# APPENDIX E
# AIRFIELD PLANNING, DESIGN, & CONSTRUCTABILITY REVIEW

The identification, evaluation, and refinement of the airfield development alternatives were subject to a variety of planning, engineering, and constructability reviews. These preliminary analyses were conducted following both advisory and regulatory requirements as prescribed by Federal, State, county and local agencies. The documentation of these analyses is intended to convey a general understanding of the various factors assessed, as required by NEPA, during the conduct of an environmental impact statement; these include but are not limited to:

- Determination of airfield geometric requirements, NAVAID siting requirements and airspace criteria to facilitate a general understanding of direct facility and environmental impacts associated with proposed development
- Evaluate the operational efficiency of airport facilities during both construction and upon project completion and quantify preliminary estimates of materials and implementation costs necessary for conducting a Net Benefits Analysis
- Assess construction sequencing, duration, and logistics to facilitate air quality analyses, identify potential temporary construction impacts, and estimate construction completion dates
- Quantification of preliminary drainage infrastructure requirements and water quality impacts
- Assess direct and indirect facility impacts to determine the need to exercise tenant leasehold buyout options and/or acquire additional property to accommodate displaced tenants.

## E.1 PLANNING ANALYSES

The airfield development alternatives were subject to preliminary planning evaluations that included a formal alternatives identification and screening analysis, the refinement of airfield geometry, Navigational Aid (NAVAID) siting, preliminary airspace evaluations, and an assessment of direct/indirect facility impacts. These planning analyses are described in the following subsections.

### E.1.1 AIRFIELD DESIGN STANDARDS

The planning and design of an airport is typically based on the airport's role and the critical aircraft that will use its facilities. Guidance for the planning and design of an airfield is obtained from FAA advisory circulars, regulations, and orders that aim to maximize airport safety, economy, efficiency, and longevity. For purposes of consistency in the evaluation of the airfield development alternatives, standard configurations for the various runway components are considered. The RPZ

dimensions assume an Instrument Landing System (ILS) with standard Category I landing minimums to protect for landing minimums with cloud ceiling heights of 200 feet above ground level and half-mile visibility.

All airfield design requirements are based upon the Airport Reference Code, or ARC, for each runway and supporting taxiways in an airfield system. The ARC, as defined in the FAA Advisory Circular 150/5300-13, Airport Design, has a coding system. This coding system is used to relate airport design criteria to the operational and physical characteristics of the most demanding aircraft anticipated to operate at the airport on a regular basis. The airport reference code has two components relating to the airport design aircraft. The first component, depicted by a letter, is the aircraft approach category and relates to aircraft approach speed (operational characteristics). The second component, depicted by a Roman numeral, is the airplane design group (ADG), or "group," and relates to airplane wingspan (physical characteristics). Generally, runway standards are related to aircraft approach speed, airplane wingspan, and designated or planned approach visibility minimums. Taxiway and taxilane standards are related to airplane design group. The classifications of design codes are detailed in **Table E.1-1, *Airport Reference Code***.

**Table E.1-1**
**AIRPORT REFERENCE CODE**
**Fort Lauderdale-Hollywood International Airport**

| Aircraft Approach Category | | Airplane Design Group | |
|---|---|---|---|
| Category | Approach Speed (knots) | Group | Wingspan (feet) |
| A | Speed of less than 91 knots | I | up to but not including 49 feet |
| B | 91 knots up to but <121 knots | II | 49 feet up to but not including 79 feet |
| C | 121 knots up to but <141 knots | III | 79 feet up to but not including 118 feet |
| D | 141 knots up to but <166 knots | IV | 118 feet up to but not including 171 feet |
| E | 166 knots or more | V | 171 feet up to but not including 214 feet |
| | | VI | 214 feet up to but not including 262 feet |

Source: FAA Advisory Circular 150/5300-13.

The ARC for an airport is selected by considering both the current and future types of critical aircraft forecasted to operate at an airport (Appendix 13), as well as the existing and future role of the airport. Selection of the ARC is the first step in the determination of facility requirements to ensure that proper airport design standards are selected for analysis and evaluation in the planning process. It may be possible, however, that certain portions of an airfield can be configured with a less demanding design standard than the ARC designation for the Airfield. This may result from designating a runway for smaller and/or slower aircraft operating on a specific runway. For example, Runway 9R/27L currently serves primarily general aviation aircraft, and therefore is configured in accordance with ARC B-II design standards.

In accordance with the design day schedule for 2012 and 2020, the design aircraft has been identified as the B767-400, which requires that the airfield comply with airfield design standards for ARC D-IV. Therefore, the airfield development alternatives developed for this DEIS comply with ARC D-IV airfield design standards. **Table E.1-2, *Airport Reference Code (ARC) D-IV Runway Design Standards,*** summarizes the ARC D-IV design standards for runway development, including dimensions (length and width) of runway and taxiway pavements, Runway Safety Areas (RSAs), Object Free Areas (OFAs) and Runway Protection Zones (RPZs). In accordance with AC 150/5300-13, *Airport Design*, these standards are defined as:

- **Runway Safety Area (RSA):** The RSA is intended to protect aircraft that inadvertently overshoot, undershoot, or veer off the runway pavement. The FAA requires the RSA to meet specific object clearing, grading, and load bearing requirements to minimize damage to aircraft. The rectangular-shaped RSA is centered on the runway end. Its width and length are dependent on the approach speed and wingspan of the design aircraft of the runway. The dimensions of the RSA are also affected by the visibility minimums prescribed for the runway.

**Table E.1-2**
**AIRPORT REFERENCE CODE (ARC) D-IV RUNWAY DESIGN STANDARDS**
**Fort Lauderdale-Hollywood International Airport**

| | Dimensions (Feet) | |
|---|---|---|
| **Runway Component** | **At-Grade Runway Length** | **Runway Component Width** |
| Runway Pavement | 6,000 - 7,800 | 150 |
| Runway Safety Area | 600 - 1,000 [1] | 500 |
| Runway Object Free Area | 1.000 | 800 |
| Runway Protection Zone [2] | 2,500 | 1,000 / 1,750 [3] |

[1] The standard RSA length corresponds to the length that it extends beyond the physical end of the runway. It is also noted that the installation of Engineered Materials Arresting System (EMAS) would allow the RSA length to be reduced from 1,000 feet to 600 feet beyond the physical end of the runway.

[2] The RPZ dimensions correspond with an arrival RPZ associated with runway served with a Category I Instrument Landing System with half-mile visibility minimums.

[3] The two dimensions presented for the RPZ width correspond with the inner and outer boundaries of the trapezoid, respectively.

Source: FAA Advisory Circular 150/5300-13 (Change 9), *Airport Design*.

- **Object Free Are (OFA):** The OFA is also centered along the runway centerline and extends from the edge of the runway pavement and beyond the runway ends. The OFA is required to be cleared of aboveground objects protruding above the runway safety area edge elevation. Except where precluded by other clearing standards, it is acceptable to place objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes and to taxi and hold aircraft in the OFA. Equipment not essential to these functions should not be placed in the OFA.

- **Runway Protection Zone (RPZ):** The RPZ is a trapezoidal shaped area that is configured beyond the physical end of a runway. The RPZ is intended to ensure the protection of people and property on the ground. The FAA recommends that the RPZ remain clear of all objects. However, some uses are permissible—those that do not attract wildlife, that remain outside of the OFA, and do not interfere with navigational aids. The FAA strongly recommends that all property within the RPZ be owned by the airport sponsor or subject to avigation easements that restrict the height of objects and the development of incompatible land uses.

  Fuel storage facilities or land uses that would encourage an assembly of people are explicitly excluded from the RPZ. Those land uses include, but are not limited to, churches, schools, hospitals, shopping centers, and office buildings. Automobile parking within the RPZ is discouraged, but may be permitted if the structures comply with FAA airfield design standards and do not result in an assembly of people within the RPZ (i.e. bus shelter for remote parking operations). Compatible land uses within an RPZ may include agricultural operations, with the exception of forestry or livestock farms, and golf courses provided they do not attract wildlife.

It is also noted that the ARC D-IV runway design standards coincide those required for ARC D-V, which would allow the airfield to accommodate aircraft with a wingspan of up to 214 feet. Although not designated as the design aircraft at FLL, B747 and A330 aircraft have operated at FLL. These larger aircraft require the airfield to be configured in accordance to ARC D-V design standards. Therefore, **Table E.1-3, *ARC D-IV and D-V Airfield Design Standards,*** presents the design standards for ARC D-V to demonstrate the ability to accommodate these larger aircraft without imposing operational restrictions.

## E.1.2 EMAS AND DECLARED DISTANCE

FAA design standards are utilized to establish the safety and design elements for each development alternative. These standards are prescribed in FAA AC 150/5300-13 (Change 9), *Airport Design*. For purposes of consistency in the evaluation of the runway development alternatives, standard configurations for the various runway components are considered. This includes full compliance FAA design standards for the configuration of Runway Safety Areas. Some runway development alternatives assume the use of an Engineered Materials Arresting System (EMAS) to maximize the overall length of the runway and to comply with RSA design standards. EMAS is an FAA approved structure that is installed beyond the end of the runway to decelerate aircraft that may overrun the runway upon landing or during an aborted take-off. The use of EMAS can increase the departure and landing distance available on a runway while reducing the standard RSA length from 1,000 to 600 feet beyond the runway end.[1]

[1] The required length of an RSA associated with EMAS is dependent on the actual length of the EMAS bed. For planning purposes, the RSA length associated with EMAS is assumed to have a length 600 feet, although actual design criteria could deviate from this assumed length.

**Table E.1-3**
**ARC D-IV and D-V AIRFIELD DESIGN STANDARDS**
**Fort Lauderdale-Hollywood International Airport**

| CRITERIA | ARC D-IV | ARC D-V |
|---|---|---|
| **Runway Width** | 150 | 150 |
| **Runway Centerline to:** | | |
| -Taxiway Centerline | 400 | 400 |
| -Taxilane Centerline | 400 | 400 |
| -Aircraft Parking Area | 500 | 500 |
| **Runway Object Free Area** | | |
| -Width | 800 | 800 |
| -Length Beyond Runway End | 1,000 | 1,000 |
| **Runway Obstacle Free Zone** | | |
| -Width | 400 | 400 |
| -Length Beyond Runway End | 200 | 200 |
| **Runway Safety Area** | | |
| -Width | 500 | 500 |
| -Length Beyond Runway End | 1,000 | 1,000 |
| **Taxiway Width** | 75 | 75 |
| **Taxiway Object Free Area Width** | 259 | 259 |
| **Taxiway Safety Area Width** | 171 | 171 |
| **Runway Blast Pad** | | |
| -Width | 200 | 200 |
| -Length | 200 | 200 |

Source: The Corradino Group, 2006

Some of the development alternatives also consider the use of declared distance as an FAA approved method of achieving RSA compliance. Through declared distance, a portion of the runway is declared unusable for consideration for take-off and/or landing operations. This is necessary to ensure full RSA compliance, by providing the minimum RSA length at each end of the runway. The benefit of utilizing declared distance is that the portion of runway declared unavailable in one operational direction, may be utilized for the start of the take-off roll while operating the runway in the opposite direction. Therefore, the use of declared distance can increase the departure distance available in one or both directions.

The use of declared distance and/or EMAS should only be considered if it is determined to be economically and/or operationally unfeasible to achieve the standard RSA and Object Free Area (OFA) length beyond the physical end of the runway. The FAA criteria prescribed for the use of declared distance and EMAS is

contained in AC 150/5300-13 (Change 9), *Airport Design*, AC 150/5220-22A, *Engineered Materials Arresting Systems for Aircraft Overruns*, and FAA Order 5200.8, *Runway Safety Area Program*.

To comply with the FAA's RSA and OFA design criteria for ARC D-IV, displacement of the landing thresholds associated with both Runways 9R and 27L is proposed under Alternative B1. In accordance with Appendix 14 of FAA AC 150/5300-13 (Change 9), *Airport Design,* this would require the use of declared distance. Declared distance is effectively a means of declaring a portion of a runway unusable to comply with FAA design criteria,[2] making the take-off[3] and Landing Distances Available less than the overall runway length. This approach to achieving compliance with FAA airfield design standards is considered an acceptable measure without compromising airfield operational safety. **Table E.1-4, *Runway 9R/27L Declared distance – Airfield Development Alternative B1***, summarizes the declared distance imposed on Runway 9R/27L as proposed under Alternative B1.

**Alternatives B1b/B1c/D1:** Although the use of EMAS would reduce the overall length of the proposed runway, it would eliminate the need for declared distance, thereby improving the runway's operational capability. Alternative B1b represents the redevelopment and extension of Runway 9R/27L between the Dania Cut-Off Canal and NE 7th Avenue that is served with EMAS, rather than a standard RSA.

**Alternative B4/D2:** Runways configured with a non-standard EMAS bed length, as proposed under Alternative B4, require a minimum separation of 600 feet between the landing threshold and the outer limits of the EMAS bed. Because the EMAS bed is configured with an overall length of 335 feet, a minimum displacement of 265 feet would be required at both runway ends. This coincides with the proposed displacement length for Runway 9R associated with Alternative B4. Due to the presence of the FEC Railway immediately east of the east runway end, additional displacement of Runway 27L is necessary.

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[2] The components of declared distance is defined as: (a) Take-off Run Available (TORA): the length of runway declared available and suitable for the ground run of an aircraft taking off; (b) Takeoff Distance Available (TODA): the length of the takeoff run available plus the length of the clearway, where provided. (Maximum clearway length allowed is 1,000 ft. and the clearway length allowed must lie within the airport boundary); (c) Accelerate Stop Distance Available (ASDA): the length of the takeoff run available plus the length of the stopway, where provided; and (d) Landing Distance Available (LDA): the length of runway which is declared available and suitable for the ground run of an aircraft landing.

[3] Take-off is defined as the Take-off Distance Available (TODA), the Take-off Runway Available (TORA), and the Accelerate Stop Distance (ASDA).

**Table E.1-4**
**RUNWAY 9R/27L DECLARED DISTANCE – AIRFIELD DEVELOPMENT ALTERNATIVE B1**
**Fort Lauderdale-Hollywood International Airport**

| Declared Distance Item | Effective Runway Length (feet) 9R | 27L |
|---|---|---|
| Take-off Run Available (TORA) | 8,163 | 7,618 |
| Take-off Distance Available (TODA) | 8,163 | 7,618 |
| Accelerate Stop Distance Available (ASDA) | 8,163 | 7,618 |
| Landing Distance Available (LDA) | 7,119 | 7,218 |

TORA: The length of runway declared available and suitable for the ground run of an aircraft taking off.

TODA: The length of the takeoff run available plus the length of the clearway, where provided. (Maximum clearway length allowed is 1,000 feet and the clearway length allowed must lie within the airport boundary.)

ASDA: The length of the takeoff run available plus the length of the stopway, where provided.

LDA: The length of runway declared available and suitable for the ground run of an aircraft landing.

Sources: The Corradino Group; Proposed Reconstruction of Runway 9R/27L Preliminary Evaluation of Runway Length and Grades, 2005; FAA Advisory Circular 150/5300-13 (Change 9), *Airport Design*.

To minimize the displacement of the Runway 27L landing threshold, Alternative B4 considers elevating the east end of the runway. This could also minimize the FEC Railway's operational impact on Runway 9R departures. Preliminary analysis has determined that the east end of the runway could be elevated to approximately 20 feet above Mean Sea Level (MSL) without requiring Runway 13/31 to be elevated. Alternative B4 assumes this elevation for the Runway 27L end. In addition to partially mitigating the operational impacts associated with the FEC Railway, this would allow Runway 13/31 to remain operational upon completion of the Runway 9R/27L redevelopment. In accordance with this elevation, the Runway 27L landing threshold would require a displacement of approximately 256 feet.

The proposed increase in elevation of the Runway 27L threshold would also require the aircraft parking apron associated with reconfigured Terminal 4 to be elevated as well. The resulting elevation of the terminal apron would be dependent on a variety of factors to be established during the final design phase. These factors include, but are not limited to:

- configuration of the terminal building
- required aircraft parking apron depth
- existing and proposed drainage design
- taxiway / taxilane grades
- terminal roadway elevations

Although Runway 9R/27L would be considerably shorter than as proposed under the Sponsor's Proposed Project, the runway configuration proposed under Alternative B4 complies with ARC D-IV. This will require a minimum pavement width of 150 feet with paved shoulders extending laterally 25 feet. Additionally, the RSA and OFA would have an overall width of 500 and 800 feet, respectively.

## E.1.3 PRELIMINARY AIRSPACE ANALYSIS

A significant aspect of the planning and design of an airport is protecting the airspace in which aircraft arrive and depart. This section presents the preliminary airspace analyses conducted for each of the short-listed airfield development alternatives. Currently, BCAD does not possess a comprehensive obstruction survey database for FLL or its surrounding environs. Limited obstruction data was obtained from BCAD's Airport Airspace Drawing and obstruction charts published by the National Oceanic & Atmospheric Administration. Other various electronic files that were compiled from as-build drawings and for the Interstate-95/ Interstate-595, I-595/U.S 1, and U.S. Highway 1/Terminal Entrance Road interchanges were also utilized. Limited aerial photogrammetry surveys were also obtained from BCAD to establish the elevations of the FEC Railway and the U.S. Highway 1 in the general vicinity of the Sponsor's Proposed Project.

Federal Aviation Regulation (FAR) Part 77, *Objects Affecting Navigable Airspace* and FAA Order 8260.3B (Change 19), *United States Standards for Terminal Airspace Procedures (TERPS)* prescribes the airspace criteria for instrument approach, departure and en-route airspace procedures. In addition, Appendix 2, of FAA Advisory Circular 150/5300-13 (Change 9), Airport Design, prescribes standards for runway end siting based on the criteria prescribed in TERPS. FAR 14 CFR Part 77 is primarily associated with identifying obstructions that are subject to lighting and marking requirements, while TERPS serves as the FAA's design criteria for establishing instrument procedures. These preliminary airspace analyses are predicated on the Obstruction Clearance Surfaces (OCS) prescribed by TERPS and Appendix 2 of AC 150/5300-13.[4]

The OCS criteria contained in TERPS establish various surfaces that serve to ensure adequate obstacle clearance is provided for arriving, departing and en-route aircraft. This analysis serves to evaluate the OCS prescribed for both precision approaches served with a standard Category I Instrument Landing System (ILS) and instrument departure procedures for both ends of a runway proposed under each of the short-listed airfield development alternatives. A standard ILS provides a three-degree glidepath for arriving aircraft with a Decision Height (DH) of 200 feet Above Ground Level (AGL). A standard departure procedure ensures adequate obstacle clearance for aircraft with a minimum climb gradient of 200 feet per nautical mile.

[4] Code of Federal Regulations (CFR) Part 77, *Objects Affecting Navigable Airspace*, January 1975; FAA Advisory Circular 150/5300-13 (Change 9), *Airport Design*, September 26, 2005; FAA Order 8260.3B (Change 19), *United States Standards for Terminal Instrument Procedures (TERPS),* May 15, 2002.

**Exhibit E.1-1** and **Exhibit E.1-2** graphically depict the standard ILS approach and instrument departure TERPS OCS, respectively. As shown, the ILS approach OCS is located in three individual surfaces: the W Area, X Area, and Y Area. All three surfaces commence 200 feet from the landing threshold. The W Area surface slopes upward at a slope of 34:1 as it extends out from the runway end. Its beginning elevation (200 feet from the threshold) has an elevation that coincides with the elevation of the landing threshold. The X Area and Y Area surfaces slope up laterally at a 4:1 and 7:1, respectively.

The TERPS Departure OCS is located in a single trapezoidal surface that extends beyond the departure end of the runway. Typically, the TERPS OCS commences at the physical end of the runway. The rare exception is if the runway available for take-off is reduced using declared distance. Declared distance is an FAA approved method of reducing the operational length of a runway in effort to mitigate for obstructions or in effort to achieve compliance with FAA Airfield design standards. With the use of declared distance, the TERPS Departure OCS commences at the end of the Take-Off Runway Available (TORA).

Typically, the TERPS Departure OCS has an initial elevation that is equal to the elevation of the departure end of the runway. The OCS may be elevated 35 feet AGL to mitigate existing obstructions only, but not to allow the construction of new or altered structures. The TERPS Departure OCS has an upward slope of 40:1 as it extends out from the end of the runway. The TERPS Departure OCS extends out for a distance of two nautical miles from the departure end of the runway.

