

ATCT SITE SELECTION STUDY (2012)

Page intentionally left blank

Concord Regional Airport Airport Traffic Control Tower Site Selection Study



Prepared For:
Concord Regional Airport
in association with
North Carolina Department of Transportation Division of Aviation

Prepared by:
TALBERT&BRIGHT

Final October 2012

SITE SELECTION STUDY
SIGNATURE PAGE



Manager, AJW-E11 Date
ESA Terminal Engineering Group

Manager, AJV-E3 date
ESA Planning & Requirements Group

Manager, AJW-E15
Engineering Services

Manager, AS0-600
Airports Division

Richard K. Lewis
JQF Airport Director

Administrator, AS0-001
Southern Region

Manager, AJW-3742
ESA Procedures Office

District Manager, AJW-EL
ARTCC

Manager, ATO-T date
Terminal Program Account

Manager, AJS-4SO
Runway Safety Office

Manager , AS0-750 date
Security Division

Director, AJW-E
ESA Technical Operations

Manager, AEA-200 date
Flight Standards Division,

Director, AJT-E date
ESA Terminal Operations

*Concord Regional Airport
ATCT Site Selection Study*

TALBERT&BRIGHT



TABLE OF CONTENTS

TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
THE RECOMMENDED SITE	1
IMPACTS	1
1.0 INTRODUCTION	3
2.0 INITIAL SITES CONSIDERED	5
2.1 Tower Site No. 1	5
2.2 Tower Site No. 2	5
2.3 Tower Site No. 3	7
2.4 Tower Site No. 4	7
2.5 Tower Site No. 5	7
2.6 Tower Site No. 6	8
2.7 Tower Site No. 7	8
2.8 Tower Site No. 8	9
3.0 PREFERRED SITES	10
3.1 Tower Site No. 1	10
3.1.1 Description	10
3.1.2 Site Reference Data	10
The site is located at Latitude 35° 23' 11.781" N and Longitude 80° 42' 44.08" W (State Plane Northing 600,025.39 and Easting 1,489,692.87)	10
3.1.3 Siting Criteria	10
3.1.3.1 Criteria 1 - Visual Performance	10
3.1.3.2 Criteria 2 - TERPS	11
3.1.3.3 Criteria 3 - FAR Part 77 Surfaces	11
3.1.3.4 Criteria 4 – Sunlight/Daylight	11
3.1.3.5 Criteria 5 – Artificial Lighting	12
3.1.3.6 Criteria 6 – Atmospheric Conditions	12
3.1.3.7 Criteria 7 – Industrial Municipal Discharge	13
3.1.3.8 Criteria 8 – Site Access	13
3.1.3.9 Criteria 9 – Interior Physical Barriers	13
3.1.3.10 Criteria 10 – Security	14
3.1.4 Environmental Impacts	14
3.1.5 Miscellaneous Considerations	14
3.1.5.1 Utilities	14
3.1.5.2 Field Cabling	14
3.1.6 Conclusions	14
3.1.7 Preliminary Opinion of Probable Cost	14



