100 foot wing span aircraft "taxiway" or a "taxilane" for a 118 for wing span aircraft. The Tie-down area is appropriate for a taxiway serving aircraft with a wing span of 86 foot or a taxilane serving aircraft with a wing span up to 100 feet. The Large GA parking area is accessible via TXY.

Upon completion of reconstruction and reopening of E-RWY 02/20, the T-RWY will be closed and converted to a parallel taxiway that serves the East Apron area. With the construction of the T-RWY along this same centerline (400 feet) and being widened to 150 feet plus the 25 foot shoulder, a portion of the T-RWY will be excess pavement when converted to a taxilane if the lateral separation remains at 400 feet. It is recommended that the centerline of the new East Side Taxiway be located at a lateral separation of 350 feet from E-RWY 02/20. This would locate the centerline at a distance of 25 feet from the west edge of the T-RWY runway pavement, essentially creating a 50 foot wide taxiway with the 25 foot T-RWY shoulder and edge lights reused.

The recommended constant lateral slope facilitated the location of the taxiway/taxilane centerline at a position other than the T-RWY centerline which would otherwise be required if the T-RWY were crowned. This should translate into cost savings as trench drains on the east side of the T-RWY would be avoided.

Exhibit 10 presented on the page that follows, shows a graphical depiction of the conversion of the T-RWY back to a taxiway in a manner that re-uses the investment made in the T-RWY to the maximum practical extent. As shown, the west edge of the T-RWY is used as the parallel taxiway.

The East Side facilities are limited to GA aircraft that may include aircraft as large as a BBJ with winglets (ADG III – maximum 118 foot wing span). This definition is consistent with the current capability. Flexibility to define the criteria as either "taxiway", meaning ATC controlled movement area or "taxilane", non-ATC controlled non-movement area. The lateral separation of 350 feet is appropriate with the limitation to ADG III Aircraft.

These actions will benefit the accommodation of Large GA aircraft as the existing apron depth is increased by 50 feet and in combination with the excavation of the high terrain, will allow further depth expansion by an additional 250 feet. This area will permit the GA facilities to be re-developed as a campus with expanded support facilities including the opportunity for additional apron area to more efficiently accommodate peak aircraft parking demands.

The 350 foot lateral separation and the reuse of the T-RWY edge lighting will save the expense of placing conduit in the T-RWY for taxiway/taxilane edge lights at a location 60 to 65 feet west of a centerline located at 400 feet. Reusing the T-RWY edge lights for the East Side taxiway/taxilane would be accomplished by changing the light fixtures only.

The design features will be addressed in cooperation with the FAA at the appropriate time. Cost savings are available to minimize the expense of the T-RWY while maximizing its long term reuse value.