### E.1.3.1 TERPS Analyses

The results of the TERPS analyses are presented graphically to show the location and height of known structures and terrain features that exist within the vicinity of the TERPS approach and departure surfaces associated with each of the short-listed airfield development alternatives. These analyses also serve to demonstrate the departure and landing distances that would result from threshold displacements and or the use of declared distance. Due to the limited availability of obstruction data information at FLL and within the surrounding environs, the results of these airspace analyses are deemed preliminary, subject to verification with detailed obstruction surveys in accordance with FAA Section 405 Survey standards.

**Exhibit E.1-3a through Exhibit E.1-3d** graphically depict the TERPS approach and departure surface analysis for Alternative B1. As shown, the Wyndham Hotel would penetrate the standard TERPS Departure OCS serving Runway 27L departures. Since the acquisition of the Wyndham Hotel is necessary to mitigate Runway Protection Zone (RPZ) impacts, BCAD would have the ability to mitigate this obstruction by removing or lowering the building height. Otherwise, the TORA for Runway 27L may be reduced and/or a non-standard departure minimums and/or climb gradient may be required for departures. No other airspace impacts have been identified at this time for Alternative B1.

**Exhibit E.1-4a** through **Exhibit E.1-4d** graphically depict the TERPS approach and departure surface analysis for the Runway 9R/27L configuration proposed under Alternatives B1b/B1c and D1. As shown, the Wyndham Hotel and the Gulfstream

International Airways maintenance hangar facility would penetrate the standard TERPS Departure OCS serving Runway 27L departures. Due to the proposed use of the outer parallel taxiway as a temporary Runway 9R/27L, the demolition of the Gulfstream International Airways maintenance hangar is proposed. Since the acquisition of the Wyndham Hotel is necessary to mitigate Runway Protection Zone (RPZ) impacts, BCAD would have the ability to mitigate this obstruction by removing or lowering the building height. No other airspace impacts have been identified at this time for the Runway 9R/27L configuration proposed under Alternatives B1b/B1c or D1.

**Exhibit E.1-5a** through **Exhibit E.1-5d** graphically depict the TERPS approach and departure surface analysis for the Runway 9R/27L configuration proposed under Alternatives B4 and D2. Although the realignment of the FEC Railway to the east is proposed, it is anticipated that a standard locomotive would still encroach Runway 9R TERPS departure surface by approximately 2.5 – 3.0 feet. This may require the establishment of non-standard departure minimums and/or climb gradient, or a reduction in the TORA for Runway 9R. The potential penetration of the Runway 27L TERPS ILS approach surface by the FEC Railway would be mitigated by displacing the landing threshold. No other airspace impacts have been identified at this time for the Runway 9R/27L configuration proposed under Alternatives B4 or D2.

**Exhibit E.1-6a** through **Exhibit E.1-6d** graphically depict the TERPS approach and departure surface analysis for the Runway 9R/27L configuration proposed under Alternative B5. As shown, the Wyndham Hotel would penetrate the standard TERPS Departure OCS serving Runway 27L departures. Because the acquisition of all or part of the Wyndham Hotel may be necessary to mitigate Runway Protection Zone (RPZ) impacts, BCAD could mitigate this obstruction by removing or lowering the building height. No other airspace impacts have been identified at this time for the Runway 9R/27L configuration proposed under Alternative B5.

**Exhibit E.1-7a** through **Exhibit E.1-7d** graphically depict the TERPS approach and departure surface analysis for the Runway 8/26 configuration proposed under Alternatives C1, D1, and D2. As shown, the Interstate 95/I-595 interchange would penetrate the standard TERPS Departure OCS prescribed for Runway 26L by approximately 35 feet. Because it is infeasible to remove or lower these roadway structures, this may require that non-standard departure minimums and/or climb gradient be established, or a reduction in the TORA for Runway 9R. It is estimated that the TORA for Runway 26 would be reduced to approximately 6,121 feet in effort to avoid non-standard departure minimums and/or climb gradient.

It has also been determined that both the fuel tank storage facilities (fuel farm) and Interstate-595 would encroach the TERPS Departure OCS associated with Runway 8. Although the encroachment of the fuel farm could be mitigated by reducing the TORA for Runway, the penetration associated with I-595 could not be completely mitigated. Therefore, it is likely that the establishment of non-standard departure minimums and/or climb gradient would be imposed on Runway 8 departures. No other airspace impacts have been identified at this time for the Runway 8/26 configuration proposed under Alternatives C1, D1, and D2.

## E.1.4 TEMPORARY RUNWAY 9R/27L

Alternatives B1, B1b, B1c, B5, and D1 consider the development of the outer parallel taxiway that would ultimately serve Runway 9R/27L as a temporary runway during construction. This is intended to minimize the operational delay due to the ultimate closure of Runways 9R/27L and/or 13/31 during construction activities. The following is summary of the preliminary planning analyses that serve to identify the configuration of temporary Runway 9R-27L, should it be implemented during construction.

**Alternatives B1, B1b, B1c,** and **D1:** To maximize the length of the temporary runway without encroaching on Runway 13/31, the outer parallel taxiway would be extended further to the west. Preliminary planning analyses indicate that this temporary runway could have an overall length of approximately 3,800 feet without it extending into the RSA serving Runway 13/31. This would allow for the construction of the temporary runway without requiring the closure of Runway 13/31. This would minimize the amount of time that FLL would have to operate without the flexibility to utilize Runway 13/31 as an emergency backup to its primary Runway 9L/27R. Maintaining the temporary runway to the west of Runway 13/31 would require that the outer taxiway be extended an additional 500 feet beyond the west end of Runway 9R/27L. The proposed configuration of the temporary runway/outer parallel taxiway is graphically depicted by **Exhibit E.1-8, *Temporary Runway Layout Alternatives B1/B1b/B1c***.

The proposed alignment of the temporary runway would cause aircraft arrivals on Runway 27L and departures from Runway 9R to occur over the south terminal complex. More specifically, the extended centerline of Temporary Runway 9R/27L (to the east) would extend through Taxiways D and T, Terminal 4's south gates, the east perimeter taxilane, and the remote aircraft hardstand positions. Preliminary analyses have determined that displacing the Runway 27L landing threshold by approximately 375 feet would allow aircraft to operate within the south terminal area without encroaching in the arrival RPZ. Furthermore, this threshold displacement would also allow aircraft with a tail height of 55 feet AGL to operate on Taxiway D and the remaining south terminal area without encroaching the threshold siting surface prescribed for temporary Runway 27L. This configuration would allow the A330-300 aircraft to operate unrestricted within the south terminal area while aircraft land on Runway 27L. The A330-300 is the largest aircraft (in terms of tail height) that currently operates at Terminal 4.

**Alternatives B5:** To maximize the length of the temporary runway without encroaching on Runway 13/31, the outer parallel taxiway would be extended further to the west. Preliminary planning analyses indicate that this temporary runway could have an overall length of 3,700 feet without it extending into the RSA serving Runway 13/31. This would allow for the construction of the temporary runway without requiring the closure of Runway 13/31. This would minimize the amount of time that FLL would have to operate without the flexibility to utilize Runway 13/31 as an emergency backup to its primary Runway 9L/27R. Maintaining the temporary runway to the west of Runway 13/31 would require the outer

taxiway to extend an additional 201 feet beyond the west end of Runway 9R/27L. The proposed configuration of the temporary runway/outer parallel taxiway is graphically depicted on **Exhibit E.1-9, *Temporary Runway Layout – Alternative B5***.

The proposed alignment of the temporary runway would cause aircraft arrivals on Runway 27L and departures from Runway 9R to occur over Taxiways D and T. Preliminary analyses have determined that displacing the Runway 27L landing threshold by approximately 282 feet would allow aircraft to operate within the south terminal area without encroaching into the arrival RPZ. Furthermore, this threshold displacement would also allow aircraft with a tail height of 55 feet AGL to operate on Taxiway D and the remaining south terminal area without encroaching the threshold siting surface prescribed for temporary Runway 27L. This configuration would allow the A330-300 aircraft to operate unrestricted within the south terminal area while aircraft land on Runway 27L. The A330-300 is the largest aircraft (in terms of tail height) that currently operates at Terminal 4.

## E.1.5 NAVIAD FACILITIES

**Alternatives B1/B1b/B1c/D1:** As proposed by BCAD, the localizer antenna serving Runway 27L arrivals (located beyond the west end of the runway) would be located to the west of the Dania Cut-Off Canal and the adjacent marina basin. This would require special security and operational considerations to ensure protection of the localizer critical area and electronic signal integrity. The localizer serving Runway 9R would be located approximately 610 feet beyond the east runway end. Because this facility would be located within the secured area of the airfield, no special security or operational considerations are anticipated.

To prevent operational impacts on the proposed taxiway system, the glideslope antennas proposed for both Runways 9R and 27L would be located along the south side of the runway at a lateral distance of 405 feet from the proposed Runway 9R/27L centerline. This distance would ensure that both the glideslope antenna and associated equipment shelters would remain outside of the RSA and OFA. The actual siting of the glideslope antennas and PAPIs (relative to the runway end) is dependent on the final longitudinal grade of the runway and threshold displacement. For the purposes of this analysis, the glideslope antennas and PAPIs are assumed to be located 1,000 feet beyond the Runway 9R and 27L landing thresholds.

Although Runway 9R would be configured with a Medium Intensity Approach Light System and Runway Alignment Indicator Lights (MALSR), Runway 27L would be served with a Medium Intensity Approach Light System (MALS). Because the MALSR is equipped with Runway Alignment Indicator Light (RAIL), it extends 2,400 feet from the landing threshold. The MALS does not include the RAIL system, and therefore, only extends 1,400 feet prior to the landing threshold. This shorter approach lighting system is necessary to avoid encroachment into West Lake Park. With the use of the MALS, however, standard ILS landing minimums would not be permitted. Therefore, Runway 27L would have a landing visibility minimums of three-fourths of a mile or greater, in lieu of the standard half mile visibility minimums prescribed for Category I ILS.

The proposed MALSR and MALS associated with Runway 9R and 27L, respectively, are configured in accordance with FAA Order 6850.2A, *Visual Guidance Lighting Systems*. In order to mitigate encroachment of the Dania Cut-Off Canal and the adjacent marina basin, a non-standard spacing of 225 feet between the seventh and eighth light stations to serve Runway 9R arrivals is proposed. This would require a modification to design standards to be requested and formally approved by the FAA.

**Alternative B4/D2:** Consistent with the other alternatives, the Runway 9R glideslope antenna would be located at a lateral distance of 405 feet from the proposed Runway 9R/27L centerline. Due to the intersection with Runway 13/31 RSA, however, the Runway 27L glideslope would be located 325 feet from the Runway 27L centerline. This distance would ensure that both the glideslope antenna and associated equipment shelters would remain outside of the RSA, but would encroach the OFA. The actual siting of the glideslope antennas and PAPIs, relative to the runway end, is dependent on the final longitudinal grade of the runway and threshold displacement. For the purposes of this analysis, the glideslope antennas and PAPIs are assumed to be located 1,000 feet beyond the Runway 9R and 27L landing thresholds.

**Alternative B5**: Consistent with the other alternatives, both glideslope antennas would be located at a lateral distance of 405 feet from the proposed Runway 9R/27L centerline. This distance would ensure that both the glideslope antenna and associated equipment shelters would remain outside of the RSA and OFA. The actual siting of the glideslope antennas and PAPIs, relative to the runway end, is dependent on the final longitudinal grade of the runway and threshold displacement. For the purposes of this analysis, the glideslope antennas and PAPIs are assumed to be located 1,000 feet beyond the Runway 9R and 27L landing thresholds.

Although Runway 9R would be configured with a MALSR, Runway 27L would be served with a MALS. With the use of the MALS, however, standard ILS landing minimums are not permitted. Therefore, Runway 27L would have landing visibility minimums of three-fourths of a mile or greater, in lieu of the standard half mile visibility minimums prescribed for Category I ILS.

The proposed MALS and MALSR associated with Runway 9R and 27L are configured in accordance with FAA Order 6850.2A. In order to mitigate encroachment of the Dania Cut-Off Canal and the adjacent marina basin, a non-standard spacing of 380 feet between the fourth and fifth light stations to serve Runway 9R arrivals is proposed. This would require a modification to design standards to be requested and formal approval by the FAA.

**Alternative C1/D1/D2:** Consistent with the other alternatives, the glideslope antennas would be located at a lateral distance of 405 feet from the proposed Runway 8/26 centerline. This distance would ensure that both the glideslope antenna and associated equipment shelters would remain outside of the RSA and OFA. The actual siting of the glideslope antennas and PAPIs, relative to the runway end, is dependant on the final longitudinal grade of the runway and threshold

displacement. For the purposes of this analysis, the glideslope antennas and PAPIs are assumed to be located 1,000 feet beyond the Runway 8 and 26L landing thresholds.

The proposed MALSRs associated with Runway 8 and 26 are configured in accordance with FAA Order 6850.2A. Due to the presence of the FEC Railway immediately east of Runway 8/26, however, the inner approach OFZ would be penetrated, thereby increasing the visibility minimums to three-fourths of a mile or greater for all instrument approaches serving Runway 26. Due to the lack of obstruction data, it could not be determined if the Interstate-95/Interstate-595 interchange would have a similar impact on instrument approaches to Runway 8.

## E.1.6 FACILITY IMPACTS

The following is a brief overview of the existing tenant leasehold facilities at Fort Lauderdale-Hollywood International Airport (FLL). This section also documents the tenant leasehold impacts for each of the individual airfield development alternatives. Much of the inventory information provided by the Broward County Aviation Department as well as through on-site inspections. Additionally, the study was performed to assist the development of order of magnitude cost estimates in conjunction with the net benefits analyses. The assessment of facility impacts also serves to identify potential land acquisition needs that would be required to accommodate displaced tenants, should a deficiency in airport property result from an airfield development alternative.

### E.1.6.1 Inventory Of Existing Tenants Leasehold

The purpose of the existing tenant leasehold inventory is to catalog the different tenants and assess the property area by facility type. **Exhibit E.1-10** graphically depicts the airport leasehold facilities. Consistent with the BCAD leasehold management system, the tenant leaseholds are identified with an alpha-numeric identifier which classify the leasehold areas according to their location on the Airport; Western (W), Northern (N) and South-Eastern (S).[5] The FLL Midfield Aircraft-Rescue Fire-Fighting (ARFF) facility, BCAD administrative offices, and the Fuel-Farm (N-FF) are also delineated. Furthermore, each tenant leasehold property is grouped by facility type: office, warehouse, hangar, apron, auto-parking and other, which represents undeveloped or vacant areas. A color code and a superimposed aerial are utilized for clarity reasons. The areas shown on the map are not accurate but are sufficient for planning purposes.

### E.1.6.2 Summary Of Tenant Leasehold Impacts

Each of the airfield development alternatives have been evaluated to identify specific tenant leaseholds that would be directly or indirectly impacted during construction. Direct impacts include those tenant facilities that require removal in order to conform to the airfield geometric requirements and/or NAVAID siting criteria. Indirect impacts include tenant facility relocations resulting from airspace

[5] FLL Leasehold Identification Map, Broward County Aviation Department, November, 2004.

encroachments or to allow for a more efficient use of airport property. **Table E.1-5,** summarizes the direct and indirect tenant facility impacts associated with each airfield development alternative that is being assessed within the EIS.

The planning of potential relocation of tenant facilities to accommodate airfield development with the airfield development alternatives can be complicated. The uncertainties associated with tenant investment in facilities, willingness to relocate, and logistical issues make it difficult to identify specific tenant relocation sites, priorities, and construction sequencing. Therefore, this effort focuses on the availability of existing on-airport property and the County to accommodate tenant displacements, assuming that replacement-in-kind (in terms of gross leasehold area) is offered to tenants that would be displaced with each alternative. This includes quantifying the gross area of all tenant leaseholds and comparing it with airport property that may be available to accommodate tenant relocations.

FLL includes several land parcels that are not contiguous to the airfield. Therefore, it would not be practical to consider these non-contiguous areas for relocating tenant facilities that are dependant on having direct airside access. These tenants may include, but are not limited to, aircraft storage and maintenance hangars, Fixed Base Operators (FBOs), ARFF facilities, and all-cargo facilities. Office buildings with no operational dependency on other airside facilities, public parking, rental car storage, and BCAD administrative/maintenance facilities are other facilities that do not require direct airfield access.

**Table E.1-6** serves to identify potential tenant leasehold deficiencies that may result from the various airfield development alternatives. This table summarizes the gross area of facility relocations that would be required compares these values with the amount of vacant airport property that could be available to accommodate these facility relocations. For the purpose of this analysis, only those facilities that are currently occupied or utilized by BCAD for operational purposed are considered. As shown, Alternatives C1, D1, and D2 would result in a deficiency of approximately 17, 84 and 44 acres, respectively.

It is noted that BCAD currently utilizes approximately 15 acres of airport property for remote public/employee parking. Therefore, the deficiencies identified for Alternatives D1 and D2 could be reduced considerably with the construction of a multi-level parking garage. The actual net reduction in airport property dedicated to parking would correlate with the size of the parking structure (gross area and number of levels), which would need to be defined through a detailed financial analysis of the airport's parking revenue structure and construction costs.

**Tables E.1-7** through **E.1-13** present a detailed summary of the tenant facility relocations anticipated for Alternatives B1, B1b/B1c, B4, B5, C1, D1, and D2, respectively. The tenant leaseholds are segregated into hangar, office, cargo/warehouse, automobile parking, apron, and other areas. Although the overall leasehold areas contained in these tables coincide with BCAD records, the facility configurations were obtained from aerial photography and were not subject to a detailed boundary survey. However, this level of detail is provided for informational purposes only and is adequate for the development of order of magnitude cost estimates.