TABLE OF CONTENTS

3.1.8	NASWATCH Summary	15
3.2	Tower Site No. 6	15
3.2.1	Description	15
3.2.2	Site Reference Data	15
	The site is located at Latitude 35° 23' 12.08" N and Longitude 80° 42' 49.59" W (State Plane Northing 600,070.71 and Easting 1,489,237.57).....	15
3.2.3	Siting Criteria	15
3.2.3.1	Criteria 1 - Visual Performance	15
3.2.3.2	Criteria 2 - TERPS	16
3.2.3.3	Criteria 3 - FAR Part 77 Surfaces	16
3.2.3.4	Criteria 4 – Sunlight/Daylight.....	16
3.2.3.5	Criteria 5 – Artificial Lighting	16
3.2.3.6	Criteria 6 – Atmospheric Conditions	17
3.2.3.7	Criteria 7 – Industrial Municipal Discharge	18
3.2.3.8	Criteria 8 – Site Access.....	18
3.2.3.9	Criteria 9 – Interior Physical Barriers	18
3.2.3.10	Criteria 10 – Security	18
3.2.4	Environmental Impacts	18
3.2.5	Miscellaneous Considerations	18
3.2.5.1	Utilities.....	18
3.2.5.2	Field Cabling.....	18
3.2.6	Conclusions.....	19
3.2.7	Preliminary Opinion of Probable Cost.....	19
3.2.8	NASWATCH Summary	19
3.3	Tower Site No. 8	19
3.3.1	Description	19
3.3.2	Site Reference Data.....	20
3.3.3	Siting Criteria	20
3.3.3.1	Criteria 1 - Visual Performance	20
3.3.3.2	Criteria 2 - TERPS	20
3.3.3.3	Criteria 3 - FAR Part 77 Surfaces	20
3.3.3.4	Criteria 4 – Sunlight/Daylight.....	21
3.3.3.5	Criteria 5 – Artificial Lighting	21
3.3.3.6	Criteria 6 – Atmospheric Conditions	21
3.3.3.7	Criteria 7 – Industrial Municipal Discharge	22
3.3.3.8	Criteria 8 – Site Access.....	22
3.3.3.9	Criteria 9 – Interior Physical Barriers	22
3.3.3.10	Criteria 10 – Security	22
3.3.4	Environmental Impacts	23
3.3.5	Miscellaneous Considerations	23
3.3.5.1	Utilities.....	23
3.3.5.2	Field Cabling.....	23
3.3.6	Conclusions.....	23



TABLE OF CONTENTS

3.3.7	Preliminary Opinion of Probable Cost.....	23
3.3.8	NASWATCH Summary	23
4.0	SITE COMPARISON CHART.....	26
5.0	SUMMARY AND RECOMMENDATIONS	27
	Final Site Recommendation and CSA Approval.....	28
	Final Recommended Site Comparative Safety Assessment	29

Figures

1-0	Concord Regional Airport Existing Air Traffic Control Tower	2
1-1	Concord Regional Airport Layout Plan	4
2-1	Concord Regional Airport Proposed ATCT Locations	6
3-2	ATCT Positioning Exhibit	24
3-3	Interior Physical Barriers	25
4-1	ATCT Site Comparison: Concord Regional Airport	26

Tables

3-1	Weather ASOS/AWOS Observations	13
-----	--------------------------------------	----

Appendix

A	List of Contacts and Sign-in Sheets	A-1
B	Recommended Tower Site Photos	B-1
C	TERPS Calculations and FAA Determination.....	C-1
D	NASWATCH Report	D-1
E	Comparative Safety Assessment.....	E-1
F	Preliminary Hazard Assessment	F-1
G	Form 7460-1.....	G-1
H	Results from AFTIL Trip #2.....	H-1
I	ATCTVAT Printouts	I-1

TABLE OF CONTENTS



J	Environmental Information.....	J-1
J	Airport Concurrence Form.....	K-1
L	Preliminary Opinion of Probable Cost.....	L-1
M	Drawings	M-1



EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The Concord Regional Airport (Airport) Master Plan Study (February 2004) recommended that the existing ATCT be relocated from the top of the terminal building to provide a clear line of sight to existing and future airfield development as depicted on the October 2004 Airport Layout Plan (ALP) drawing (refer to Figure 1-1, page 2). Currently, the top of the existing ATCT is 701 MSL, with a estimated eye-level height of 693 which is approximately 11 feet lower than the end of Runway 20. In addition, the existing control tower cab size is not sufficient to accommodate new technological equipment, additional workstations, and counter space. Based on these deficiencies, an ATCT Site Selection Study was initiated as part of the Master Plan to determine the optimum location and height for a new ATCT.