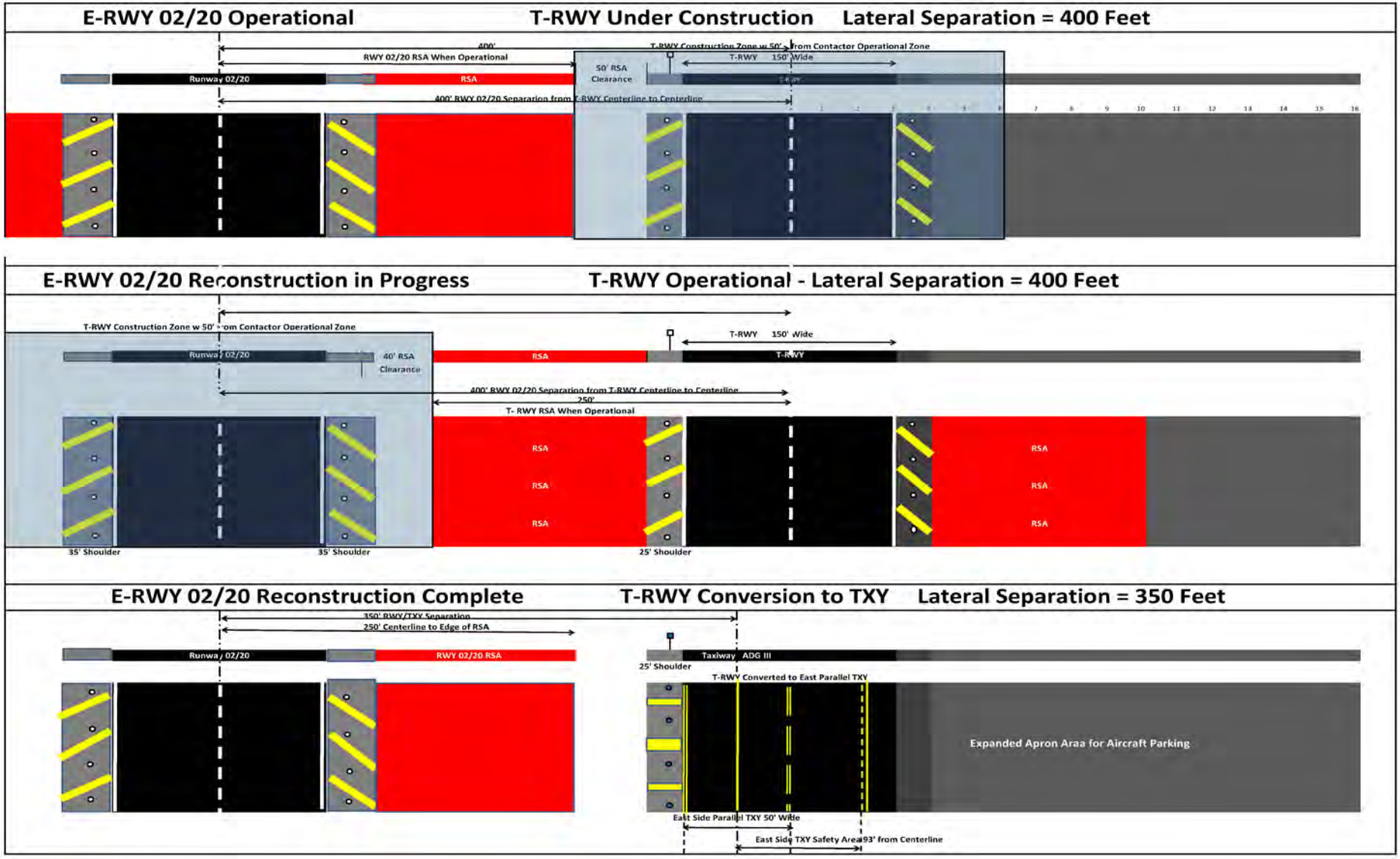
7. Modification to Standards Required for the T_RWY

The recommended project and its components to reconstruct E-RWY 02/20 include the two major phases of constructing and operating a T-RWY on an interim basis (estimated to be approximately 15 months) and reconstructing and operating for the long term the E-RWY 02/20 (reconstructed in place). The recommended plan has some limitations and has been defined to occur in recognition of several existing constraints. The proposed solution represents numerous trade-offs and interim accommodations to maintain all airport and user operations in some form or fashion. All user requirements are addressed in an economical and functional manner. Interim accommodations are not perfect but are appropriate for the interim operational period of the T-RWY and the requirement to reconstruct E-RWY 02/20. The non-standard features of the recommended plan are presented below.

7.1 Reconstructed E-RWY 02/20

The reconstructed E-RWY with or without an extension will be designed to meet all FAA design standards for a precision instrument runway. There will be two criteria for which the DOT-A should request a Modification to Standard (MoS). These include:

Exhibit 10 – Recommended T-RWY Conversion to a Taxiway



- Lateral Separation of TXY A from Reconstructed E-RWY
- RPZ Land Ownership (applicable only if an 1,530 foot Extension is recommended for E-RWY 02).

Each is described below.

7.1.1 TXY A

The new Airport Design Advisory Circular 150-5300-13A brings new taxiway lateral separation criteria into play that here to fore was not a factor. TXY A will not meet new lateral separation standards based upon new Taxiway Design Group (TDG) definitions. The current lateral separation is 450 feet for the current D-V Runway and Parallel Taxiway. The new standards could require a lateral separation of as much as 520 feet. TXY A has operated adequately under the prior standards. There are constraints to meeting the new TDG design standards that present a significant expense to correct (relocation of E-RWY 02/20 or relocation of the Terminal Building) or a significant operational constraint with the loss of the push-out zone.