## Table E.1-5
## FLL TENANT LEASEHOLD IMPACT SUMMARY (NON-TERMINAL IMPACTS)

| | | EIS Alternatives | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Tenant** | **Leasehold ID** | **A** | **B1** | **B1b** | **B4** | **B5** | **C1** | **D1** | **D2** |
| **Terminals:** | | | | | | | | | |
| Terminal 1 | T-1 | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact |
| Terminal 2 | T-2 | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact |
| Terminal 3 | T-3 | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact |
| Terminal 4 | T-4 | No Impact | Indirect | Indirect | Direct | No Impact | No Impact | Indirect | Direct |
| **GA/FBO:** | | | | | | | | | |
| National Jets | N-5A | No Impact | No Impact | No Impact | No Impact | No Impact | Direct | Direct | Direct |
| FLL-Air Inc. | N-6 | No Impact | No Impact | No Impact | No Impact | No Impact | Direct | Direct | Direct |
| SHELTAIR | N-7 | No Impact | No Impact | No Impact | No Impact | No Impact | Direct | Direct | Direct |
| Aero Lauderdale | N-8 | No Impact | No Impact | No Impact | No Impact | No Impact | Direct | Direct | Direct |
| Embraer | N-9 | No Impact | No Impact | No Impact | No Impact | No Impact | Direct | Direct | Direct |
| Embraer | N-9 | No Impact | No Impact | No Impact | No Impact | No Impact | Direct | Direct | Direct |
| Private-Miami Dolphins | N-9 | No Impact | No Impact | No Impact | No Impact | No Impact | Direct | Direct | Direct |
| Azorra Aviaion | N-10 | No Impact | No Impact | No Impact | No Impact | No Impact | Direct | Direct | Direct |
| Aircraft Services Intl | N-12 | No Impact | No Impact | No Impact | No Impact | No Impact | Direct | Direct | Direct |
| Signature Flight | W-9 | No Impact | No Impact | No Impact | No Impact | No Impact | Indirect | Indirect | Indirect |
| SHELTAIR | W-12 | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact |
| SHELTAIR | W-13 | No Impact | Direct | Direct | Direct | No Impact | No Impact | Direct | Direct |
| SHELTAIR (Holiday Lot) | W-15 | No Impact | Indirect | Indirect | Indirect | No Impact | No Impact | Indirect | Indirect |
| SHELTAIR | W-21 | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact |
| Gulfstream | W-22 | No Impact | Direct | Direct | Direct | Direct | No Impact | Direct | Direct |
| Tropical Aviation | W-5 | No Impact | No Impact | No Impact | No Impact | No Impact | Indirect | Indirect | Indirect |
| **Cargo:** | | | | | | | | | |
| Lynxs FLL Cargoport LLC | N-2 | No Impact | No Impact | No Impact | No Impact | No Impact | Direct | Direct | Direct |
| Fedex | N-5A | No Impact | No Impact | No Impact | No Impact | No Impact | Direct | Direct | Direct |
| DHL etc | N-8 | No Impact | No Impact | No Impact | No Impact | No Impact | Direct | Direct | Direct |
| BCAD/Cargo Facility | N-13A | No Impact | No Impact | No Impact | No Impact | No Impact | Direct | Direct | Direct |
| Delta Airlines | N-14A | No Impact | No Impact | No Impact | No Impact | No Impact | Direct | Direct | Direct |
| **ARFF:** | | | | | | | | | |
| Midfield ARFF [1/] | N/A | No Impact | Direct | Direct | Direct | Direct | Direct | Direct | Direct |
| **Offices Buildings:** | | | | | | | | | |
| Maintenance/BCAD | N-14B | No Impact | No Impact | No Impact | No Impact | No Impact | Direct | Direct | Direct |
| Airport Recycling | N-15 | No Impact | No Impact | No Impact | No Impact | No Impact | Direct | Direct | Direct |
| URS | N-16B | No Impact | No Impact | No Impact | No Impact | No Impact | Direct | Direct | Direct |
| Naval Airstation | W-1 | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact |
| Animal Care | W-2 | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact |
| FAA | W-4B | No Impact | No Impact | No Impact | No Impact | No Impact | Indirect | Indirect | Indirect |
| BellSouth | W-4C | No Impact | No Impact | No Impact | No Impact | No Impact | Indirect | Indirect | Indirect |
| Avis | W-8 | No Impact | No Impact | No Impact | No Impact | No Impact | Indirect | Indirect | Indirect |
| FAA | W-10 | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact |
| BCAD | W-11A | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact |
| BCAD | W-11B | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact |
| BCAD | W-14 | No Impact | No Impact | No Impact | No Impact | No Impact | Indirect | Indirect | Indirect |
| Sheltair (Option Parcel) | W-18 | No Impact | No Impact | No Impact | Indirect | No Impact | No Impact | No Impact | Indirect |
| Sheltair | W-20 | No Impact | No Impact | No Impact | No Impact | No Impact | Indirect | Indirect | Indirect |
| BCAD/Shuttle port | W-24 | No Impact | No Impact | No Impact | No Impact | No Impact | Indirect | Indirect | Indirect |
| FAA | W-29 | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact |
| BCAD Offices [1/] | N/A | No Impact | Direct | Direct | Direct | No Impact | Direct | Direct | Direct |
| **Parking Facilities** | | | | | | | | | |
| BCAD (Tower Lot - Partial) | W-23 | No Impact | No Impact | No Impact | No Impact | No Impact | Indirect | Indirect | Indirect |
| BCAD (Tower Lot) | W-25 | No Impact | No Impact | No Impact | No Impact | No Impact | Indirect | Indirect | Indirect |
| BCAD | W-27 | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact |
| **Vacant/Undeveloped** | | | | | | | | | |
| BCAD | N-1 | No Impact | No Impact | No Impact | No Impact | No Impact | Direct | Direct | Direct |
| BCAD | N-3 | No Impact | No Impact | No Impact | No Impact | No Impact | Direct | Direct | Direct |
| BCAD Fuel Farm | N-FF | No Impact | No Impact | No Impact | No Impact | No Impact | Indirect | Indirect | Indirect |
| BCAD | W-3A | No Impact | No Impact | No Impact | No Impact | No Impact | Indirect | Indirect | Indirect |
| BCAD | W-4A | No Impact | No Impact | No Impact | No Impact | No Impact | Indirect | Indirect | Indirect |
| BCAD | W-6 | No Impact | No Impact | No Impact | No Impact | No Impact | Indirect | Indirect | Indirect |
| Amerijet Intl | W-7 | No Impact | No Impact | No Impact | No Impact | No Impact | Indirect | Indirect | Indirect |
| BCAD | W-19 | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact |
| Lauderdale boat Club | W-26 | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact |
| BCAD | W-28 | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact | No Impact |
| BCAD (Former Budget RAC) | S-4 | No Impact | Direct | Direct | No Impact | Direct | Indirect | Direct | Indirect |
| BCAD | S-8 | No Impact | Direct | Direct | No Impact | Direct | Indirect | Direct | Indirect |

[1/] In accordance with the ongoing LFA Master Plan. Relocation of the midfield Aircraft-Rescue Fire Fighting (ARFF) is anticipated to facilitate Future Terminal Expansion.

Source: BCAD Tenant Leasehold Map, November 2004
Prepared By: The Corradino Group

## Table E.1-6
## FLL TENANT FACILITY RELOCATION SUMMARY (ACRES)

| | Alternative | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **A** | **B1** | **B1b / B1c** | **B4** | **B5** | **C1** | **D1** | **D2** |
| **Total Tenant Displacements:** | | | | | | | | |
| Airside | - | 22 | 22 | 34 | 7 | 158 | 178 | 183 |
| Non-Airside | - | 8 | 8 | 7 | 2 | 90 | 98 | 105 |
| **Total:** | **-** | **30** | **30** | **40** | **9** | **248** | **277** | **288** |
| **Existing Vacant Airport Property Potentially Available for Redevelopment** | | | | | | | | |
| Airside | 104 | 103 | 103 | 95 | 103 | 148 [1/] | 143 [1/] | 161 [1/] |
| Non-Airside | 84 | 50 | 50 | 84 | 17 | 84 | 50 | 84 |
| **Total:** | **187** | **153** | **153** | **178** | **120** | **231** | **193** | **245** |
| **Surplus/Deficiency** | | | | | | | | |
| Airside | 104 | 81 | 81 | 61 | 96 | (11) | (36) | (22) |
| Non-Airside | 84 | 42 | 42 | 77 | 15 | (6) | (48) [2/] | (21) [2/] |
| **Total:** | **187** | **123** | **123** | **138** | **111** | **(17)** | **(84)** | **(44)** |

[1/] The net property available for facility relocation within the west (airside) area has been reduced by 10 acres to account for wet detention required for water quality purposes.
[2/] The net property available for facility relocation within the remote west (non-aiside) area has been reduced by 5 acres to account for wet detention required for water quality purposes.
[3/] Alternatives C1, D1, and D2 are predicated on the relocation of the FAA's Airport Surveillance Radar (ASR-9) to either recommended Site #2 or Site #3.
[4/] The deficiency in Airport property available for non-airside tenant facility could be reduced by approximately 16 acres if remote parking areas were replaced with multi-level parking structures. This assumes a four level parking structure with a footprint area of 220,000 square feet.

Source: BCAD Tenant Leasehold Map, November, 2004; The Corradino Group.

## Table E.1-7
## TENANT FACILITY RELOCATION REQUIREMENTS – ALTERNATIVE B1

| Tenants Requiring Airside Access (Assumed Relocation to West Development Area) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Existing Facilities Summary (Tenant Leashold Map) | | | | | | |
| Tenant | Leasehold ID | Hangar | Warehouse | Office | Apron | Auto Parking | Other | Total |
| **GA/FBO:** | | | | | | | | |
| SHELTAIR | W-13 | 32,600 | - | - | 61,500 | 18,500 | - | **112,600** |
| SHELTAIR (holiday Lot) | W-15 | - | - | - | - | 467,200 | 69,700 | **536,900** |
| Gulfstream | W-22 | 30,300 | - | - | 59,900 | 51,300 | 77,300 | **218,800** |
| **Total** | | **62,900** | **-** | **-** | **121,400** | **537,000** | **147,000** | **868,300** |
| **ARFF** | | | | | | | | |
| Midfield ARFF | N/A | - | 13,900 | 13,900 | - | - | 62,200 | 90,000 |
| | | | | | | | - | |
| **Total** | | **-** | **13,900** | **13,900** | **-** | **-** | **62,200** | **90,000** |
| | | | | | | | - | |
| **Grand Total (Airside)** | | **62,900** | **13,900** | **13,900** | **121,400** | **537,000** | **209,200** | **958,300** |
| | | | | | | | - | |
| **Tenants Not Requiring Airside Access (Assumed Relocation to Remote West Development Area)** | | | | | | | - | |
| | | | | | | | - | |
| **Offices Buildings:** | | | | | | | - | |
| BCAD Offices | N/A | - | - | 53,000 | - | 93,000 | 139,000 | 285,000 |
| | | | | | | | - | |
| **Total** | | **-** | **-** | **53,000** | **-** | **93,000** | **139,000** | **285,000** |
| **Vacant/Undeveloped** | | | | | | | | |
| BCAD / Taxi Lot (Former Budget RAC) | S-4 | - | - | - | - | 75,000 | - | 75,000 |
| BCAD | S-8 | - | - | - | - | - | - | - |
| | | | | | | | - | |
| **Total** | | **-** | **-** | **-** | **-** | **75,000** | **-** | **75,000** |
| **Grand Total (Non Airside)** | | **-** | **-** | **53,000** | **-** | **168,000** | **139,000** | **360,000** |

Source: BCAD Tenant Leasehold Map, November, 2004; The Corradino Group
Prepared By: The Corradino Group

## Table E.1-8
## TENANT FACILITY RELOCATION REQUIREMENTS - ALTERNATIVES B1b/B1c

| Tenants Requiring Airside Access (Assumed Relocation to West Development Area) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Existing Facilities Summary (Tenant Leashold Map) | | | | | | |
| Tenant | Leasehold ID | Hangar | Warehouse | Office | Apron | Auto Parking | Other | Total |
| **GA/FBO:** | | | | | | | | |
| SHELTAIR | W-13 | 32,600 | - | - | 61,500 | 18,500 | - | **112,600** |
| SHELTAIR (holiday Lot) | W-15 | - | - | - | - | 467,200 | 69,700 | **536,900** |
| Gulfstream | W-22 | 30,300 | - | - | 59,900 | 51,300 | 77,300 | **218,800** |
| **Total** | | **62,900** | **-** | **-** | **121,400** | **537,000** | **147,000** | **868,300** |
| **ARFF** | | | | | | | | |
| Midfield ARFF | N/A | - | 13,900 | 13,900 | - | - | 62,200 | 90,000 |
| | | | | | | | - | |
| **Total** | | **-** | **13,900** | **13,900** | **-** | **-** | **62,200** | **90,000** |
| | | | | | | | - | |
| **Grand Total (Airside)** | | **62,900** | **13,900** | **13,900** | **121,400** | **537,000** | **209,200** | **958,300** |
| | | | | | | | - | |
| **Tenants Not Requiring Airside Access (Assumed Relocation to Remote West Development Area)** | | | | | | | - | |
| | | | | | | | - | |
| **Offices Buildings:** | | | | | | | - | |
| BCAD Offices | N/A | - | - | 53,000 | - | 93,000 | 139,000 | 285,000 |
| | | | | | | | - | |
| **Total** | | **-** | **-** | **53,000** | **-** | **93,000** | **139,000** | **285,000** |
| **Vacant/Undeveloped** | | | | | | | | |
| BCAD / Taxi Lot (Former Budget RAC) | S-4 | - | - | - | - | 75,000 | - | 75,000 |
| BCAD | S-8 | - | - | - | - | - | - | - |
| | | | | | | | - | |
| **Total** | | **-** | **-** | **-** | **-** | **75,000** | **-** | **75,000** |
| | | | | | | | - | |
| **Grand Total (Non Airside)** | | **-** | **-** | **53,000** | **-** | **168,000** | **704,200** | **360,000** |

Source: BCAD Tenant Leasehold Map, November, 2004; The Corradino Group
Prepared By: The Corradino Group

## Table E.1-9
## TENANT FACILITY RELOCATION REQUIREMENTS - ALTERNATIVES B4

**Tenants Requiring Airside Access (Assumed Relocation to West Development Area)**

| | | Existing Facilities Summary (Tenant Leashold Map) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Tenant** | **Leasehold ID** | **Hangar** | **Warehouse** | **Office** | **Apron** | **Auto Parking** | **Other** | **Total** |
| **GA/FBO:** | | | | | | | | |
| SHELTAIR | W-13 | 65,100 | - | - | 230,200 | 37,300 | - | **332,600** |
| SHELTAIR (holiday Lot) | W-15 | - | - | - | - | 467,200 | 69,700 | **536,900** |
| Sheltair (Option Parcel) | W-18 | - | - | 20,300 | - | 43,200 | 229,800 | **293,300** |
| Gulfstream | W-22 | 30,300 | - | - | 59,900 | 51,300 | 77,300 | **218,800** |
| **Total** | | **95,400** | **-** | **20,300** | **290,100** | **599,000** | **376,800** | **1,381,600** |
| **ARFF** | | | | | | | | |
| Midfield ARFF | N/A | - | 13,900 | 13,900 | - | - | 62,200 | 90,000 |
| | | | | | | | - | |
| **Total** | | **-** | **13,900** | **13,900** | **-** | **-** | **62,200** | **90,000** |
| | | | | | | | - | |
| **Grand Total (Airside)** | | **95,400** | **13,900** | **34,200** | **290,100** | **599,000** | **439,000** | **1,471,600** |
| **Tenants Not Requiring Airside Access (Assumed Relocation to Remote West Development Area)** | | | | | | | | |
| **Offices Buildings:** | | | | | | | - | |
| BCAD Offices | N/A | - | - | 53,000 | - | 93,000 | 139,000 | 285,000 |
| **Total** | | **-** | **-** | **53,000** | **-** | **93,000** | **139,000** | **285,000** |
| **Grand Total (Non Airside)** | | **95,400** | **13,900** | **66,900** | **-** | **93,000** | **201,200** | **375,000** |

Source: BCAD Tenant Leasehold Map, November, 2004; The Corradino Group
Prepared By: The Corradino Group

## Table E.1-10
## TENANT FACILITY RELOCATION REQUIREMENTS - ALTERNATIVES B5

| Tenants Requiring Airside Access (Assumed Relocation to West Development Area) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Existing Facilities Summary (Tenant Leashold Map) | | | | | | | |
| Tenant | Leasehold ID | Hangar | Warehouse | Office | Apron | Auto Parking | Other | Total |
| **GA/FBO:** | | | | | | | | |
| Gulfstream | W-22 | 30,300 | - | - | 59,900 | 51,300 | 77,300 | **218,800** |
| **Total** | | **30,300** | **-** | **-** | **59,900** | **51,300** | **77,300** | **218,800** |
| **ARFF** | | | | | | | | |
| Midfield ARFF | N/A | - | 13,900 | 13,900 | - | - | 62,200 | 90,000 |
| | | | | | | | - | |
| **Total** | | **-** | **13,900** | **13,900** | **-** | **-** | **62,200** | **90,000** |
| | | | | | | | - | |
| | | | | | | | - | |
| **Grand Total (Airside)** | | **30,300** | **13,900** | **13,900** | **59,900** | **51,300** | **139,500** | **308,800** |
| **Tenants Not Requiring Airside Access (Assumed Relocation to Remote West Development Area)** | | | | | | | | |
| **Vacant/Undeveloped** | | | | | | | | |
| BCAD / Taxi Lot (Former Budget RAC) | S-4 | - | - | - | - | 75,000 | - | 75,000 |
| BCAD | S-8 | - | - | - | - | - | - | - |
| **Total** | | **-** | **-** | **-** | **-** | **75,000** | **-** | **75,000** |
| **Grand Total (Non Airside)** | | **-** | **13,900** | **13,900** | **-** | **75,000** | **62,200** | **165,000** |

Source: BCAD Tenant Leasehold Map, November, 2004; The Corradino Group
Prepared By: The Corradino Group

## Table E.1-11
## TENANT FACILITY RELOCATION REQUIREMENTS - ALTERNATIVES C1

| Tenant | Existing Facilities Summary (Tenant Leashold Map) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Leasehold ID | Hangar | Warehouse | Office | Apron | Auto Parking | Other | Total |
| **GA/FBO:** | | | | | | | | |
| National Jets | N-5A | 36,600 | 12,000 | - | 305,500 | 40,900 | 400 | **395,400** |
| FLL-Air Inc. | N-6 | 31,700 | - | 8,800 | 168,100 | 35,900 | 92,200 | **336,700** |
| SHELTAIR | N-7 | 61,100 | 13,100 | 2,400 | 281,800 | 66,400 | 105,500 | **530,300** |
| Aero Lauderdale | N-8 | 24,700 | - | 64,700 | 92,800 | 257,900 | 67,900 | **508,000** |
| Embraer | N-9 | 51,500 | - | 29,700 | 30,600 | 91,900 | 113,800 | **317,500** |
| Embraer | N-9 | 49,700 | - | - | 108,700 | - | 175,600 | **334,000** |
| Private-Miami Dolphins | N-9 | 92,600 | - | - | 363,700 | 131,600 | 56,500 | **644,400** |
| Azorra Aviaion | N-10 | 54,900 | - | - | 169,200 | - | 91,900 | **316,000** |
| Aircraft Services Intl | N-12 | - | - | 4,700 | - | - | 10,100 | **14,800** |
| Signature Flight | W-9 | 85,900 | - | 7,800 | 400,200 | 123,100 | 59,600 | **676,600** |
| Sheltair | W-20 | - | - | 20,800 | - | 67,100 | 30,600 | **118,500** |
| Tropical Aviation | W-5 | - | 11,100 | - | 40,000 | 9,300 | - | **60,400** |
| **Sub-total** | | **488,700** | **36,200** | **138,900** | **1,960,600** | **824,100** | **804,100** | **4,252,600** |
| **Cargo:** | | | | | | | | |
| Lynxs FLL Cargoport LLC | N-2 | - | 74,800 | - | 183,200 | 184,800 | 21,100 | **463,900** |
| Fedex | N-5A | - | 69,400 | - | 755,900 | 319,900 | 227,200 | **1,372,400** |
| DHL etc | N-8 | - | 124,300 | - | 303,300 | 143,600 | - | **571,200** |
| BCAD/Cargo Facility | N-13A | - | 43,600 | 8,800 | 19,700 | 23,000 | 8,900 | **104,000** |
| Delta Airlines | N-14A | - | - | 8,600 | - | 5,600 | 27,800 | **42,000** |
| **Sub-total** | | **-** | **312,100** | **17,400** | **1,262,100** | **676,900** | **285,000** | **2,553,500** |
| **ARFF** | | | | | | | | |
| Midfield ARFF | N/A | - | 13,900 | 13,900 | - | - | 62,200 | **90,000** |
| **Sub-total** | | **-** | **13,900** | **13,900** | **-** | **-** | **62,200** | **90,000** |
| **Grand Total (Airside)** | | **488,700** | **362,200** | **170,200** | **3,222,700** | **1,501,000** | **1,151,300** | **6,896,100** |

Source: BCAD Tenant Leasehold Map, November, 2004; The Corradino Group
Prepared By: The Corradino Group

## Table E.1-11, *Continued*
## TENANT FACILITY RELOCATION REQUIREMENTS - ALTERNATIVES C1

**Tenants Not Requiring Airside Access (Assumed Relocation to Remote South East or Remote West Development Area)**

| | Existing Facilities Summary (Tenant Leashold Map) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Tenant** | **Leasehold ID** | **Hangar** | **Warehouse** | **Office** | **Apron** | **Auto Parking** | **Other** | **Total** |
| **Offices Buildings:** | | | | | | | | |
| Maintenance/BCAD | N-14B | - | - | 27,800 | - | 41,700 | 14,800 | **84,300** |
| Airport Recycling | N-15 | - | - | 3,800 | - | - | 28,800 | **32,600** |
| URS | N-16B | - | - | 13,300 | - | 50,700 | 25,400 | **89,400** |
| BellSouth | W-4C | - | - | - | - | - | 2,800 | **2,800** |
| Avis | W-8 | - | - | 14,700 | - | 275,300 | - | **290,000** |
| BCAD | W-14 | - | - | - | - | 35,300 | 10,900 | **46,200** |
| BCAD/Shuttle port | W-24 | - | - | 6,900 | - | - | 123,500 | **130,400** |
| FAA | W-4B | - | - | - | - | - | 12,100 | **12,100** |
| **Sub-total** | | **-** | **-** | **66,500** | **-** | **403,000** | **218,300** | **687,800** |
| **Parking Facilities** | | | | | | | | |
| BCAD | W-23 | - | - | - | - | 209,800 | 7,200 | **217,000** |
| BCAD | W-25 | - | - | - | - | 185,600 | - | **185,600** |
| **Sub-total** | | **-** | **-** | **-** | **-** | **395,400** | **7,200** | **402,600** |
| **Vacant/Undeveloped** | | | | | | | | |
| BCAD | N-1 | - | - | - | - | 316,600 | 150,600 | **467,200** |
| BCAD | N-3 | - | - | - | - | 82,100 | 47,200 | **129,300** |
| BCAD Fuel Farm | N-FF | - | - | - | - | - | 103,800 | **103,800** |
| BCAD | W-3A | - | - | - | - | 399,600 | 1,010,800 | **1,410,400** |
| BCAD | W-4A | - | - | 19,500 | 131,700 | 393,600 | 76,100 | **620,900** |
| BCAD | W-6 | - | - | - | - | 54,500 | 47,300 | **101,800** |
| **Sub-total** | | **-** | **-** | **19,500** | **131,700** | **1,246,400** | **1,435,800** | **2,833,400** |
| **Grand Total (Non Airside)** | | **-** | **-** | **86,000** | **131,700** | **2,044,800** | **1,661,300** | **3,923,800** |