THE RECOMMENDED SITE

Site #8, on the west side of the airfield, is the recommended location. Site #8 is located at coordinate Latitude 35° 23' 06.74" and Longitude 80° 42' 45.17" which is approximately 66' to the south of the existing control tower. The tower height at this site is 788' MSL (126' AGL) and an eye-level height of 772' MSL (110' AGL). Site #8 meets all siting criteria and is deemed safe under the safety management system. The proposed tower provides completely unobstructed views of all controlled airport surface areas and maximum visibility of all airborne traffic.

IMPACTS

Visibility: The proposed height and location satisfies the FAA Visibility Performance requirements for unobstructed view, Object Discrimination, and Line of Sight (LOS) Angel of Incidence. All taxiways, runways, aircraft aprons, and approaches are highly visible from the proposed control cab.

FAR Part 77: The proposed tower penetrates the transitional surface, but will be lighted in accordance with FAA regulations.

TERPS: The proposed tower does not create any impact to the existing approach procedures. However, should the airport ever expand the existing ILS to CAT II/III, then the proposed tower would have an IFR effect on the missed approach. The missed approach would be penetrated by 8 feet and an adjustment to the minimums would be necessary.

There are no other known impacts in terms of TERPS, LOS, Part 77, future airport development, and local weather phenomena with the potential to impair visibility.

EXECUTIVE SUMMARY



Figure 1-0 – Concord Regional Airport Existing Air Traffic Control Tower

CHAPTER ONE
INTRODUCTION



1.0 INTRODUCTION

This study has been performed in accordance with Federal Aviation Administration (FAA) Order 6480.4 *Airport Traffic Control Tower Siting Criteria* (November 1972) and FAA Order 6480.4A *Airport Traffic Control Tower Siting Criteria* (April 2006), which establishes requirements for site selection and control tower cab height of airport traffic control towers (ATCT) to be established or replaced for use by the FAA or contract personnel.

The Concord Regional Airport (JQF) Master Plan Study (November 2010) recommended that the existing ATCT be relocated from the top of the terminal building to provide a clear line of site to existing and future airfield development as depicted on the November 2010 Airport Layout Plan (ALP) drawing (refer to Figure 1-1, page 2). Currently, the existing ATCT is lower than the end of Runway 20 by approximately 11 feet. In addition, the existing control tower cab size is not sufficient to accommodate new technological equipment, additional workstations, and counter space. Based on these deficiencies, an ATCT Site Selection Study was initiated as part of the Master Plan to determine the optimum location and height for a new ATCT.

Concord Regional Airport is located in Cabarrus County, North Carolina, approximately seven miles west of the City of Concord (downtown central business district). In addition, the Airport is located approximately 15 minutes northeast of the City of Charlotte's central business district. JQF encompasses approximately 674 acres and is generally bounded by I-85 to the east, the Rocky River and Concord Mills Boulevard to the south, Derita Road to the west, and Poplar Tent Road to the north. Cabarrus County is linked to the Charlotte region by three interstates (I-85, I-77, and I-485) and three major highways (US 29, US 601, and NC 49).