The DOT-A should request that the existing lateral separation of the E-RWY and TXY A be grandfathered. A Modification to Standard to maintain the current lateral separation will be prepared and submitted to FAA for consideration.

7.1.2 RPZ Standards

Should it be decided that a 1,530 foot extension is the preferred course of action the E-RWY 02 RPZ would extend beyond the Airport's south property line. The extent of area outside of the property line is limited. Current FAA guidance indicates that there may be opportunity for a waiver of the criteria in cases where the intended safety interests can be appropriately maintained. The FAA guidance allows for an application for a waiver to be made. It is recommended that this application be made for only the 1,530 foot extension should it be recommended.

7.2 T-RWY

The T-RWY will be in place and operated for only the time required to reconstruct E-RWY 02/20 and restore it to operational status. This may or may not include an extension of at least 795 feet but not more than 2,605 feet. The operational time frame for the T_RWY is estimated to be approximately 15 months.

The modifications to design standards for the T-RWY include the following:

- Runway Shoulder
- Helicopter Area TLOF
- ROFA Standards
- East Side Parallel Taxiway Lateral Separation from the E-RWY

Each is discussed in the sections that follow.

7.2.1 T-RWY Runway Shoulder Width

The T-RWY shoulder width is recommended to be 25 feet in width. The recommended standard is 35 feet for a runway serving D-V aircraft. In the case of OGG, all ADG IV and ADG V aircraft will be twin engine aircraft where the engines will remain over paved surface. The 25 foot recommendation is also related to the shoulder requirement for the ADG III East Side TXY that will be created from the T-RWY. The 25 foot recommendation for the interim T-RWY is a cost saving recommendation for the interim conditions but also an investment that meets standards for the long term.

ARFF Vehicle access is a consideration in this change. The shoulder is recommended to meet the design requirements for ARFF vehicle passage. It is expected that the continuous paved surface to the east of the T-RWY will serve this purpose as well although it is recognized that an ARFF Vehicle approach to an aircraft is wind based and may not always be from one side.

7.2.2 Helicopter Area TLOF

The Helicopter TLOF is recommended to be located immediately outside of the ROFA (400 feet) on an interim basis. The recommended standard is that the TLOF be located laterally 700 feet from the centerline of a runway serving ADG V aircraft. The key in this recommendation is the presumption of independent operations. Wake vortex considerations are factors in this consideration. Given the limited number of widebody arrival aircraft operations (ADG IV and ADG V) as well as the overall time of day of ADG IV and V arrival operations, the recommendation is that a non-standard TLOF approved with the definition of a procedure to assure that wake vortex separation is maintained. This may induce some delays into the normally free flow of helicopter arrivals and departures during the interim operational period of the T-RWY. This is considered a more appropriate trade-off to the relocation of the helicopter operations from a cost and schedule perspective, as well as, a customer perspective, given the short duration of the T-RWY operations.

7.2.3 ROFA Standards

The T-RWY will be a visual runway and the presence of limited fixed facilities within the ROFA is not considered to be a particular issue. The interim nature of the T-RWY along with the fact that workers and equipment will be located inside of the ROFA (up to the RSA at 250 feet from the operating runway) make the definition of other less prominent ROFA penetrations at greater distances considerations but not issues. The project will make every attempt to clear ROFA penetrations including the demolition of buildings if necessary. The goal is to clear the ROFA to a distance of 375 feet from the centerline of the T-RWY. The recommended plan for addressing all East Side ROFA issues is contained in a companion paper titled: *East Side Facility Interim Accommodations*.

7.2.4 East Side Parallel Taxiway Lateral Separation from the E-RWY

A MoS is recommended to seek approval for a 350 foot lateral separation of the East Side parallel taxiway. In the case of the East Side Parallel taxiway, the 350 foot lateral separation is presumed acceptable with aircraft restrictions to ADG III. This ADG III restriction on a taxiway located at 350 feet locates the wing tip at the same location as an ADG V aircraft wing tip on a parallel taxiway located at 400 feet. FAA standards consider same aircraft runway/taxiway separations. The MoS will request consideration of different ADG standards. The 350 foot lateral spacing will save both project cost and conversion time. In addition, it will also maximize the investments made in pavements and increase areas for parking GA aircraft in the future.