Source: BCAD Tenant Leasehold Map, November, 2004; The Corradino Group
Prepared By: The Corradino Group

## Table E.1-12
## TENANT FACILITY RELOCATION REQUIREMENTS - ALTERNATIVES D1

**Tenants Requiring Airside Access (Assumed Relocation to West Development Area)**

| | | Existing Facilities Summary (Tenant Leashold Map) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Tenant** | **Leasehold ID** | **Hangar** | **Warehouse** | **Office** | **Apron** | **Auto Parking** | **Other** | **Total** |
| **GA/FBO:** | | | | | | | | |
| National Jets | N-5A | 36,600 | 12,000 | - | 305,500 | 40,900 | 400 | **395,400** |
| FLL-Air Inc. | N-6 | 31,700 | - | 8,800 | 168,100 | 35,900 | 92,200 | **336,700** |
| SHELTAIR | N-7 | 61,100 | 13,100 | 2,400 | 281,800 | 66,400 | 105,500 | **530,300** |
| Aero Lauderdale | N-8 | 24,700 | - | 64,700 | 92,800 | 257,900 | 67,900 | **508,000** |
| Embraer | N-9 | 51,500 | - | 29,700 | 30,600 | 91,900 | 113,800 | **317,500** |
| Embraer | N-9 | 49,700 | - | - | 108,700 | - | 175,600 | **334,000** |
| Private-Miami Dolphins | N-9 | 92,600 | - | - | 363,700 | 131,600 | 56,500 | **644,400** |
| Azorra Aviaion | N-10 | 54,900 | - | - | 169,200 | - | 91,900 | **316,000** |
| Aircraft Services Intl | N-12 | - | - | 4,700 | - | - | 10,100 | **14,800** |
| Signature Flight | W-9 | 85,900 | - | 7,800 | 400,200 | 123,100 | 59,600 | **676,600** |
| SHELTAIR | W-13 | 32,600 | - | - | 61,500 | 18,500 | - | **112,600** |
| SHELTAIR (holiday Lot) | W-15 | - | - | - | - | 467,200 | 69,700 | **536,900** |
| Sheltair | W-20 | - | - | 20,800 | - | 67,100 | 30,600 | **118,500** |
| Gulfstream | W-22 | 30,300 | - | - | 59,900 | 51,300 | 77,300 | **218,800** |
| Tropical Aviation | W-5 | - | 11,100 | - | 40,000 | 9,300 | - | **60,400** |
| **Total** | | **551,600** | **36,200** | **138,900** | **2,082,000** | **1,361,100** | **951,100** | **5,120,900** |
| **Cargo:** | | | | | | | | |
| Lynxs FLL Cargoport LLC | N-2 | - | 74,800 | - | 183,200 | 184,800 | 21,100 | **463,900** |
| Fedex | N-5A | - | 69,400 | - | 755,900 | 319,900 | 227,200 | **1,372,400** |
| DHL etc | N-8 | - | 124,300 | - | 303,300 | 143,600 | - | **571,200** |
| BCAD/Cargo Facility | N-13A | - | 43,600 | 8,800 | 19,700 | 23,000 | 8,900 | **104,000** |
| Delta Airlines | N-14A | - | - | 8,600 | - | 5,600 | 27,800 | **42,000** |
| **Total** | | **-** | **312,100** | **17,400** | **1,262,100** | **676,900** | **285,000** | **2,553,500** |
| **ARFF** | | | | | | | | |
| Midfield ARFF | N/A | - | 13,900 | 13,900 | - | - | 62,200 | 90,000 |
| **Total** | | **-** | **13,900** | **13,900** | **-** | **-** | **62,200** | **90,000** |
| | | | | | | | - | |
| **Grand Total (Airside)** | | **551,600** | **362,200** | **170,200** | **3,344,100** | **2,038,000** | **1,298,300** | **7,764,400** |

Source: BCAD Tenant Leasehold Map, November, 2004; The Corradino Group
Prepared By: The Corradino Group

## Table E.1-12, *Continued*
## TENANT FACILITY RELOCATION REQUIREMENTS - ALTERNATIVES D1

| Tenant | Existing Facilities Summary (Tenant Leashold Map) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Leasehold ID | Hangar | Warehouse | Office | Apron | Auto Parking | Other | Total |
| **Tenants Not Requiring Airside Access (Assumed Relocation to Remote South East or Remote West Development Area)** | | | | | | | | |
| **Offices Buildings:** | | | | | | | | |
| Maintenance/BCAD | N-14B | - | - | 27,800 | - | 41,700 | 14,800 | **84,300** |
| Airport Recycling | N-15 | - | - | 3,800 | - | - | 28,800 | **32,600** |
| URS | N-16B | - | - | 13,300 | - | 50,700 | 25,400 | **89,400** |
| BellSouth | W-4C | - | - | - | - | - | 2,800 | **2,800** |
| Avis | W-8 | - | - | 14,700 | - | 275,300 | - | **290,000** |
| BCAD | W-14 | - | - | - | - | 35,300 | 10,900 | **46,200** |
| BCAD/Shuttle port | W-24 | - | - | 6,900 | - | - | 123,500 | **130,400** |
| FAA | W-4B | - | - | - | - | - | 12,100 | **12,100** |
| BCAD Offices | N/A | - | - | 53,000 | - | 93,000 | 139,000 | **285,000** |
| **Total** | | **-** | **-** | **119,500** | **-** | **496,000** | **357,300** | **972,800** |
| **Parking Facilities** | | | | | | | | |
| BCAD | W-23 | - | - | - | - | 209,800 | 7,200 | **217,000** |
| BCAD | W-25 | - | - | - | - | 185,600 | - | **185,600** |
| **Sub-total** | | **-** | **-** | **-** | **-** | **395,400** | **7,200** | **402,600** |
| **Vacant/Undeveloped** | | | | | | | | |
| BCAD | N-1 | - | - | - | - | 316,600 | 150,600 | **467,200** |
| BCAD | N-3 | - | - | - | - | 82,100 | 47,200 | **129,300** |
| BCAD Fuel Farm | N-FF | - | - | - | - | - | 103,800 | **103,800** |
| BCAD | W-3A | - | - | - | - | 399,600 | 1,010,800 | **1,410,400** |
| BCAD | W-4A | - | - | 19,500 | 131,700 | 393,600 | 76,100 | **620,900** |
| BCAD | W-6 | - | - | - | - | 54,500 | 47,300 | **101,800** |
| BCAD / Taxi Lot (Former Budget RAC) | S-4 | - | - | - | - | 75,000 | - | 75,000 |
| BCAD | S-8 | - | - | - | - | - | - | - |
| **Total** | | **-** | **-** | **19,500** | **131,700** | **1,321,400** | **1,435,800** | **2,908,400** |
| **Grand Total (Non Airside)** | | **-** | **-** | **139,000** | **131,700** | **2,212,800** | **1,800,300** | **4,283,800** |

Source: BCAD Tenant Leasehold Map, November, 2004; The Corradino Group
Prepared By: The Corradino Group

## Table E.1-13
## TENANT RELOCATION REQUIREMENTS - ALTERNATIVES D2

**Tenants Requiring Airside Access (Assumed Relocation to West Development Area)**

| | | Existing Facilities Summary (Tenant Leashold Map) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Tenant** | **Leasehold ID** | **Hangar** | **Warehouse** | **Office** | **Apron** | **Auto Parking** | **Other** | **Total** |
| **GA/FBO:** | | | | | | | | |
| National Jets | N-5A | 36,600 | 12,000 | - | 305,500 | 40,900 | 400 | **395,400** |
| FLL-Air Inc. | N-6 | 31,700 | - | 8,800 | 168,100 | 35,900 | 92,200 | **336,700** |
| SHELTAIR | N-7 | 61,100 | 13,100 | 2,400 | 281,800 | 66,400 | 105,500 | **530,300** |
| Aero Lauderdale | N-8 | 24,700 | - | 64,700 | 92,800 | 257,900 | 67,900 | **508,000** |
| Embraer | N-9 | 51,500 | - | 29,700 | 30,600 | 91,900 | 113,800 | **317,500** |
| Embraer | N-9 | 49,700 | - | - | 108,700 | - | 175,600 | **334,000** |
| Private-Miami Dolphins | N-9 | 92,600 | - | - | 363,700 | 131,600 | 56,500 | **644,400** |
| Azorra Aviaion | N-10 | 54,900 | - | - | 169,200 | - | 91,900 | **316,000** |
| Aircraft Services Intl | N-12 | - | - | 4,700 | - | - | 10,100 | **14,800** |
| Signature Flight | W-9 | 85,900 | - | 7,800 | 400,200 | 123,100 | 59,600 | **676,600** |
| SHELTAIR | W-13 | 65,100 | - | - | 230,200 | 37,300 | - | **332,600** |
| SHELTAIR (holiday Lot) | W-15 | - | - | - | - | 467,200 | 69,700 | **536,900** |
| Sheltair | W-20 | - | - | 20,800 | - | 67,100 | 30,600 | **118,500** |
| Gulfstream | W-22 | 30,300 | - | - | 59,900 | 51,300 | 77,300 | **218,800** |
| Tropical Aviation | W-5 | - | 11,100 | - | 40,000 | 9,300 | - | **60,400** |
| **Total** | | **584,100** | **36,200** | **138,900** | **2,250,700** | **1,379,900** | **951,100** | **5,340,900** |
| **Cargo:** | | | | | | | | |
| Lynxs FLL Cargoport LLC | N-2 | - | 74,800 | - | 183,200 | 184,800 | 21,100 | **463,900** |
| Fedex | N-5A | - | 69,400 | - | 755,900 | 319,900 | 227,200 | **1,372,400** |
| DHL etc | N-8 | - | 124,300 | - | 303,300 | 143,600 | - | **571,200** |
| BCAD/Cargo Facility | N-13A | - | 43,600 | 8,800 | 19,700 | 23,000 | 8,900 | **104,000** |
| Delta Airlines | N-14A | - | - | 8,600 | - | 5,600 | 27,800 | **42,000** |
| **Total** | | **-** | **312,100** | **17,400** | **1,262,100** | **676,900** | **285,000** | **2,553,500** |
| **ARFF** | | | | | | | | |
| Midfield ARFF | N/A | - | 13,900 | 13,900 | - | - | 62,200 | 90,000 |
| | | | | | | | - | |
| **Total** | | **-** | **13,900** | **13,900** | **-** | **-** | **62,200** | **90,000** |
| | | | | | | | - | |
| | | | | | | | - | |
| **Grand Total (Airside)** | | **-** | **13,900** | **13,900** | **-** | **-** | **62,200** | **7,984,400** |

Source: BCAD Tenant Leasehold Map, November, 2004; The Corradino Group
Prepared By: The Corradino Group

## Table E.1-13, *Continued*
## TENANT RELOCATION REQUIREMENTS - ALTERNATIVES D2

**Tenants Not Requiring Airside Access (Assumed Relocation to Remote West Development Area)** -

| | Existing Facilities Summary (Tenant Leashold Map) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Tenant** | **Leasehold ID** | **Hangar** | **Warehouse** | **Office** | **Apron** | **Auto Parking** | **Other** | **Total** |
| **Offices Buildings:** | | | | | | | | |
| Maintenance/BCAD | N-14B | - | - | 27,800 | - | 41,700 | 14,800 | **84,300** |
| Airport Recycling | N-15 | - | - | 3,800 | - | - | 28,800 | **32,600** |
| URS | N-16B | - | - | 13,300 | - | 50,700 | 25,400 | **89,400** |
| BellSouth | W-4C | - | - | - | - | - | 2,800 | **2,800** |
| Avis | W-8 | - | - | 14,700 | - | 275,300 | - | **290,000** |
| BCAD | W-14 | - | - | - | - | 35,300 | 10,900 | **46,200** |
| BCAD/Shuttle port | W-24 | - | - | 6,900 | - | - | 123,500 | **130,400** |
| FAA | W-4B | - | - | - | - | - | 12,100 | **12,100** |
| Sheltair (Option Parcel) | W-18 | - | - | 20,300 | - | 43,200 | 229,800 | **293,300** |
| BCAD Offices | N/A | - | - | 53,000 | - | 93,000 | 139,000 | **285,000** |
| **Total** | | **-** | **-** | **139,800** | **-** | **539,200** | **587,100** | **1,266,100** |
| **Parking Facilities** | | | | | | | | |
| BCAD | W-23 | - | - | - | - | 209,800 | 7,200 | **217,000** |
| BCAD | W-25 | - | - | - | - | 185,600 | - | **185,600** |
| **Sub-total** | | **-** | **-** | **-** | **-** | **395,400** | **7,200** | **402,600** |
| **Vacant/Undeveloped** | | | | | | | | |
| BCAD | N-1 | - | - | - | - | 316,600 | 150,600 | **467,200** |
| BCAD | N-3 | - | - | - | - | 82,100 | 47,200 | **129,300** |
| BCAD Fuel Farm | N-FF | - | - | - | - | - | 103,800 | **103,800** |
| BCAD | W-3A | - | - | - | - | 399,600 | 1,010,800 | **1,410,400** |
| BCAD | W-4A | - | - | 19,500 | 131,700 | 393,600 | 76,100 | **620,900** |
| BCAD | W-6 | - | - | - | - | 54,500 | 47,300 | **101,800** |
| BCAD / Taxi Lot (Former Budget RAC) | S-4 | - | - | - | - | 75,000 | - | **75,000** |
| BCAD | S-8 | - | - | - | - | - | - | **-** |
| **Total** | | **-** | **-** | **19,500** | **131,700** | **1,321,400** | **1,435,800** | **2,908,400** |
| **Grand Total (Non Airside)** | | **-** | **-** | **159,300** | **131,700** | **2,256,000** | **2,030,100** | **4,577,100** |

Source: BCAD Tenant Leasehold Map, November, 2004; The Corradino Group
Prepared By: The Corradino Group

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## E.1.7 TERMINAL 4 IMPACTS – ALTERNATIVES B1/B1b/B1c

The airfield configuration associated with Alternative B1 would encroach upon the perimeter taxilane serving Terminal 4. This is due to the proposed elevation of Runway 9R/27L and its inner parallel taxiway, and its proximity to Terminal 4. To minimize these impacts, a Mechanically Stabilized Earth (MSE) retaining wall is proposed along the northern boundary of the taxiway safety area serving the inner parallel taxiway.

The *Proposed Reconstruction of Runway 9R/27L Evaluation of Preliminary Evaluation of Runway Lengths and Grades* report describes the separation required between the existing south terminal perimeter taxilane centerline and the MSE wall would be 112.5 feet. Accordingly, the perimeter taxilane would be restricted to aircraft with a wingspan of 170 feet. This coincides with B767-400 aircraft or smaller. The existing taxilane capability could be maintained by shifting the taxilane centerline, but this would reduce the depth of the aircraft parking apron south of Concourse H, which would effectively limit the number and/or size of aircraft that could be accommodated in the south terminal complex. **Exhibit E.1-11, *Terminal 4 Impacts Alternative B1/B1b/B1c***, graphically depicts the impacts to the existing Terminal 4 perimeter taxilane. For comparative purposes, the apron impacts associated with realigning the taxiway centerline to maintain its current aircraft compatibility are also shown.

As contained in Appendix N.2 *Future Terminal Gate Demand/Capacity Assessment*, the ongoing FLL Airport Master Plan is evaluating opportunities to reconfigure Terminal 4. Included in this analysis are several alternatives that consider various configurations for Terminal 4, primarily associated with the development of a linear terminal facility with frontal gates configured along the south side of the terminal complex. To provide efficient aircraft taxi flows within the south terminal complex, dual apron edge parallel taxilanes are also proposed in the airport Master Plan.

The dual taxilane configuration is necessary to allow aircraft pushback operations to occur without impeding aircraft taxi flows into and out of the south terminal area. A single taxilane configuration in the redeveloped south terminal area would compromise operational efficiency. An increase in aircraft taxi delays and gate holds would be anticipated with a single taxilane system. Without a dedicated ramp control tower, airfield gridlock is also likely to occur, thereby exacerbating aircraft delays.

The dual parallel taxilane infrastructure would be situated between the Terminal 4 apron and the MSE wall to its south. These taxilanes are proposed in accordance to the FAA design standards associated with ARC D-IV aircraft. In accordance with those standards, the Runway 9R/27L alignment proposed by Alternative B1 is located as far north without encroaching on the proposed dual taxilane system that would serve a redeveloped Terminal 4. Shifting Runway 9R/27L further to the north would cause the MSE wall to encroach the taxilane OFA. This action would limit the aircraft wingspan that could be accommodated at Terminal 4 or restrict the terminal to a single taxilane system. The implementation of either action would compromise the operational efficiency of the south terminal complex, and therefore is not considered.

# E.2 ENGINEERING ANALYSES

The engineering analysis documents all of the engineering assumptions and calculations that went into the formulation of the airfield alternatives. The information is presented in the following sections.

- Typical Sections – Used to determine, among other things, cut and fill quantities, grading, pavement thicknesses and transverse slope calculations. The
- Special Features – Items that are not comment to all alternatives and includes items such as retaining walls, approach lighting systems and aircraft arresting systems (EMASS).
- Drainage – Presents the drainage and sub-basin requirements for each of the airfield alternatives.
- Constructability – Determination if the airfield alternative could be constructed while meeting minimum local, state and federal regulations and construction standards.

The data presented in the following sections will be used to calculate cost estimates for each airfield alternative.

## E.2.1 TYPICAL SECTIONS

A typical section is a cross sectional view, at a right angle to the centerline, through the runway or taxiway showing features such as the pavement width, safety area width, cross slopes, and pavement thickness. **Exhibit E.2-1** contains an example typical section.

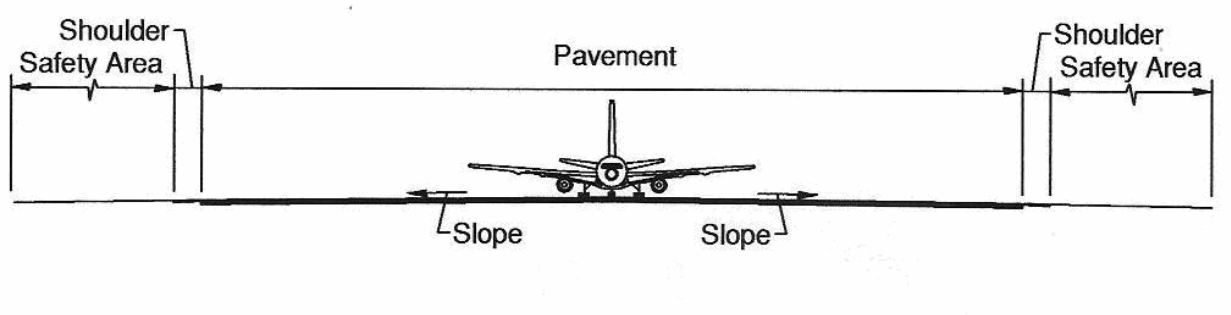



**Exhibit E.2-1**

The following sections describe the various elements of the typical section.