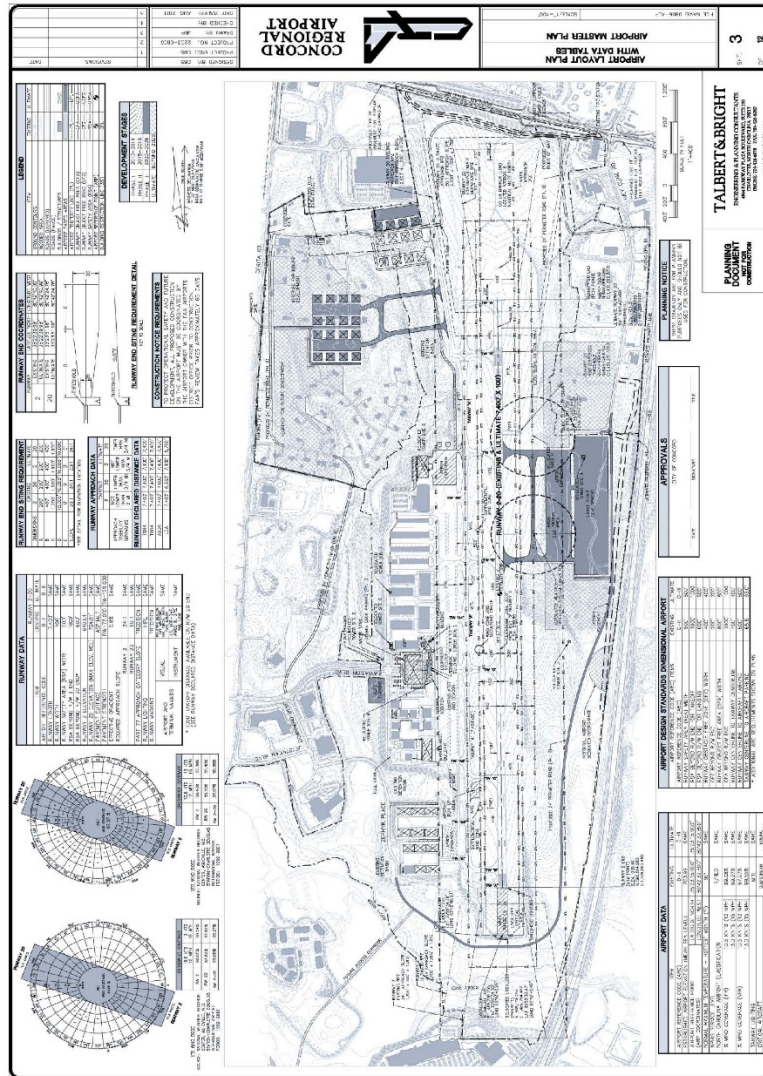
Construction of Concord Regional Airport was completed in September 1994 and officially opened November 11, 1994. Since the opening of the Airport, aviation activity has increased 22.8 percent (between 1998 [55,250 operations] and 2008 [67,874 operations])¹ this growth and the projected growth through 2025 (83,028 operations, representing a 50.3 percent increase or an average annual growth rate of 1.9 percent). In addition to an increase in operations, the number of based aircraft increased from 132 in 1998 to 188 in 2008, an increase of 42 percent. The growth of the airport has led to an increased concern that the existing ATCT would not be able to meet current and future airport needs.

¹Federal Aviation Administration, "APO Terminal Area Forecast Detail Report," December 2008, , accessed June 10, 2009.



CHAPTER ONE
INTRODUCTION

**Figure 1-1 – Concord Regional
Airport Layout Plan**
Source: Talbert & Bright, Inc. (October
2004)
Approved: 2006



Concord Regional Airport
ATCT Site Selection Study

TALBERT & BRIGHT

CHAPTER TWO INITIAL SITES CONSIDERED

2.0 INITIAL SITES CONSIDERED

Figure 2-1 depicts the location of the proposed tower sites: 1, 2, 3, 4, 5, 6, 7, and 8 (refer to Figure 2-1, page 6).

2.1 Tower Site No. 1

Proposed Tower Site No. 1, the original location depicted on the ALP for the ATCT relocation, is located approximately 357.0 feet north of the existing terminal in an undeveloped area between the terminal and Spitfire Hangar. The site is located at Latitude 35° 23' 11.71" and Longitude 80° 42' 44.08" (Northing 600,025.39 and Easting 1,489,692.87) and has a ground elevation of 670.0 feet above mean sea level (MSL). Future development in the vicinity of proposed Tower Site No. 1 includes a new air rescue and fire fighting building; most of the area has already been developed.

Proximity to Terminal	357.0'
Access Road	Yes
Parking	Yes, inside gate
Proximity to Utilities	Good
Proximity to Electrical Vault	765.0'
Future Development Capability	Limited
Approximate Ground Elevation	670.0'

2.2 Tower Site No. 2

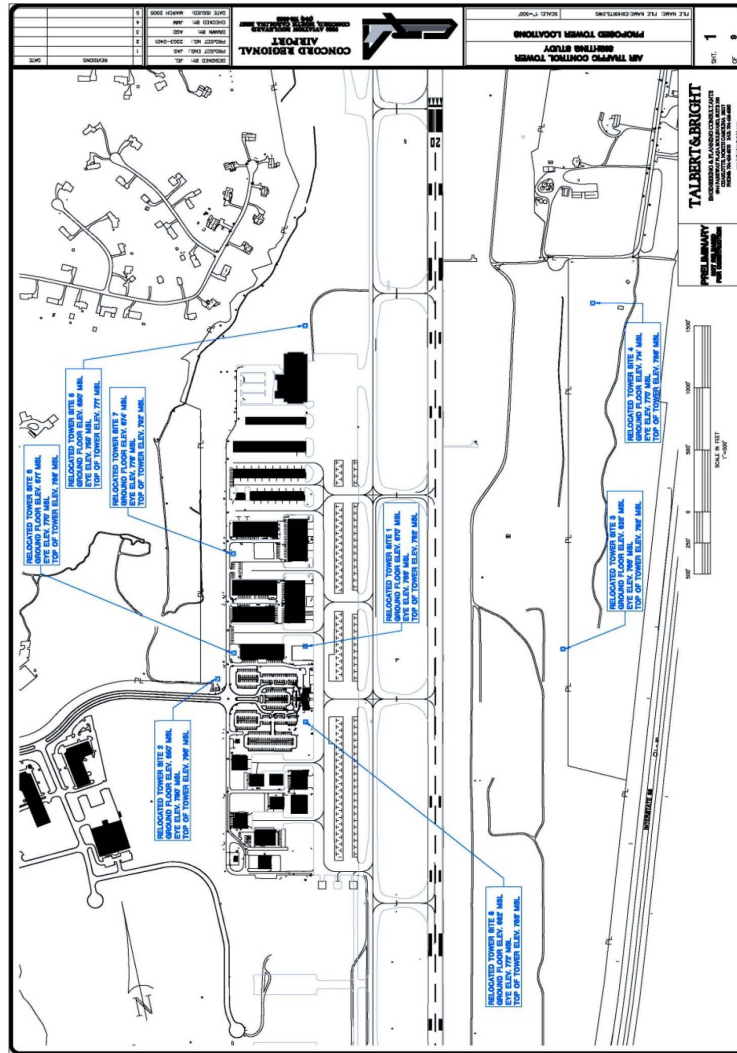
Proposed Tower Site No. 2 is located approximately 600.0 feet west of the existing terminal in an undeveloped area to the north of Aviation Boulevard. The site is located at Latitude 35° 23' 10.58" and Longitude 80° 42' 51.20" (Northing 599,921.64 and Easting 1,489,101.43) and has a ground elevation of 650.0 feet MSL. Future development in the vicinity of proposed Tower Site No. 2 includes a multi-level automobile parking garage.

Proximity to Terminal	600.0'
Access Road	Yes
Parking	Yes
Proximity to Utilities	Good
Proximity to Electrical Vault	450.0'
Future Development Capability	Limited, location of water tank
Approximate Ground Elevation	650.0'



CHAPTER TWO
 INITIAL SITES CONSIDERED

Figure 2-1 – Concord Regional
 Airport Proposed ATCT Locations
 Source: Talbert & Bright, Inc. (May 2005)



Concord Regional Airport
 ATCT Site Selection Study

TALBERT & BRIGHT 6

CHAPTER TWO
EVALUATION OF PROPOSED TOWER SITES



2.3 Tower Site No. 3

Proposed Tower Site No. 3 is located approximately 1,650.0 feet east of the existing terminal in an undeveloped area between Runway 2-20 and Interstate 85 (I-85). The site is located at Latitude 35° 23' 08.57" and Longitude 80° 42' 24.52" (Northing 599,679.97 and Easting 1,491,307.01) and has a ground elevation of 625.0 feet MSL. Future development in the vicinity of proposed Tower Site No. 3 would occur beyond 2022 (the ultimate development window of the ALP).