### E.2.1.1 Pavement Width

Pavement widths for runways and taxiways are predicated on the Airport Reference Code (ARC) of the associated runway. As stipulated in AC 150/5300-13 "Airport Design," ARC D-IV requires a runway pavement width of 150 feet and taxiway and taxilane pavement widths of 75 feet. Shoulders, although not required, are recommended for this classification of runway and will measure 25 feet in width.

### E.2.1.2 Safety Area Width

Chapter 1 of AC 150/5300-13 defines a safety area as a defined surface surrounding the runway (RSA) or taxiway (TSA), suitable for reducing the risk of damage to airplanes in the event of an excursion from the paved surface.

The widths utilized for the RSA cross sections are 500 feet (250 feet from centerline) in width and they extend 1,000 feet beyond each landing end. The taxiway width of the TSA 171 feet total or 85.5 feet on either side of the taxiway centerline.

### E.2.1.3 Transverse Grades

Transverse grades, or cross slope refer to the slope, expressed in percent, of the various elements of the typical section to promote storm water drainage. Generally, the high point in a typical section is at the centerline of the pavement, with the pavement, shoulder, and safety areas sloping away toward swales outside the safety area. Chapter 5 of AC 150/5300-13 discusses surface gradients and supplies the following transverse grade ranges:

| | |
|---|---|
| Runway or Taxiway pavements | 1.0% to 1.5% |
| Shoulders | 1.5% to 5.0% |
| Safety Areas | 1.5% to 3.0% |

### E.2.1.4 Pavement Thickness

Pavement thickness is a function of the load imposed by aircraft weight and number of that aircraft repetitions over the anticipated life of the pavement and the structure of the underlying soil. A weak soil will require a thicker pavement or some remediation to strengthen the soil.

A design aircraft is selected by first considering individually all of the types (i.e. gear configuration and maximum takeoff weight) of aircraft in the fleet that will use the pavement as well as the number of departures of that particular type of aircraft. The type of aircraft that results in the thickest pavement, on its own, is considered the design aircraft. All of the other types of aircraft are converted into what the AC terms "equivalent departures" of this design aircraft.

The design life of new airfield pavements is 20 years; therefore, the equivalent departures of the design aircraft are computed based on traffic forecasts for 20 years.

In lieu of direct soil testing such, strength of soil was estimated by determining the general classification of the soil type and applying the typical strength characteristics for that soil type. A common classification system to describe the engineering properties of soil is called the Unified Soil Classification (USC) system. In this system, soils are classified based on general types such as silts, sands, clays, etc., with each soil type given a two-letter designation. Engineering properties of each of these soil types are assumed based on years of accumulated field and laboratory soil tests. One of the more common engineering properties for describing a soil, at least in pavement design, is the Subgrade Modulus, commonly referred to by the symbol "k." Typical k values for various USC soil classifications are contained in AC 50/5320-6D, *Airport Pavement Design and Evaluation*.

Soil boring information was obtained from "Runway 9L/27R Overlay and Taxiway B Rehabilitation and Reconstruction" by Tetra Tech WHS, a predominate soil type on the airfield is USC – SP (Sand or Gravelly Sand, poorly graded). A k value of 200 to 300 was assumed.

### E.2.1.5 Runway with Parallel Taxiway

AC 150/5300-13 prescribes standards for taxiway grades. This criterion establishes a maximum longitudinal grade of 1.5 percent for runway exit taxiways. Therefore, an inner parallel taxiway that serves a runway that is configured for ADG IV aircraft (i.e. 400 feet of lateral separation) can be no lower than six feet below the centerline elevation of the runway that it serves. On that basis, the inner parallel taxiway serving any runway that is elevated (to either mitigate obstructions or extend over the FEC Railroad and US Highway 1) coincides with the maximum 1.5 percent slope requirement.

### E.2.1.6 Survey Data

The first step to determine the earthwork, or "cut and fill," is to obtain surface model information. The alternatives that had development on the southern side (Alt B1, B1b, B1c, B-4, and B-5) airport used data obtained from a flown aerial survey provided by BCAD. At the time this analysis was conducted, the northern portion of the airport did not have topographic information. Therefore, an assumed existing ground elevation of five feet was used. A surface model was developed using this information.

### E.2.1.7 Runway Centerlines

Stationing along the centerlines of the future runways was established for the alternatives. The centerlines were then converted into alignments, which serve as the base line for all earthwork computations conducted as part of this report.

### E.2.1.8 Runway Alignment Information

For the purposes of identifying stations along the runway centerline, **Tables E.2-1 through E.2-6** summarize for each of the runway development alternatives the beginning and ending points for evaluating preliminary runway and taxiway grading requirements. The alignments extend beyond the physical end of the runways to

provide consideration for the portions of the airfield that may be subject to grading and/or drainage design. This ensures that the grading requirements for both the runway and its associated RSA are considered.

The beginning point corresponds with the west end of the area and the east end represents the ending point. It is noted that no runway alignment information is shown for Alternatives D1 and D2 because these are dual runway development Alternatives consisting runways contained in Table E.2-1.

**Table E.2-1**
**RUNWAY ALIGNMENT INFORMATION**
**Fort Lauderdale-Hollywood International Airport**

| | B1 | B1b/B1c | B4 | B5 | C1 |
|---|---|---|---|---|---|
| BEGINNING STATION | 90+00.00 | 90+00.00 | 90+00.00 | 95+00.00 | 74+35.57 |
| ENDING STATION | 195+00.00 | 195+00.00 | 170+00.00 | 195+00.00 | 166+02.24 |
| LENGTH | 10,500.00 | 10,500.00 | 8,000.00 | 10,000.00 | 9,166.67 |
| BEARING | S89°59'19"E | S89°59'19"E | N89°59'60"E | S89°59'19"E | N89°59'60"E |

Source: The Corradino Group, 2007

### E.2.1.9 Existing Cross Sections

Existing cross sections were established in intervals of 500 feet along the centerline alignment. Cross sections were also identified for the critical stations, such as edges of a blast pad or EMAS and at significant profile grade changes. The cross sections were extracted from the appropriate surface model for each Alternative, utilizing the profile of the existing ground as the existing baseline ground elevation.

### E.2.1.10 Runway Profile Grades

The proposed centerline profile grade for each Alternative was designed following the standards outlined in FAA Advisory Circular 150/5300-13. Each of the profile grades were inserted into Eagle Point 2004 to estimate the quantity of fill necessary to construct the airfield components associated with each alternative. The following tables provide the vertical alignment[6] information for each of the Alternatives that serve to estimate these quantities.

[6] Vertical Alignment the profile grade represents the elevation of the top of the subgrade at the centerline.

**Table E.2-2**
**RUNWAY 9R-27L CENTERLINE PROFILE – ALTERNATIVE B1**
**Fort Lauderdale-Hollywood International Airport**

| PVI[7] | STATION | ELEVATION[8] | GRADE[9] OUT (%) | LENGTH OF CURVE[10] |
|---|---|---|---|---|
| BEGIN OF PROFILE | 94+15.26 | 4.79 | +3.00 | |
| 1 | 95+26.60 | 8.10 | 0 | |
| 2 | 97+25.60 | 8.10 | +0.59 | |
| 3 | 155+40.51 | 42.63 | +0.10 | 800 |
| 4 | 179+19.28 | 45.01 | +0.10 | |
| 5 | 183+26.20 | 45.42 | 0.00 | |
| 6 | 185+26.20 | 45.42 | -3.00 | |
| 7 | 187+26.20 | 39.42 | -5.00 | |
| END OF PROFILE | 189+26.20 | 29.42 | | |

**Table E.2-3**
**RUNWAY 9R-27L CENTERLINE PROFILE – ALTERNATIVE B1b/B1c**
**Fort Lauderdale-Hollywood International Airport**

| PVI | STATION | ELEVATION | GRADE OUT (%) | LENGTH OF CURVE |
|---|---|---|---|---|
| BEGIN OF PROFILE | 96+77.86 | 5.26 | +5.00 | |
| 1 | 97+27.23 | 7.73 | +0.60 | |
| 2 | 103+27.23 | 11.33 | +0.60 | |
| 3 | 155+40.18 | 42.62 | +0.10 | 800 |
| 4 | 183+29.28 | 45.42 | 0.00 | |
| 5 | 189+29.28 | 45.42 | -25.00 | |
| END OF PROFILE | 190+32.77 | 19.55 | | |

Source: The Corradino Group, 2007

[7] PVI: The point where tangents intersect is known as the vertical point of intersection
[8] Elevation: height above a fixed reference point, often the mean sea level elevation.
[9] Grade: The slope of each tangent, expressed in percent rise.
[10] Length of (Vertical) Curve: The horizontal distance from one end of the vertical curve to the other, or the horizontal distance between the VPC and the VPT.

**Table E.2-4**
**RUNWAY 9R-27L CENTERLINE PROFILE – ALTERNATIVE B4**
**Fort Lauderdale-Hollywood International Airport**

| PVI | STATION | ELEVATION | GRADE OUT (%) | LENGTH OF CURVE |
|---|---|---|---|---|
| BEGIN OF PROFILE | 93+29.12 | 4.00 | +25.00 | |
| 1 | 93+41.11 | 7.00 | 0.00 | |
| 2 | 93+51.08 | 7.00 | 0.00 | |
| 3 | 140+77.11 | 7.00 | +0.80 | 800 |
| 4 | 158+27.11 | 21.00 | 0.00 | |
| 5 | 163+12.11 | 21.00 | -25.00 | |
| END OF PROFILE | 163+79.19 | 4.23 | | |

**Table E.2-5**
**RUNWAY 9R-27L CENTERLINE PROFILE – ALTERNATIVE B5**
**Fort Lauderdale-Hollywood International Airport**

| PVI | STATION | ELEVATION | GRADE OUT (%) | LENGTH OF CURVE |
|---|---|---|---|---|
| BEGIN OF PROFILE | 99+16.41 | 0.86 | +25.00 | |
| 1 | 99+56.97 | 11.00 | 0.00 | |
| 2 | 109+63.02 | 11.00 | +0.78 | 800 |
| 3 | 156+64.41 | 47.60 | 0.00 | 2800 |
| 4 | 190+12.83 | 47.60 | -25.00 | |
| END OF PROFILE | 190+37.79 | 41.36 | | |

**Table E.2-6**
**RUNWAY 8-26 CENTERLINE PROFILE – ALTERNATIVE C1**
**Fort Lauderdale-Hollywood International Airport**

| PVI | STATION | ELEVATION | GRADE OUT (%) | LENGTH OF CURVE |
|---|---|---|---|---|
| BEGIN OF PROFILE | 80+58.30 | 5.00 | +2.50 | |
| 1 | 82+58.30 | 10.00 | -0.75 | |
| 2 | 86+58.30 | 7.00 | 0.00 | 800 |
| 3 | 155+79.65 | 7.00 | 0.75 | |
| 4 | 159+79.65 | 10.00 | -2.50 | |
| END OF PROFILE | 161+79.65 | 5.00 | | |

Source: The Corradino Group, 2007

No vertical alignment information is shown for Alternatives D1 and D2 due to the fact that they are combinations of two of the Alternatives shown above.

### E.2.1.11 Typical Sections

Typical sections were developed following the transverse grade requirements prescribed by the FAA. The offsets between the runways and the various taxiways were measured from the plan view for each Alternative. Beyond the limits of the RSA, either MSE walls or a 4:1 side slope was used.

### E.2.1.12 Proposed Taxiway Profile Grades

The profiles of the parallel taxiways for each Alternative were developed based on FAA design, which states that the maximum slope between a runway and a parallel taxiway cannot exceed a grade of 1.5 percent. The proposed taxiway profiles for the various Alternatives are not shown.

## E.2.2 ESTIMATED QUANTITIES

The quantities associated with earthwork (embankment or fill), airside pavements, roadway realignments, and facility relocations are summarized in **Table E.2-7**. The airside pavement areas coincide with the FLL ALP basemap files provided by BCAD in 2004, supplemented by the preliminary facility configurations associated with the airfield development alternatives. The following is a summary of how these quantities were estimated for cost estimating purposes.

**Table E.2-7**
**ESTIMATED QUANTITIES – AIRSIDE PAVEMENTS, EARTHWORK, AND TENANT FACILITIES**
**Fort Lauderdale-Hollywood International Airport**

| Item Description | UNIT | EIS ALTERNATIVES | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | B1 | B1B / B1c | B4 | B5 | C1 | D1 | D2 |
| | | | | | | | | |
| Pavement (Concrete) | SY | 516,500 | 517,300 | 490,150 | 510,000 | 403,750 | 828,900 | 832,800 |
| Site Earthwork (Double Handling) | CY | 6,153,660 | 6,153,660 | 954,600 | 6,935,200 | 183,900 | 6,337,600 | 1,138,500 |
| Griffin Road Realignment | LS | No | No | No | Yes | No | No | No |
| | | | | | | | | |
| Relocated Tenant Facilities | | | | | | | | |
| Buildings | SF | 115,900 | 115,900 | 196,500 | 30,300 | 1,259,200 | 1,375,100 | 1,455,700 |
| Auto Parking | SY | 89,100 | 89,100 | 76,889 | 6,700 | 435,467 | 524,567 | 512,356 |
| GA/FBO Aprons | SY | 13,500 | 13,500 | 32,233 | 5,700 | 233,700 | 247,200 | 265,933 |
| Cargo Aprons | SY | 0 | 0 | 0 | 0 | 140,233 | 140,233 | 140,233 |
| Fuel Farm | LS | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| | | | | | | | | |

### E.2.2.1 Relocated Tenant Facilities

Tenant facility relocation costs are estimated in accordance to the overall areas designated to building, apron, fuel farms, and automobile parking areas. Consideration for both demolition and replacement-in-kind facilities is given. Only those facilities that are directly impacted, or deemed incompatible land uses based on FAA airfield design criteria, are to be relocated. A more detailed description of the tenant facility impacts is contained in Chapter 4, *Airfield Alternatives*.

## E.2.3 SPECIAL FEATURES

The following is a brief description of special features that are incorporated into some of the airfield development alternatives. These features include: Mechanically Stabilized Earth (MSE) retaining walls, the bridge/tunnel structure over the FEC Railroad and U.S. Highway 1, elevated localizer antenna, and Engineered Materials Arresting Systems (EMAS).

### E.2.3.1 MSE Wall

Alternatives B1, B1b/B1c, B5, and D1 specify the construction of an MSE wall beyond the east and northern boundaries of the Runway 9R/27L RSA. All four of these alternatives require the elevation of the eastern portion of Runway 9R/27L over the Florida East Coast (FEC) railroad and U.S. Highway 1, which requires the construction of embankments to support the new runway pavement. If typical grading standards were followed for construction of embankment slopes, these embankments would encroach upon NW 7th Avenue and/or the south terminal apron areas. To avoid these encroachments, an MSE wall is proposed to support the elevated runway end.

An MSE wall is also proposed beyond the east end of the Runway 9R/27L RSA for Alternatives B4 and D2. An MSE wall is required, due to the proposed elevation of Runway 27L threshold in effort to mitigate potential airspace impacts associated with the realigned FEC Railway, immediately east of the runway.

### E.2.3.2 Bridge/Tunnel Structure

Alternatives B1, B1b/B1c, B5, and D1 specify the construction of a tunnel structure. This tunnel structure would support Runway 9R/27L and its parallel taxiways as they span over U.S. Highway 1 and the FEC Railway. The elevation of the bottom of the tunnel structure for these four alternatives was determined based on the minimum allowable clearance of 23.5 feet over the railroad. This elevation and the required pavement thickness were then used to determine the proposed Runway 9R/27L profile for each of the four alternatives.

### E.2.3.3 9R Localizer

Alternatives B1, B1b/B1c and D1 specify the installation of a Runway 27L localizer on the west side of the Dania Cut-off Canal. This location would be off airport property and not within the airport's security fence. To provide security, a fence would need to be constructed around the facility. However, this fence would cause interference to the localizer signal if the localizer were installed at ground elevation. To provide the required minimum signal coverage and performance, the Runway 27L localizer would be elevated onto a structure so that neither the fence nor the boat traffic on the Dania Cut-off Canal interferes with the integrity of the localizer signal.

### E.2.3.4 Engineered Materials Arresting System (EMAS)

All alternatives comply with FAA design standards for RSA configuration. Some airfield development alternatives assume the use of EMAS to maximize the overall length of the runway and comply with RSA design standards. The use of EMAS can increase the departure and landing distance available on a runway, while reducing the standard RSA length to 600 feet. The use of EMAS should only be considered if it is determined to be economically or operationally unfeasible to achieve the standard RSA and OFA length beyond the physical end of the runway. The FAA criteria prescribed for the use of EMAS is contained in A/C 150/5300-13 (Change 9), Airport Design, A/C 150/5220-22A, Engineered Materials Arresting Systems for Aircraft Overruns, and FAA Order 5200.8, Runway Safety Area Program.

## E.2.4 DRAINAGE

According to AC 150/5320-5B *Airport Drainage*, "An airport should have well-drained operational areas with sufficient stability to permit the safe movement of aircraft under all weather conditions." Meeting this requirement can be a challenging proposition, as airfields typically involve large flat areas, which are not easily "well-drained."

### E.2.4.1 Level of Analysis

Chapter 5 of AC 150/5320-5B describes the design process of an airfield drainage system as consisting of three general procedures: collection of the basic information, initial design step, and final design.

Some of the basic information needed to begin design of an airfield drainage system includes physical site data such as ground contours, drainage outfall locations, pavement geometry, pavement grades, and the location of features such as aprons and terminals. This information is collected and shown on what the AC terms a "drainage working drawing."

The initial design step consists of analyzing the drainage working drawings to develop an overall drainage layout. This layout includes the general location and flow path of storm sewers, drainage swales, and the location of water quality and quantity treatment areas. Final design is an iterative process to develop the most

efficient and economical storm water drainage layout. Storm sewer pipes and swales are sized, grades computed, drainage inlets are located, and water quality and quantity treatment areas are sized.

In this Alternatives analysis, the drainage design is taken to the initial design step; that is, the basic information is collected and shown on the drainage working drawings, the general flow pattern of the proposed drainage system is developed, and an estimate of the storm water quality and quantity treatment areas are quantified. This level of analysis allows for comparisons of proposed drainage systems between the Alternatives, and identification of any major drainage issues with Alternative. It also permits the development of an order of magnitude cost for required drainage improvements for each Alternative.

## E.2.5 METHOD OF ANALYSIS

Applying the drainage design process described in the preceding section and in Chapter Five of AC 150/5320-5B to the Alternatives involves collecting the basic information from various sources, transferring this information to the drainage working drawings, and then making some design assumptions to develop an initial design.

Existing airport topography, including pavement locations, building, terminal locations, and drainage features, such as storm sewers, were plotted on the drainage working drawings. Sources for this information include aerial mapping and a utilities atlas supplied by BCAD staff.

Existing drainage characteristics, such as drainage outfalls, outfall drainage basin delineations, and delineation of drainage sub-basins within each outfall drainage basin, were obtained from the *Broward County Aviation Department, Fort Lauderdale-Hollywood International Airport, Stormwater Master Plan Update 2005– Storm Water Management Model Update*, dated December 2005, prepared by CDM (CDM Drainage Report.)

Proposed Runway, Taxiway, and apron pavement geometry for each Alternative were plotted on the drainage working drawings. The drainage working drawings were then analyzed to determine the new delineation of the proposed drainage sub-basins.

A proposed drainage sub-basin is defined as a newly created or altered drainage area necessitated by proposed pavements, proposed grading breaks, or alterations to the existing layout. A proposed basin is defined as a drainage area flowing to a single drainage outfall. Boundaries of the seven existing outfall areas and locations of their corresponding outfalls were obtained from the CDM Drainage Report. In addition, data was compiled and used which listed the existing sub-basins, and their corresponding size, grade, and percentage of impervious surfaces.

For this process, the following components are assessed:

1.) Pavement Geometry

2.) Cross Sectional Profiles

3.) Runway Profiles

4.) Current Drainage Sub-Basin Delineation

Using GIS, the proposed pavement geometry for each alternative was overlaid onto the current sub-basin layout, per the CDM Drainage Report. This task was performed to determine if there were any changes needed to the current sub-basin layout. The sub-basins were then divided using the following initial assumptions:

a) The centerline of all runways, taxiways/taxilanes and service road, in general, would be the dividing point between sub-basins. This assumption was based on the typical practice of crowning the pavements to facilitate drainage.

b) Sub-Basins would have a maximum length, in any direction, of approximately 1000 feet to allow for adequate and efficient drainage.

c) When possible, exiting sub-basin boundaries were maintained as much as possible to maximize the usage of the existing drainage system.

The runway profiles for each alternative were reviewed to determine if any further sub-basin division was necessary. When there was a significant change in profile grade; it was assumed that there would be a division in sub-basins.

The newly established sub-basins were assigned a unique identification code. This renaming applied to any sub-basin that was newly-created, modified from its original shape, or adjusted from its original data calculations.

Once the sub-basin divisions had been finalized, the grades, or slopes, for each newly created or altered sub-basin were determined. Calculating this number required the evaluation of the cross sectional profiles. The profiles were reviewed, at each station listed to determine the slope, starting at the crown of each centerline to its corresponding pavement edge. After these numbers were tabulated for each sub-basin, the applicable grades were estimated and a value was assigned. When calculating the area for a sub-basin that included both a current sub-basin area and a new development, the current slope or grade for that sub-basin was considered.

The areas for each of the new sub-basins were calculated, using GIS. This included an estimate of the percentage of impervious surfaces was calculated using a collaboration of both CAD and GIS applications. To complete the initial design step, the drainage working drawing of each alternative, with all of the information described herein, was analyzed to develop a logical drainage flow path for the airfield. Consideration was given to preserving, to the extent possible, the original boundaries of the existing permitted drainage basin of each drainage outfall.

By analyzing the piping layout in the existing utility atlas, the current routing plan, indicating the storm water flow path through the system to one of the seven existing permitted outfalls was determined. With this information, the flow connectivity diagram was created for Alternative A. Using this diagram as a baseline, flow diagrams for the other alternatives were developed, with the intent to maintain the existing infrastructure as closely as possible. However, when necessary, the flow paths were altered. This alteration resulted in changes to the outfall pattern for the airport boundary.

## E.2.6 COMMON CHANGES FOR ALL ALTERNATIVES

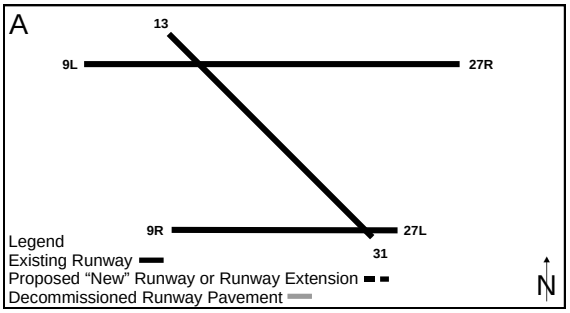
While the designs of the drainage system were ultimately unique for each alternative, common methodologies were utilized for some of the newly created or modified sub-basins. The generalization of these methods are detailed as follows:

1.) While the CDM Drainage Report was the preliminary source of the sub-basin drainage design, it did not include the newest delineation of the Fort Lauderdale – Hollywood International Airport boundary. Using the newest information from the Broward County Aviation Department, and considering the needs for water quantity and quality treatment, up to ten new sub-basins were added to the design for each alternative. For these new sub-basins, impervious percentages and percent slope (or grade) were assumed (based on existing information), calculated, or estimated for each alternative.

2.) For the alternatives, some of the sub-basins had to be split. Consequently, the boundary of one of these new sub-basins would be completely altered from its original geometry, and the remaining sub-basin would have relatively the same boundary, except for the splitting of the sub-basin. For this situation, two methods were used to calculate the new data for the split sub-basins. The sub-basin with the altered shape was calculated using the same methods as described for all newly created sub-basins. The area calculation for the sub-basin with relatively unchanged boundaries (minus the sub-basin split) used the CDM Drainage Report for the percentage of impervious area and the grade. This conservative assumption was made to determine the effect of this sub-basin on the system based on its current condition.

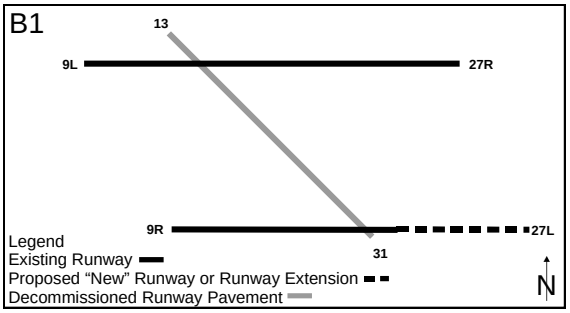
## E.2.7. SUMMARY OF ALTERNATIVES

### Alternative A: No Build/No Action




Since there are no significant changes in the airport layout for Alternative A, the drainage system will remain similar to its current design. To account for the expanded airport property boundary, seven new sub-basins were added to the current design. **Exhibit E.2-2 *Outfall Diagram – Alternative A***, illustrates the airport with its existing drainage system, which includes the individual sub-basins, (whether pre-existing or newly expanded), the outfall drainage areas, the outfall drainage area, and the impervious area calculations.

### Alternative B1: Redevelop and extend existing Runway 9R/27L to an 8,600-foot by 150-foot elevated runway




Alternative B1 includes new airport design that is primarily concentrated in the southern portion of the sub-basin system. For this reason, most of the changes in the existing delineations are located in the southern sub-basins, or the sub-basins that extend into the southern section. In addition, the proposed Runway 9R/27L includes an incline over US Highway 1; therefore, additional sub-basins needed to be delineated for the areas over the highway and to the East.

While the general delineations and flow paths of the outfalls remained relatively similar to the original design, there were changes in both the total drainage areas and the impervious areas. These changes are noted more specifically below.

1.) The design of this alternative resulted in redirecting some of the sub-basin areas that were formerly a part of Outfall 7 to Outfall 1. These areas included some of the areas that are now a part of sub-basins TCG-B1-3, TCG-B1-6, and TCG-B1-8.

a. The drainage divide between Outfalls 1 and 7 is located along the northeastern border of existing sub-basins DCB30 and DCB50. This was designed to follow the pavement crown of the existing taxiways. For Alternative B1, these taxiway pavements are being reconfigured to accommodate the mid-field holding pad; and therefore, the proposed sub-basins TCG-B1-3, TCG-B1-6, and TCG-B1-8 are designed to follow the new pavement geometry and better utilize the existing storm sewers.

b. The existing drainage system design included an additional divide between Outfalls 1 and 7, which was located along the eastern border of existing sub-basin DCB10. To coordinate with the new alternative layout, a portion of TCG-B1-36 (which was formerly flowing to Outfall 1) is now flowing to Outfall 7. In addition, a portion of sub-basin TCG-B1-38 that was previously flowing to Outfall 7 is now flowing to Outfall 1.

c. This change in overall outfall delineation resulted in a decrease in its overall drainage area for Outfall 7; however, the new design of the alternative, including the new Runway 9R-27L, created an increase in impervious surfaces for this outfall.

2.) The addition of these sub-basins resulted in an increased drainage area and an increased impervious areas; thereby, increasing the flow to Outfall 2.

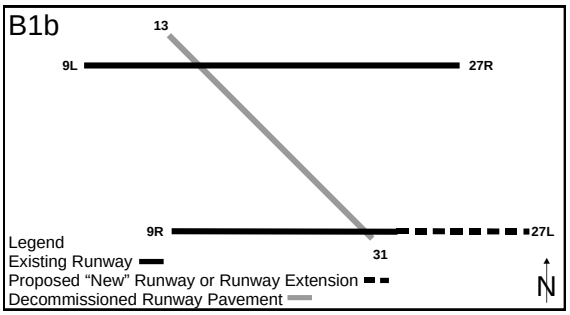
3.) Since this alternative concentrated in changes to the southern portion of the airport, no changes were seen in Outfall drainage areas 3, 4, and 5.

4.) Sub-Basins TCG-B1-3 and TCG-B1-6 include a section that was formerly flowing to Outfall 6, but is now designated for Outfall 1. This change resulted in a decrease in total drainage area to Outfall 6.

5.) Alternative B1 includes facility relocations, which are located within Outfall 6. Because of this addition, there is an increase in the total impervious area for that Outfall.

**Exhibit E.2-3** ***Outfall Diagram – Alternative B1***, shows the new drainage system for this alternative. This system includes the individual sub-basins, whether pre-existing or newly created, the outfall drainage areas, and both the outfall drainage and impervious area calculations. **Exhibit E.2-4** ***Drainage Working Diagram – Alternative B1*** shows the flow patterns designed for this alternative. This exhibit shows the path of drainage through the system for the sub-basins within each outfall drainage area until they reach their designated outfall. **Exhibit E.2-5** ***Impacts of the Limits of Disturbance to the Storm Water Sub-basin Design – Alternative B1***, shows the effects of the limits of disturbance to the alternative drainage design. Additional information, in regard to the limits of disturbance can be found in Chapter Four, *Section 4.E*.

**Alternative B1b: Redevelop and extend existing Runway 9R/27Lto an 8,000-foot by 150-foot elevated runway with EMAS**




Alternative B1b includes a new airport design that is primarily concentrated in the southern portion of the sub-basin system. For this reason, most of the changes in the existing delineations are located in the southern sub-basins, or the sub-basins that extend into the southern section. In addition, the proposed Runway 9R/27L includes an incline over US1; and therefore additional sub-basins needed to be delineated for the areas over the highway, and to the East.

While the general delineations and flow paths of the outfalls remained relatively similar to the original design, there were changes in both the total drainage areas and the impervious areas. These changes are noted more specifically below.

1.) The design of this alternative resulted in redirecting some of the sub-basin areas that were formerly a part of Outfall 7 to Outfall 1. These areas included some of the areas that are now a part of sub-basins TCG-B1b-4, TCG-B1b-5, TCG-B1b-7, and TCG-B1b-8.

   a. The drainage divide between Outfalls 1 and 7 is located along the northeastern border of existing sub-basins DCB30 and DCB50. This was designed to follow the pavement crown of the existing taxiways. For Alternative B1b, these taxiway pavements are being reconfigured to accommodate the mid-field holding pad; therefore, the proposed sub-basins TCG-B1b-4, TCG-B1b-5, TCG-B1b-7, and TCG-B1b-8 are designed to follow the new pavement geometry and better utilize the existing storm sewers.

   b. This change in overall outfall delineation resulted in a decrease in the overall drainage area flowing to Outfall 7.

2.) The addition of these sub-basins resulted in an increased drainage area and an increased impervious areas; thereby, increasing the flow to Outfall 2.

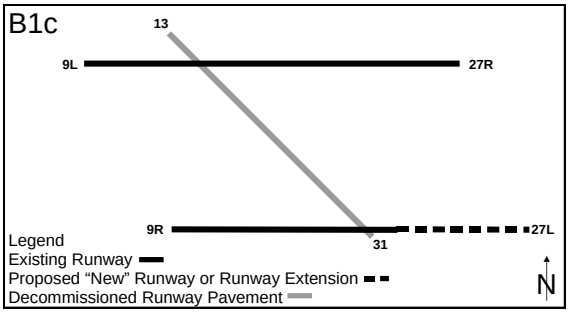
3.) Since this alternative concentrated in changes to the southern portion of the airport, no changes were seen in Outfall drainage areas 3, 4, and 5.

4.) Sub-Basins TCG-B1b-4 and TCG-B1b-5 include a section that was formerly flowing to Outfall 6, but is now designated for Outfall 1. This change resulted in a decrease in total drainage area to Outfall 6.

5.) Alternative B1b includes facility relocations, which are located within Outfall 6. This change results in an increase of impervious areas for those specific sub-basins; however, with the decommissioning of the crosswind Runway 13/31, the overall impervious area for Outfall 6 is decreased for this alternative.

**Exhibit E.2-6** ***Outfall Diagram – Alternative B1b***, shows the new drainage system for this alternative. This system includes the individual sub-basins, whether pre-existing or newly created, the outfall drainage areas, and both the outfall drainage and impervious area calculations. **Exhibit E.2-7** ***Drainage Working Diagram – Alternative B1b*** shows the flow patterns designed for this alternative. This exhibit shows the path of drainage through the system for the sub-basins within each outfall drainage area until they reach their designated outfall. **Exhibit E.2-8** ***Impacts of the Limits of Disturbance to the Storm Water Sub-basin Design – Alternative B1b***, shows the effects of the limits of disturbance to the alternative drainage design. Additional information in regard to the limits of disturbance can be found in Chapter Four, *Section 4.E*.

**Alternative B1c: Re-develop and extend existing Runway 9R/27L to an 8,000-foot by 150-foot elevated runway with EMAS**




Alternative B1c includes new airport design that is primarily concentrated in the southern portion of the sub-basin system. For this reason, most of the changes in the existing delineations are located in the southern sub-basins, or the sub-basins that extend into the southern section. In addition, the proposed Runway 9R/27L includes an incline over US1; therefore, additional sub-basins needed to be delineated for the areas over the highway and to the East.

Please note that, due to the identical design of Alternatives B1b and B1c, the sub-basin drainage delineations for Alternative B1b were used for this alternative; and therefore, the sub-basin naming labeling designation is identical to what is discussed in Alternative B1b.

While the general delineations and flow paths of the outfalls remained relatively similar to the original design, there were changes in both the total drainage areas and the impervious areas. These changes are noted more specifically below.

1.) The design of this alternative resulted in redirecting some of the sub-basin areas that were formerly a part of Outfall 7 to Outfall 1. These areas included some of the areas that are now a part of sub-basins TCG-B1b-4, TCG-B1b-5, TCG-B1b-7, and TCG-B1b-8.

a. The drainage divide between Outfalls 1 and 7 is located along the northeastern border of existing sub-basins DCB30 and DCB50. This was designed to follow the pavement crown of the existing taxiways. For Alternative B1c, these taxiway pavements are being reconfigured to accommodate the mid-field holding pad; therefore, the proposed sub-basins TCG-B1b-4, TCG-B1b-5, TCG-B1b-7, and TCG-B1b-8 are designed to follow the new pavement geometry and better utilize the existing storm sewers.

b. This change in overall outfall delineation resulted in a decrease of the overall drainage area of Outfall 7.

2.) The addition of these sub-basins resulted in an increased drainage area and an increased impervious areas; thereby, increasing the flow to Outfall 2.

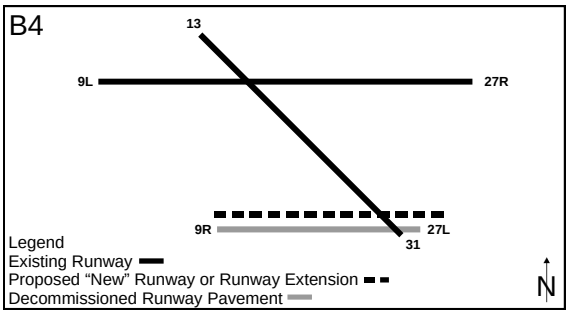
3.) Since this alternative concentrated in changes to the southern portion of the airport, no changes were seen in Outfall drainage areas 3, 4, and 5.

4.) Sub-Basins TCG-B1b-4 and TCG-B1b-5 include a section that was formerly flowing to Outfall 6, but is now designated for Outfall 1. This change resulted in a decrease in total drainage area to Outfall6.

5.) Alternative B1c includes facility relocations, which are located within Outfall 6. This change results in an increase of impervious areas for those specific sub-basins; however, with the decommissioning of the crosswind Runway 13/31, the overall impervious area for Outfall 6 is decreased for this alternative.

**Exhibit E.2-9** ***Outfall Diagram – Alternative B1c***, shows the new drainage system for this alternative. This system includes the individual sub-basins (whether pre-existing or newly created), the outfall drainage areas, and both the outfall drainage and impervious area calculations. **Exhibit E.2-10** ***Drainage Working Diagram – Alternative B1c*** shows the flow patterns designed for this alternative. This exhibit shows the path of drainage through the system for the sub-basins within each outfall drainage area until they reach their designated outfall. **Exhibit E.2-11** ***Impacts of the Limits of Disturbance to the Storm Water Sub-basin Design – Alternative B1c***, shows the effects of the limits of disturbance to the alternative drainage design. Additional information in regard to the limits of disturbance can be found in Chapter Four, *Section 4.E*.

## Alternative B4: Build a new 6,001-foot at grade runway with EMAS located 340 feet north of existing south runway (to replace existing Runway 9R/27L)




Alternative B4 includes new airport design that is primarily concentrated in the southern portion of the sub-basin system. For this reason, most of the changes in the existing delineations are located in the southern sub-basins, or the sub-basins that extend into the southern section.

While the general delineations and flow paths of the outfalls remained relatively similar to the original design, there were changes in both the total drainage areas and the impervious areas. These changes are noted more specifically below.

1.) Because of the design of the new southern runway, both the total drainage and impervious areas were increased for Outfall drainage area 1. This increase is due to the redirection of the sub-basin FDOT10, drainage from Outfall 2 to Outfall 1. This sub-basin is renamed TCG-B4-33, and, to coincide with a proposed southern taxiway, will drain to Outfall 1. In addition, this change caused a decrease in the total drainage and impervious areas for Outfall 2.

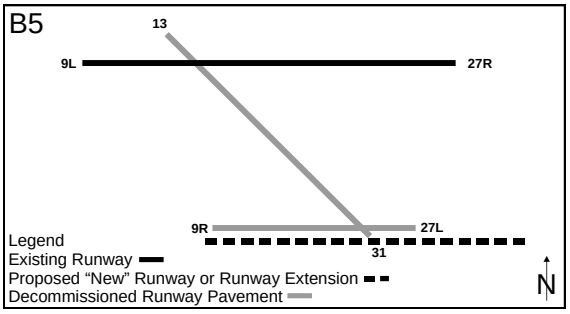
2.) Since this alternative concentrated in changes to the southern portion of the airport, no changes were seen in Outfall drainage areas 3, 4, and 5.

3.) This alternative includes facility relocations that will be located within the boundaries of Outfall drainage area 6. To account for the facility relocations, existing sub-basin DCA70 was divided, which redirected flow from Outfall 6 to Outfall 7. This change resulted in a decrease in both the total drainage and impervious area for Outfall 6, while having the opposite effect on Outfall 7.

**Exhibit E.2-12** ***Outfall Diagram – Alternative B4***, shows the new drainage system for this alternative. This system includes the individual sub-basins (whether pre-existing or newly created), the outfall drainage areas, and both the outfall drainage and impervious area calculations. **Exhibit E.2-13** ***Drainage Working Diagram – Alternative B4*** shows the flow patterns designed for this alternative. This exhibit shows the path of drainage through the system for the sub-basins within each outfall drainage area until they reach their designated outfall. **Exhibit E.2-14** ***Impacts of the Limits of Disturbance to the Storm Water***

***Sub-basin Design – Alternative B4***, shows the effects of the limits of disturbance to the alternative drainage design. Additional information in regard to the limits of disturbance can be found in Chapter Four, *Section 4.E*.

## Alternative B5: Build a 7,800-foot elevated runway with EMAS located 320 feet south of existing south runway (to replace existing Runway 9R/27L)




Alternative B5 includes new airport design that is primarily concentrated in the southern portion of the sub-basin system. For this reason, most of the changes in the existing delineations are located in the southern sub-basins, or the sub-basins that extend into the southern section.

While the general delineations and flow paths of the outfalls remained relatively similar to the original design, there were changes in both the total drainage areas and the impervious areas. These changes are noted more specifically below.

1.) The design of this alternative resulted in redirecting some of the sub-basin areas that were formerly a part of Outfall 7 to Outfall 1. These areas included some of the areas that are now a part of sub-basins TCG-B5-4, TCG-B5-9, TCG-B5-18, TCG-B5-19, and TCG-B5-21.

   a. The drainage divide between Outfalls 1 and 7 is located along the northeastern border of existing sub-basins DCB30 and DCB50. This was designed to follow the pavement crown of the existing taxiways. For Alternative B5, these taxiway pavements are being reconfigured to accommodate the mid-field holding pad; therefore the proposed sub-basins TCG-B5-4, TCG-B5-9, TCG-B5-18, TCG-B5-19, and TCG-B5-21 are designed to follow the new pavement geometry and better utilize the existing storm sewers.

   b. This change in overall outfall delineation resulted in a decrease, for Outfall 7, in its overall drainage and impervious areas for Outfall 7, while having the opposite effect on Outfall 1.

2.) The addition of these sub-basins resulted in an increased drainage area and an increased impervious areas; thereby, increasing the flow to Outfall 2.