Proximity to Terminal	1,650.0'
Access Road	No
Parking	No
Proximity to Utilities	Poor
Proximity to Electrical Vault	2,150.0'
Future Development Capability	Good
Approximate Ground Elevation	625.0'

2.4 Tower Site No. 4

Proposed Tower Site No. 4 is located approximately 3,227.0 feet northeast of the existing terminal in an undeveloped area between Runway 2-20 and I-85. The site is located at Latitude 35° 23' 31.06" and Longitude 80° 42' 17.05" (Northing 601,921.54 and Easting 1,491,952.29) and has a ground elevation of 714.0 feet MSL. Future development in the vicinity of proposed Tower Site No. 4 would occur beyond 2022 (the ultimate development window of the ALP).

Proximity to Terminal	3,575.0'
Access Road	No
Parking	No
Proximity to Utilities	Fair
Proximity to Electrical Vault	3,710.0'
Future Development Capability	Fair
Approximate Ground Elevation	730.0'

2.5 Tower Site No. 5

Proposed Tower Site No. 5 is located approximately 2,185.0 feet northwest of the existing terminal in an undeveloped area at the end of the existing T-hangars. The site is located at Latitude 35° 23' 32.88" and Longitude 80° 42' 39.20" (Northing 602,141.74 and Easting 1,490,122.31) and has a ground elevation of 680.0 feet MSL. Future development in the vicinity of proposed Tower Site No. 5 includes the development of a future apron development.

CHAPTER TWO
EVALUATION OF PROPOSED TOWER SITES



Proximity to Terminal	2,517.0'
Access Road	No
Parking	No
Proximity to Utilities	Good
Proximity to Electrical Vault	2,450.0'
Future Development Capability	Good, Would need to revise ALP to eliminate future corporate hangar.
Approximate Ground Elevation	680.0'

2.6 Tower Site No. 6

Proposed Tower Site No. 6 is located approximately 575 feet northwest of the existing terminal at the end of Hanger 'A' that houses the ARFF equipment. The site is located at Latitude 35° 23' 12.08" and Longitude 80° 42' 49.59" (Northing 600,070.71 and Easting 1,489,237.57) and has a ground elevation of 671.0 feet MSL. Future development in the vicinity of proposed Tower Site No. 6 is limited because most of the area has already been developed.

Proximity to Terminal	575.0'
Access Road	Yes
Parking	Yes
Proximity to Utilities	Good
Proximity to Electrical Vault	600.0'
Future Development Capability	Limited
Approximate Ground Elevation	671.0'

2.7 Tower Site No. 7

Proposed Tower Site No. 7 is located approximately 1,100.0 feet northwest of the existing terminal next to the existing Hangar 'H'. The site is located at Latitude 35° 23' 18.59" and Longitude 80° 42' 48.20" (Northing 600,727.40 and Easting 1,489,364.01) and has a ground elevation of 674.0 feet MSL. Future development in the vicinity of proposed Tower Site No. 7 is limited because most of the area has already been developed.

Proximity to Terminal	1,100.0'
Access Road	Yes
Parking	Yes
Proximity to Utilities	Good
Proximity to Electrical Vault	1,265.0'
Future Development Capability	Limited
Approximate Ground Elevation	674.0'

CHAPTER TWO
EVALUATION OF PROPOSED TOWER SITES



2.8 Tower Site No. 8

Proposed Tower Site No. 8 is located approximately 66.0 feet south of the existing terminal in the location where the proposed terminal expansion is illustrated on the ALP. The site is located at Latitude 35° 23' 07.04" and Longitude 80° 42' 45.28" (Northing 599,555.30 and Easting 1,489,585.62), and has a ground elevation of 662.0 feet MSL. Future development in the vicinity of proposed Tower Site No. 8 is limited because most of the area has already been developed. Parking would utilize parking lots for the existing terminal building.