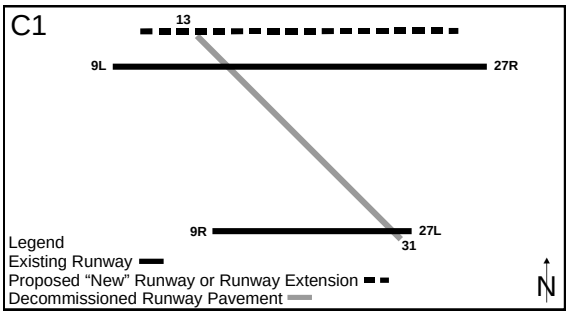
3.) Since this alternative concentrated in changes to the southern portion of the airport, no changes were seen in Outfall drainage areas 3, 4, and 5.

4.) Sub-Basin TCG-B5-4 includes a section that was formerly flowing to Outfall 6, but is now designated for Outfall 1. This change resulted in a decrease in total drainage area for Outfall 6.

5.) Alternative B5 includes facility relocations, which are located within Outfall 6. Because of this addition, there is an increase in the total impervious area for that Outfall.

**Exhibit E.2-15** ***Outfall Diagram – Alternative B5***, shows the new drainage system for this alternative, which includes the individual sub-basins, whether pre-existing or newly created, the outfall drainage areas, and both the outfall drainage and impervious area calculations. **Exhibit E.2-16** ***Drainage Working Diagram – Alternative B5*** shows the flow patterns designed for this alternative. This exhibit shows the path of drainage through the system for the sub-basins within each outfall drainage area until they reach their designated outfall. **Exhibit E.2-17** ***Impacts of the Limits of Disturbance to the Storm Water Sub-basin Design – Alternative B5***, shows the effects of the limits of disturbance to the alternative drainage design. Additional information in regard to the limits of disturbance can be found in Chapter Four, *Section 4.E.*

**Alternative C1: Build a 7,721-foot at grade runway located 850 feet north of existing Runway 9L/27R (a dependent parallel runway to existing Runway 9L/27R)**




Alternative C1 includes new airport design that is primarily concentrated in the Northern portion of the sub-basin system, although there are new designs affecting the southern portion as well. For this reason, most of the changes in the existing delineations are located in the Northern sub-basins, or the sub-basins that extend into the Northern section, with some changes also seen in southern basins.

While the general delineations and flow paths of the outfalls remained relatively similar to the original design, there were changes in both the total drainage areas and the impervious areas. These changes are noted more specifically below.

1.) The design of this alternative resulted in redirecting some of the sub-basin areas that were formerly a part of Outfall 7 to Outfall 1. These areas included some of the areas that are now a part of sub-basins TCG-C1-60, TCG-C1-63, and TCG-C1-65.

   a. The drainage divide between Outfalls 1 and 7 is located along the northeastern border of existing sub-basins DCB30 and DCB50. This was

designed to follow the pavement crown of the existing taxiways. For Alternative C1, these taxiway pavements are being reconfigured to accommodate the mid-field holding pad; therefore, the proposed sub-basins TCG-C1-60, TCG-C1-63, and TCG-C1-65 are designed to follow the new pavement geometry and better utilize the existing storm sewers.

b. In addition, a portion of TCG-C1-76 includes an area that is currently draining to Outfall 1. This new design will result in this drainage now flowing to Outfall 7.

c. This change in overall outfall delineation resulted in a decrease in its overall drainage area for Outfall 7. However, the new design of the holding pad will cause the impervious area for this outfall to increase.

2.) The design of this alternative resulted in redirecting some of the sub-basin areas that were formerly a part of Outfall 1 to Outfall 6. This included some of the area that is now a part of sub-basin TCG-C1-51.

a. The drainage divide between Outfalls 1 and 6 is located along the Southwestern border of existing sub-basin DCC120. This was designed to follow the pavement crown of the existing Taxiway D. For Alternative C1, Taxiway D is being reconfigured in this area of the airfield for better traffic movement with the East side of proposed sub-basin TCG-C1-51. This is being designed to follow the new pavement crown in addition to better utilizing the existing storm sewers.

b. In addition, a portion of TCG-C1-51 includes an area that is currently draining to Outfall 1. This new design will result in this drainage now flowing to Outfall 6.

c. This change in overall outfall delineation resulted in an increase, for Outfall 6, in its overall drainage and impervious areas.

3.) The design of this alternative resulted in redirecting some of the sub-basin areas that were formerly a part of Outfall 1 to Outfall 3. This included some of the area that is now a part of sub-basins TCG-C1-8, TCG-C1-9, TCG-C1-10, TCG-C1-20, TCG-C1-21, TCG-C1-22, and TCG-C1-23.

a. Existing sub-basins DCC310 and DCC330 currently flow to Outfall 1. Alternative C1, with the design of proposed Runway 8-26, will bisect these existing sub-basins. Instead of having the Northern sections of these sub-basins flow under the proposed runway pavement, these new sub-basins TCG-C1-8, TCG-C1-9, TCG-C1-10, TCG-C1-20, TCG-C1-21, TCG-C1-22, and TCG-C1-23 have been redirected to flow East and into Outfall 3.

b. This change in overall outfall delineation, as well as the effects of the changes between both Outfalls 1 and 7, and Outfalls 1 and 3, resulted in an overall decrease, for Outfall 1, in both its drainage and impervious areas. The opposite results are seen for Outfall 3.

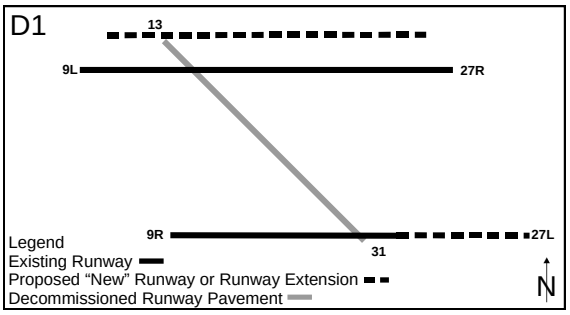
4.) Alternative C1 includes facility relocations, which are located within Outfalls 1, 2, 5, 6, and 7. Because of these, there are significant changes in the total impervious area for those Outfalls, which are considered along with the changes in outfall divides, where applicable.

   a. For Outfall 2, sub-basins were added to the East side of US1 to account for the facility relocations added to this area. This had an impact on both the total drainage and the impervious areas for this outfall.

5.) A portion of TCG-C1-34 includes area that was formerly flowing to Outfall 4. While minor, this will cause a decrease in the total drainage area for Outfall 4.

**Exhibit E.2-18** ***Outfall Diagram – Alternative C1***, shows the new drainage system for this alternative, which includes the individual sub-basins, whether pre-existing or newly created, the outfall drainage areas, and both the outfall drainage and impervious area calculations. **Exhibit E.2-19** ***Drainage Working Diagram – Alternative C1*** shows the flow patterns designed for this alternative. This exhibit shows the path of drainage through the system for the sub-basins within each outfall drainage area until they reach their designated outfall. **Exhibit E.2-20** ***Impacts of the Limits of Disturbance to the Storm Water Sub-basin Design – Alternative C1***, shows the effects of the limits of disturbance to the alternative drainage design. Additional information in regard to the limits of disturbance can be found in Chapter Four, *Section 4.E*.

**Alternative D1: Redevelop and extend existing Runway 9R/27L to 8,000 feet and build a new 7,721-foot runway north of existing Runway 9L/27R (combination of Alternatives B1b and C1)**




Alternative D1 is an alternative that combines characteristics from both Alternative B1b and Alternative C1. Because of this, changes are seen throughout the design, which affects every outfall. In addition, the proposed Runway 9R/27L includes an incline over US1, and therefore additional sub-basins needed to be delineated for the areas over the highway, and to the East.

Please note that since Alternative D1 is a combination of Alternative B1b and C1, the labeling system will include sub-basin names designating their source alternative (For example TCG-C1-1 or TCG-B1b-1). In addition, other sub-basins have been added that are unique to this alternative.

While the general delineations and flow paths of the outfalls remained relatively similar to the original design, there were changes in both the total drainage areas and the impervious areas. These changes are noted more specifically below.

1.) The design of this alternative resulted in redirecting some of the sub-basin areas that were formerly a part of Outfall 7 to Outfall 1. This included some of the areas that are now a part of sub-basins TCG-B1b-4, TCG-B1b-5, TCG-B1b-7, and TCG-B1b-8.

   a. The drainage divide between Outfalls 1 and 7 is located along the northeastern border of existing sub-basins DCB30 and DCB50. This was designed to follow the pavement crown of the existing taxiways. For Alternative D1, these taxiway pavements are being reconfigured to accommodate the mid-field holding pad; therefore, the proposed sub-basins TCG-B1b-4, TCG-B1b-5, TCG-B1b-7, and TCG-B1b-8 are designed to follow the new pavement geometry and better utilize the existing storm sewers.

   b. This change in overall outfall delineation resulted in a decrease of the overall drainage and impervious areas for Outfall 7.

2.) The addition of these of these sub-basins resulted in an increased drainage area and an increased impervious areas; thereby, increasing the flow to Outfall 2.

3.) Sub-Basins TCG-B1b-4 and TCG-B1b-5 include a section that was formerly flowing to Outfall 6, but is now designated for Outfall 1.

4.) The design of this alternative resulted in redirecting some of the sub-basin areas that were formerly a part of Outfall 1 to Outfall 6. This included some of the area that is now a part of sub-basin TCG-C1-51.

   a. The drainage divide between Outfalls 1 and 6 is located along the southwestern border of existing sub-basin DCC120. This was designed to follow the pavement crown of the existing Taxiway D. For Alternative C1, Taxiway D is being reconfigured in this area of the airfield for better traffic movement with the East side of proposed sub-basin TCG-C1-51. This is being designed to follow the new pavement crown and to better utilize the existing storm sewers.

   b. In addition, a portion of TCG-C1-51 includes an area that is currently draining to Outfall 1. This new design will result in this drainage now flowing to Outfall 6.

5.) The design of this alternative resulted in re-directing some of the sub-basin areas that were formerly a part of Outfall 1 to Outfall 3. This included some of the area that is now a part of sub-basins TCG-C1-8, TCG-C1-9, TCG-C1-10, TCG-C1-20, TCG-C1-21, TCG-C1-22, and TCG-C1-23.

   a. Existing sub-basins DCC310 and DCC330 currently flow to Outfall 1. Alternative D1, with the design of proposed Runway 8-26, will bisect these existing sub-basins. Instead of having the northern sections of

these sub-basins flow under the proposed runway pavement, these new sub-basins TCG-C1-8, TCG-C1-9, TCG-C1-10, TCG-C1-20, TCG-C1-21, TCG-C1-22, and TCG-C1-23 have been redirected to flow East and into Outfall 3.

6.) Alternative D1 includes facility relocations, which are located within Outfalls 1, 2, 5, 6, and 7. Because of these additions, there are changes in both total drainage and impervious areas for these outfalls.

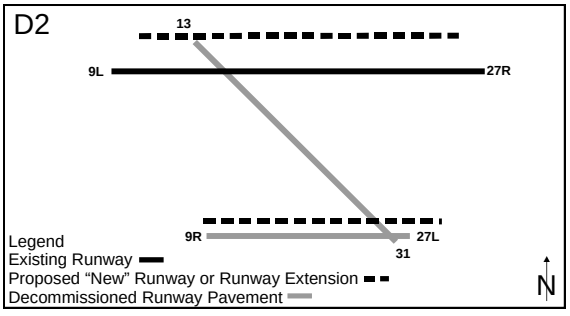
   a. For Outfall 2, sub-basins were added to the East side of US1 to account for the facility relocations added to this area. This addition had an impact on both the total drainage and the impervious areas for this outfall.

7.) A portion of TCG-C1-34 includes area that was formerly flowing to Outfall 4.

8.) These changes in overall outfall delineation resulted in adjustments in both total drainage and impervious areas for all the affected outfalls.

**Exhibit E.2-21** ***Outfall Diagram – Alternative D1***, shows the new drainage system for this alternative. This system includes the individual sub-basins, (whether pre-existing or newly created), the outfall drainage areas, and both the outfall drainage and impervious area calculations. **Exhibit E.2-22** ***Drainage Working Diagram – Alternative D1*** shows the flow patterns designed for this alternative. This exhibit shows the path of drainage through the system for the sub-basins within each outfall drainage area until they reach their designated outfall. **Exhibit E.2-23** ***Impacts of the Limits of Disturbance to the Storm Water Sub-basin Design – Alternative D1***, shows the effects of the limits of disturbance to the alternative drainage design. Additional information in regard to the limits of disturbance can be found in Chapter Four, *Section 4.E*.

**Alternative D2: Build a new 6,001-foot at grade runway with EMAS located 340 feet north of existing south runway and build a 7,721 foot at grade runway located 850 feet north of existing Runway 9L/27R (combination of Alternatives B4 and C1)**




Alternative D2 is an alternative that combines characteristics from both Alternative B4 and Alternative C1. Because of this, changes are seen throughout the design, which affects every outfall. In addition, the proposed Runway 9R/27L includes an incline over US1, and therefore additional sub-basins needed to be designed for the design over the highway, and an additional area to the East.

Please note that since Alternative D2 is a combination of Alternative B4 and C1, the labeling system will include sub-basin names designating their source alternative (For example TCG-C1-1 or TCG-B4-1). In addition, other sub-basins have been added that are unique to this alternative.

While the general delineations and flow paths of the outfalls remained relatively similar to the original design, there were changes seen in both the total drainage areas and the impervious areas. These changes are noted more specifically below.

1.) Because of the design of the new southern runway, both the total drainage and impervious areas will change for Outfall drainage areas 1 and 2. This increase is due to the redirection of drainage of existing sub-basin FDOT10, which currently drains to Outfall 2 following the geometry of a parking lot. This sub-basin is renamed TCG-B4-33, and to coincide with a proposed southern taxiway, will drain to Outfall 1.

2.) This alternative includes facility relocations that will be located within the boundaries of Outfall drainage area 6. To account for the facilities relocation, existing sub-basin DCA70 was divided, which redirected flow from Outfall 6 to Outfall 7.

3.) The design of this alternative resulted in redirecting some of the sub-basin areas between Outfalls 1 and 7.

   a. The drainage divide between Outfalls 1 and 7 is located along the northeastern border of existing sub-basins DCB30 and DCB50. This was designed to follow the pavement crown of the existing taxiways. For Alternative D2, these taxiway pavements are being reconfigured to accommodate the mid-field holding pad; therefore, the proposed sub-basins TCG-CG-2, TCG-CG-4, and TCG-B4-39 are designed to follow the new pavement geometry and to better utilize the existing storm sewers.

4.) The design of this alternative resulted in redirecting some of the sub-basin areas between Outfalls 1 and 6.

   a. The drainage divide between Outfalls 1 and 6 is located along the Southwestern border of existing sub-basin DCC120. This was designed to follow the pavement crown of the existing Taxiway D. For Alternative D2, Taxiway D is being reconfigured in this area of the airfield for better traffic movement with the East side of proposed sub-basin TCG-C1-51. This is being designed to follow the new pavement crown and to better utilize the existing storm sewers.

   b. In addition, a portion of TCG-C1-51 includes an area that is currently draining to Outfall 1. This new design will result in this drainage now flowing to Outfall 6.

   c. TCG-CG-2 includes a section that was formerly draining to Outfall 6. This alternative requires the flow to now be directed to Outfall 1.

5.) The design of this alternative resulted in redirecting some of the sub-basin areas that were formerly a part of Outfall 1 to Outfall 3. This included some of the area that is now a part of sub-basins TCG-C1-8, TCG-C1-9, TCG-C1-10, TCG-C1-20, TCG-C1-21, TCG-C1-22, and TCG-C1-23.

   a. Existing sub-basins DCC310 and DCC330 currently flow to Outfall 1. Alternative C1, with the design of proposed Runway 8-26, will bisect these existing sub-basins. Instead of having the northern sections of these sub-basins flow under the proposed runway pavement, these new sub-basins TCG-C1-8, TCG-C1-9, TCG-C1-10, TCG-C1-20, TCG-C1-21, TCG-C1-22, and TCG-C1-23 have been redirected to flow East and into Outfall 3.

6.) Alternative C1 includes facility relocations, which are located within Outfalls 1, 2, 5, 6, and 7. Because of these, there are significant changes in the total impervious area for those Outfalls, which are considered along with the changes in outfall divides, where applicable.

   a. For Outfall 2, sub-basins were added to the east side of US Highway 1 to account for the facility relocations added to this area. This had an impact on both the total drainage and the impervious areas for this outfall.

7.) A portion of TCG-C1-34 includes area that was formerly flowing to Outfall 4. While minor, this will cause a decrease in the total drainage area for Outfall 4.

**Exhibit E.2-24** ***Outfall Diagram – Alternative D2***, shows the new drainage system for this alternative. This system includes the individual sub-basins, (whether pre-existing or newly created), the outfall drainage areas, and both the outfall drainage and impervious area calculations. **Exhibit E.2-25** ***Drainage Working Diagram – Alternative D2*** shows the flow patterns designed for this alternative. This exhibit shows the path of drainage through the system for the sub-basins within each outfall drainage area until they reach their designated outfall. **Exhibit E.2-26** ***Impacts of the Limits of Disturbance to the Storm Water Sub-basin Design – Alternative D2***, shows the effects of the limits of disturbance to the alternative drainage design. Additional information, in regard to the limits of disturbance can be found in Chapter Four, *Section 4.E*.

## E.2.8 STORMWATER STORAGE ESTIMATES

To facilitate the water quality analyses and net benefits analysis, preliminary estimates of stormwater storage requirements were made for each alternative. The stormwater modeling (SWMM) results from the *Stormwater Management Model Update*, dated December 2005, prepared by CDM (CDM Drainage Report) serve as a baseline for these estimates. This document provides stormwater storage requirements for an airfield configuration that coincides with that of Alternative B1.

For the remaining alternatives, Santa Barbara hydrographs were utilized to estimate the net increase or decrease in stormwater storage requirements relative to Alternative B1. **Table E.2-8** summarizes the results of this analysis.

**Table E.2-8**
**PRELIMINARY STORMWATER STORAGE REQUIREMENTS (ACRE FEET)**
**Fort Lauderdale-Hollywood International Airport**

| | Alternative | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Outfall | A [2/] | B1 [1/] | B1b/B1c [2/] | B4 [2/] | B5 [2/] | C1 [2/] | D1 [2/] | D2 [2/] |
| 1 | 61 | 160 | 160 | 152 | 157 | 129 | 139 | 134 |
| 2 | 60 | 53 | 53 | 51 | 52 | 54 | 52 | 54 |
| 3 | 196 | 196 | 196 | 196 | 196 | 222 | 221 | 222 |
| 4 | 52 | 52 | 52 | 52 | 52 | 50 | 50 | 50 |
| 5 | 142 | 142 | 142 | 142 | 142 | 145 | 145 | 145 |
| 6 | 120 | 120 | 120 | 117 | 120 | 123 | 121 | 120 |
| 7 | 68 | 94 | 88 | 115 | 97 | 68 | 88 | 106 |
| | **699** | **817** | **811** | **825** | **816** | **792** | **816** | **831** |

[1/] The stormwater storage requirements for Alternatives B1 were obtained from the Broward County Aviation Department, Fort Lauderdale-Hollywood International Airport, Stormwater Master Plan Update, December, 2005

[2/] For planning purposes, the preliminary stormwater storage requirements identified for Alternatives A, B1b/B1c, B4, B5, C1, D1,and D2 reflect adjustments to the FLL Stormwater Master Plan's SWMM output utilizing the Santa Barbara Urban Hydrograph method

## E.2.9 COST ESTIMATE FOR THE AIRPORT SPONSOR'S PROPOSED PROJECT

The cost estimates developed for the EIS analysis were based upon the unit cost assumptions provided by U.S. COST. U.S. COST, a consultant to Broward County, prepared a preliminary independent cost estimate for the Airport Sponsor's Proposed Project based on the proposed airfield configuration as of September 23, 2005. This resulted in an estimated cost of $638 million.

The airfield configuration use by U.S. COST does not coincide with the final version of the Airport Sponsor's Proposed Project that is assessed in this EIS as Alternative B1c. Therefore, some modifications to the baseline cost estimate were necessary to reflect the configuration of Alternative B1c. These changes include:

- Elimination of ILS equipment for temporary Runway 9R-27L
- Installation of EMAS at both runway ends
- Adjustments to airfield pavement demolition and construction costs to reflect actual quantities in accordance with the revised pavement geometry
- Elimination of elevated Griffin Road / U.S. Highway 1 intersection
- Inclusion of facility relocation and demolition costs

- Inclusion of the costs associated with the potential acquisition of the Wyndham (Hilton) Hotel

Because of these changes, the cost estimate for Alternative B1c was increased to $695 million for the purposes of comparing the EIS airfield development. The resulting preliminary cost estimates for the EIS airfield development alternatives are contained in Chapter Four, *Alternatives.*

# E.3 CONSTRUCTABILITY ANALYSES

The constructability analyses include a preliminary evaluation of construction sequencing, maintenance of traffic, and construction schedules associated with the implementation of the airfield development alternatives.

## E.3.1 CONSTRUCTION SEQUENCING / MAINTENANCE OF TRAFFIC

The following is a brief summary of the sequencing of construction activities for the seven airfield development alternatives that have been identified for evaluation during the Environmental Impact Statement (EIS). This will form the basis for evaluating environmental consequences associated activities and conducting the Net Benefits Analysis.

### E.3.1.1 Alternative A

Alternative A is the No-Build Alternative, thus no construction activities would occur.

### E.3.1.2 Alternative B1/B1b/B1C

The following are the primary phases of construction for Alternatives B1/B1b/B1c:

Phase 0 (Pre-construction activities):

- Contract bid and award
- Permitting
- Engineering design (Runway)
- Terminal foundation and building design
- Relocate Buckeye Pipeline
- Stockpile fill material
- Construct slurry pipeline from Port Everglades and/or FEC rail spur/conveyor system to transport embankment (fill) material.

Phase 1A:

- Existing runways remain operational
- Taxiways G and H remain operational
- Construct temporary taxiway connecting Taxiway E to Taxiway P

- Construct portion of temporary taxiway connecting the Sheltair (Jet Center) ramp to Taxiway Q
- Relocate Jet Center and Gulfstream International facilities
- Relocate ASR

Phase 1B:

- All existing runways remain operational
- Taxiways G and H remain operational
- Construct east end of permanent Runway 9R/27L and parallel Taxiway over FEC Railway U.S. Highway 1 (Includes construction of MSE retaining wall)
- Construct west end of the new taxiway/temporary runway 9R/27L
- Construct west end of the temporary taxiway connecting to new taxiway/temporary Runway 9R/27L
- Realign east end of Taxiway G for temporary use.

Phase 2:

- Existing Runways 9R/27L and 13/31 remain operational
- Taxiways G and H remain operational
- Construct east end of the temporary taxiway east of Taxiway Q
- Begin construction of midfield hold pad
- Continue construction of east end of new permanent Runway 9R/27L

Phase 3:

- Existing Runways 9L/27R and 13/31 remain operational
- Commission temporary Runway 9R/27L (ARC B-II)
- Decommission existing Runway 9R/27L and parallel Taxiways G and H
- Realign Taxiway T immediately south of Terminal 4
- Decommission and downsize south gates at Terminal 4
- Continue construction the new Runway 9R/27L

Phase 4:

- Existing Runways 9L/27R remain operational
- Continue operation of temporary Runway 9R/27L (Construction of MSE retaining wall may limit arrivals to Runway 27L and/or departures from Runway 9R)
- Permanent closure of Runway 13/31
- Complete construction of new permanent Runway 9R/27L and dual parallel taxiways
- Complete midfield holding bay expansion
- Install EMAS (Alternative B1b/B1c only)

Phase 5:

- Commission new permanent Runway 9R/27L and inner parallel taxiway
- Convert temporary Runway 9R/27L to permanent outer parallel taxiway.
- Decommission temporary rail spur and/or slurry pipeline

### E.3.1.3 Alternative B4

The following are the primary phases of construction for Alternative B4:

Phase 0 (Pre-construction activities):

- Contract Bid and Award
- Permitting
- Engineering Design (Runway)
- Terminal Foundation Design
- Terminal Building Design
- Relocate Buckeye Pipeline
- Stockpile Fill
- Relocate Jet Center and Gulfstream International facilities
- Relocate ASR facility

Phase 1:

- Existing Runway 9R/27L and Parallel Taxiways G and H remain operational
- Existing Runway 13/31 and Taxiways Q and E remain operational
- Construct east end of new Runway 9R/27L
- Construct east wing of Terminal 4 and associated apron (existing Terminal 4 gates remain operational)
- Construct Western portion of new North parallel taxiways
- Construct new North parallel Taxiways G and H between Runway 13/31 RSA and Taxiway T
- Relocate Perimeter Road and F.E.C Rail Line

Phase 2:

- Existing Runway 9R/27L and parallel Taxiways G and H remain operational
- Temporary closure of Runway 13/31 and Taxiways E and P
- Western portion of new North parallel taxiways become operational
- Continue construction of East wing of Terminal 4 (existing Terminal 4 gates remain operational)
- Complete construction of North parallel taxiways between Taxiway P and Taxiway D OFA

Phase 3:

- Existing Runway 9R/27L remains operational
- Permanent closure of Taxiway G (New North parallel taxiways serve existing Runway 9R/27L)
- Construct central portion of new Terminal 4 and associated apron
- Complete construction of New Runway 9R/27L (including EMAS, localizer and approach lights)
- Construct new Runway 9R/27L taxiway connectors to south parallel taxiway

Phase 4:

- New Runway 9R/27L becomes operational (ARC B-II)
- Decommission existing Runway 9R/27L and parallel Taxiway H
- Temporary displacement of Runway 31 threshold
- Demolish existing Terminal 4 (excluding concourse)
- Construct west wing of Terminal 4 and associated ramp areas (relocate terminal gates)
- Construct south parallel taxiway
- Install Glideslope Antennas

Phase 5:

- New Runway 9R/27L becomes fully operational (ARC D-IV)
- Demolish Terminal 4 concourse (13 NBEG operational)
- Construct remainder of Terminal 4 apron (16 NBEG operational post construction)

### E.3.1.4 Alternative B5

The following are the primary phases of construction for Alternative B5:

Phase 0 (Pre-construction activities):

- Contract Bid and Award
- Permitting
- Engineering Design (Runway)
- Relocate Buckeye Pipeline
- Stockpile Fill
- Construct slurry pipeline from Port Everglades and/or FEC rail spur and/or conveyor system.

Phase 1:

- Existing runways to remain operational
- Existing parallel Taxiways G and H to remain operational
- Realign Griffin Road

- Construct midfield hold pad taxiway system
- Construct east end of new Runway 9R/27L, inner parallel taxiway and MSE retaining wall
- Construct temporary taxiway
- Relocate Gulfstream International facilities

Phase 2:

- Existing runways 9R/27L to remain operational
- Decommission existing Taxiway G
- Construct outer parallel taxiway
- Continue construction of Runway 9R/27L and bridge structure.
- Continue construction of temporary taxiway and midfield taxiway
- Construct outer parallel taxiway (temporary Runway 9R/27L)

Phase 3:

- Existing Runways 9L/27R and 13/31 to remain operational
- Decommission existing Runway 9R/27L and parallel Taxiway H
- Operate outer parallel taxiway as temporary Runway 8R-27L
- Continue construction of Runway 9R/27L
- Construct western portion of inner parallel taxiway
- Construct midfield hold pad (north of Runway 13/31 RSA)

Phase 4:

- Existing Runway 9L/27R to remain operational
- Decommission Runway 13/31
- Complete construction of Runway 9R/27L and Taxiway system
- Convert temporary Runway into permanent Taxiway
- Decommission temporary taxiway
- Complete construction of midfield hold pad

Phase 5:

- Commission new Runway 9R/27L (ARC D-IV)

### E.3.1.5 Alternative C1

The following are the primary phases of construction for Alternative C1:

Phase 0 (Pre-construction activities):

Phase 1:

- Existing Runways to remain operational

- Improve drainage, roadway and utility infrastructure
- Construct dual access taxilanes to facilitate access to relocated tenant facilities
- Relocation non-essential west tenant facilities
- Initiate relocation of north airfield tenants
- Reconfigure Taxiway P and west parallel taxiway
- Realign Taxiway G and new north parallel taxiway
- Relocate primary fuel farm storage facility

Phase 2:

- Existing Runways 9L/27R and 9R/27L remain operational
- Decommission Runway 13/31
- Demolish vacant north tenants facilities with Runway 8/26 OFA, RPZ and NAVAID critical area
- Construct midfield holding bay
- Continue relocation of northeast tenant facilities
- Begin construction of north Runway 8/26

Phase 3:

- Runways 9L/27R and 9R/27L remain operational
- Continue demolition of vacant north airfield facilities within Runway 8/26 OFA, RPZ and NAVAID critical area
- Construct NE portion of Runway 8/26 and taxiway connectors
- Install approach light system and ILS components

Phase 4:

- Runway 9R/27L remains operational
- Runway 8/26 becomes operational, temporary closure of Runway 9L/27R
- Construction of crossing taxiways on going
- Complete construction of taxiway connectors

### E.3.1.6 Alternative D1

The following are the primary phases of construction for Alternative D1:

Phase 0 (Pre-construction activities):

- Contract Bid and Award
- Permitting
- Engineering Design (Runway)
- Terminal Foundation Design
- Terminal Building Design
- Relocate Buckeye Pipeline
- Stockpile Fill
- Initiate relocation of Non-essential Tenants (West Side)
- Construct slurry pipeline from Port Everglades and/or F.E.C. Rail Spur with conveyor system for transportation of fill material

Phase 1A:

- Existing Runways remain operational
- Taxiways G and H remain operational
- Relocate Gulfstream and Jet Center hangars
- Construct temporary taxiway connecting Taxiway E to Taxiway P
- Construct portion of temporary taxiway connecting the Sheltair (Jet Center) ramp to Taxiway Q
- Relocated ASR-9 (Site 2 or 3 only)

Phase 1B:

- All existing Runways remain operational
- Taxiways G and H remain operational
- Construct east end of permanent Runway 9R/27L and parallel Taxiway over U.S. Highway 1 (Includes construction of MSE retaining wall))
- Construct west end of the new taxiway/temporary Runway 9R/27L
- Construct west end of the temporary taxiway connecting to new taxiway/temporary Runway 9R/27L
- Realign east end of Taxiway G for temporary use

Phase 2:

- All existing runways remain operational
- Taxiways G and H remain operational
- Construct east end of the temporary taxiway east of Taxiway Q
- Begin construction of midfield holding bay

- Complete temporary Runway 9R/27L
- Continue construction of east end of new permanent Runway 9R/27L

Phase 3:

- Existing Runways 9L/27R and 13/31 remain operational
- Commission temporary Runway 9R/27L (ARC B-II)
- Decommission existing Runway 9R/27L and parallel Taxiways G and H
- Realign Taxiway T Immediately south of Terminal 4
- Decommission and downsize south gates at Terminal 4 (Unless Terminal is reconfigured)
- Construct remaining sections of the new Runway 9R/27L and inner parallel taxiway outside of Runway 13/31
- Initiate relocation of north airfield tenants
- Relocated fuel farm storage facility

Phase 4:

- Existing Runway 9L/27R remain operational
- Continue operation of temporary Runway 9R/27L (Construction of MSE retaining wall may limit arrivals to Runway 27L and/or departures from Runway 9R)
- Permanent closure of Runway 13/31
- Complete construction of new permanent Runway 9R/27L and dual parallel taxiways
- Begin construction of north Runway 8/26
- Complete midfield holding bay expansion
- Install Engineered Material Arresting System (EMAS) on Runway 9R/27L
- .Demolish vacant north tenants facilities within Runway 8/26 OFA, RPZ and NAVAID critical area
- Continue relocation of northeast facilities

Phase 5:

- Commission new permanent Runway 9R/27L and inner parallel taxiway
- Convert temporary Runway 9R/27L to permanent outer parallel taxiway
- Decommission temporary rail spur and/or slurry pipeline
- Construct NE portion of Runway 8/26 and taxiway connectors
- Complete installation of approach light system and ILS components

Phase 6:

- New Runway 9R/27L remains operational
- Runway 8/26 becomes operational, temporary closure of Runway 9L/27R
- Construction of crossing taxiways on-going
- Complete construction of taxiway connectors

### E.3.1.7 Alternative D2

The following are the primary phases of construction for Alternative D2:

Phase 0 (Pre-construction activities):

- Contract Bid and Award
- Permitting
- Engineering Design (Runway)
- Terminal Foundation Design
- Terminal Building Design
- Relocate Buckeye Pipeline
- Stockpile Fill
- Relocate Jet Center and Gulfstream International facilities
- Relocate ASR facility

Phase 1:

- Existing Runway 9R/27L and Parallel Taxiways G and H remain operational
- Existing Runway 13/31 and Taxiways Q and E remain operational
- Construct East end of new Runway 9R/27L
- Construct East wing of Terminal 4 and associated apron (existing Terminal 4 gates remain operational)
- Construct Western portion of new North parallel taxiways
- Construct new North parallel Taxiways G and H between Runway 13/31 RSA and Taxiway T
- Improve drainage, roadway, and utility infrastructure for tenant facility relocation
- Construct dual taxilanes for west tenant facility relocations
- Initiate relocation of West airfield tenants

Phase 2

- Existing Runway 9R/27L and parallel Taxiways G and H remain operational
- Temporary closure of Runway 13/31 and Taxiway E and P
- Initiate relocation of northwest airfield tenants

- Western portion of new North parallel taxiways become operational
- Continue construction of East wing of Terminal 4 (existing Terminal 4 gates remain operational)
- Complete construction of North parallel taxiways between Taxiway P and Taxiway D OFA

Phase 3:

- Existing Runway 9R/27L remains operational
- Permanent closure of Taxiway G (New North parallel taxiways to serve existing Runway 9R/27L
- Construct central portion of Terminal 4 and associated apron
- Complete construction of new Runway 9R/27L (including EMAS, localizer and approach lights)
- Construct new Runway 9R/27L taxiway connectors to south taxiways

Phase 4:

- New Runway 9R/27L becomes operational (ARC D-IV)
- Continue relocation of north airfield tenants
- Decommission existing Runway 9R/27L and parallel Taxiway H
- Permanent closure of Runway 13/31
- Demolish existing Terminal 4 (excluding concourse)
- Construct west wing of Terminal 4 and associated ramp areas (relocate terminal gates)
- Construct south parallel taxiway
- Install glideslope antennas on new Runway 9R/27L
- Begin construction of Runway 8/26

Phase 5:

- Continue relocation of north tenant facilities
- Demolish Terminal 4 concourse (13 NBEG operational)
- Construct remainder of Terminal 4 apron (16 NBEG operational post construction)
- Continue demolition of vacant north airfield tenant facilities
- Construct east end of Runway 8/26 and taxiway connectors
- Install approach light system and ILS components on Runway 8/26

Phase 6:

- Continue demolition of vacant north airfield facilities within Runway 8/26 OFA, RPZ and NAVAID critical area
- Construct NE portion of Runway 8/26 and taxiway connectors

- Install approach light system and ILS components

Phase 7:

- Runway 8/26 becomes operational, temporary closure of Runway 9L/27R
- Construction of crossing taxiways on going
- Complete construction of taxiway connectors

## E.3.2 PRODUCTION SCHEDULES

The preliminary construction sequencing plans presented in Section E.3.1, *Construction Sequencing / Maintenance of Traffic*, is the basis for estimating design and construction durations that were included in the air quality analyses for the Draft EIS. These estimates consider all tasks associated with implementation following the issuance of a Record of Decision (ROD) with a traditional bid, design and construct process as a baseline. Based on current procurement/administrative and permitting procedures, the schedules are predicated on a minimum of one-year duration between the ROD and commencing any construction activities. Should a design/build contract or Construction Management (CM) at Risk contract be procured by BCAD, the procurement and construction durations could be reduced accordingly.

The following sections present the preliminary baseline schedules in the form of Gantt charts. Each line item in the schedule corresponds with the primary phases contained in the construction sequencing plan presented in Section E.3.1, *Construction Sequencing/Maintenance of Traffic*. This schedule assumes that the FAA would issue its ROD at the end of 2007, but may be accelerated if a ROD is issued earlier in the year.

### E.3.2.1 Alternatives B1/B1b/B1c

The construction schedule for Alternatives B1/B1b/B1c is presented in **Figure E.3-1.** Consistent with current planning and engineering analyses provided by BCAD, this schedule is predicated on the design and construction of a box culvert tunnel structure over the FEC Railway and U.S. Highway 1. This presents a complicated maintenance of traffic issues with maintaining both corridors. As a result, the overall design/construction process is estimated to have a duration of approximately six and one-half years. Should BCAD commence the procurement process at the beginning of 2008, this would result in a project completion date in 2014, during which Runway 9R/27L would become operational.

Consultation with BCAD staff has indicated that it may be possible that a deck structure be utilized in lieu of a box culvert design. They would also like to commence the procurement process for a design firm this year and begin preliminary design efforts prior to the issuance of the ROD. Should the design of a deck structure be adopted and preliminary design efforts commence prior to the issuance of the ROD, the construction duration could be reduced to approximately four and one-half years, potentially allowing for its completion in 2012.

### E.3.2.2 Alternative B4

The construction schedule for Alternative B4 is presented in **Figure E.3-2.** Since the construction of Runway 9R/27L would be integrated with the reconstruction of Terminal 4, the commencement of airfield construction activities could be delayed beyond one year. Therefore, the estimated duration of the design/construction activities associated with Alternative B4 would be approximately seven years. Should BCAD commence the procurement process at the end of 2007, this would result in a project completion date in 2014, during which a reconfigured Terminal 4 would become operational. It is estimated, however, that Runway 9R/27L would become operational in 2012, prior to the completion of Terminal 4.

### E.3.2.3. Alternative B5

The construction schedule for Alternative B5 is presented in **Figure E.3-3.** Similar to Alternatives B1, B1b, and B1c, this schedule is predicated on the design and construction of a box culvert tunnel structure over the FEC Railway and U.S. Highway 1. As a result, the duration of the overall construction process is estimated to be nearly six years. Should BCAD commence the procurement process at the end of 2007, this would result in a project completion date in 2014, during which Runway 9R/27L would become operational.

Should a deck structure be adopted in lieu of a box culvert, the design/construction duration could be reduced to five years, potentially allowing for its completion in 2012.

### E.3.2.4 Alternative C1

The construction schedule for Alternative C1 is presented in **Figure E.3-4.** The implementation of this alternative is complicated by the amount of facility relocations that would be required in advance of the construction of Runway 8/26. Although the duration of negotiating tenant relocations is speculative, it may be feasible for the construction of Runway 8/26 to commence in 2011. This would allow for Runway 8/26 to become fully operational in 2014. It should be noted that there would be a brief period of time after Runway 8/26 would become operational, but Runway 9L/26R would be closed temporarily to facilitate the construction of the cross-field taxiways through its RSA.

### E.3.2.5 Alternative D1

The construction schedule for Alternative D1 is presented in **Figure E.3-5.** Consistent with Alternatives B1b/B1c, the completion of Runway 9R/27L would occur in 2014, unless a deck structure is implemented in lieu of a box culvert. Due to its dependency on the closure of Runway 13/31, construction of Runway 8/26 would not occur until Phase 4 (2013 – assuming a box culvert tunnel design). On that basis, Alternative D2 would have a design/construction duration of approximately eight years, thereby allowing Runway 8/26 to become operational in 2016. Should a deck structure be adopted for Runway 9R/27L, Runway 8/26 could become operational in 2014, reducing the design/construction duration to seven years.

### E.3.2.6 Alternative D2

The construction schedule for Alternative D2 is presented in **Figure E.3-6**. Consistent with Alternative B4, Runway 9R/27L would become fully operational in 2013. Although the construction of Runway 9R/27L does not require the permanent closure of Runway 13/31, it would not be prudent to commence the construction of Runway 8/26 until the new Runway 9R/27L becomes fully operational. This would ensure that a suitable backup runway is available in case the closure of Runway 9R/27L is required for maintenance or an emergency is declared. Therefore, the construction of Runway 8/26 would not commence until 2012. On that basis, Alternative D2 would have a design/construction duration of approximately eight years; thereby Runway 8/26 could become operational in 2014.

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