Proximity to Terminal	66.0'
Access Road	Yes
Parking	Yes
Proximity to Utilities	Good
Proximity to Electrical Vault	400.0'
Future Development Capability	Limited
Approximate Ground Elevation	662.0'

CHAPTER THREE
PREFERRED SITES



3.0 PREFERRED SITES

3.1 Tower Site No. 1

3.1.1 Description

Proposed Tower Site No. 1 is located approximately 357.0 feet north of the existing terminal in an undeveloped area between the terminal and Spitfire Hangar. The site has a ground elevation of 670.0 feet above mean sea level (MSL). The ATCT cab will have northerly, easterly, and southerly views of the airfield. This site would allow for visibility of airborne traffic patterns. No anticipated conditions exist that would block or prevent air traffic controllers from seeing aircraft in the air. The location of Tower Site No. 1 would allow direct observation of the runway approaches and landing areas. The result of the Three-Dimensional Airspace Analysis Program (3DAAP) analysis conducted indicated that for the tower to clear all the buildings for a clear line of sight, the tower would penetrate the Part 77 transitional surface. Based on this analysis, the controller eye height would be 60.0 feet, and the tower height would be 76.0 feet. The critical point, object that dictates the height for line of sight, for the location of Tower Site No. 1 is the hangar just north of the site, which has a crown of 714.0 feet. The critical point is approximately 350.0 feet away from the proposed tower location (refer to Appendix I). The minimum height for depth perception would be 62.0 feet above the runway threshold elevation of 703.7 MSL. This would require an eye-level elevation of 766.0 feet, which is higher (36.0 feet) than the required height for visibility based on the line-of-sight requirements (730.0 feet MSL).

The proposed tower height of the cab level is 96 feet AGL (766 feet MSL). The overall height is estimated to the tops of the antennas and lightning rods is 112 feet AGL (782 feet MSL). Future development in the vicinity of proposed Tower Site No. 1 includes a new air rescue and fire fighting building; most of the area has already been developed.

3.1.2 Site Reference Data

The site is located at Latitude 35° 23' 11.781" N and Longitude 80° 42' 44.08" W (State Plane Northing 600,025.39 and Easting 1,489,692.87).

3.1.3 Siting Criteria

3.1.3.1 Criteria 1 - Visual Performance

A visibility siting analysis was performed to assess the impact of tower height on ATCT ability to notice the presence of an object on the airport surface, ability to discriminate a class of objects, and line of sight angle of a distant object intersects

CHAPTER THREE
PREFERRED SITES

the airport surface. The analysis was performed using the FAA's tower visibility analysis tool for each end of the runway. The line of sight angle of incidence furthest point on the airport was the end of Runway 20. The distance to this point from Tower Site No. 1 is 4,385 feet. Tower Site No. 1 "passed" the minimum requirements with a 99.8% detection and 69.3% recognition. There were no impacts from the Shadow Study (see Appendix I).

3.1.3.2 Criteria 2 - TERPS

An evaluation of the United States Standard for Terminal Instrument Procedures was conducted by FAA - Flight Procedures Team / AJV-E24. There were no impacts to any of the existing and future planned instrument procedures for this site. There was an impact to CAT II/III instrument procedure missed approach surface. It will create a 12 ft. penetration to any future CAT II missed approach surface area "D". With all other requirements of CAT II minimums being addressed, the charted results will be a restricted CAT II with 100 FT HAT and 1200 RVR. No further improvements to CAT III operations will be available. The result of this analysis is included in Appendix C.

An FAA review of Form 7460- resulted in a Final Determination Letter citing no objection, provided applicable requirements are met during construction. A copy of the Final Determination Letter is included in Appendix C.

3.1.3.3 Criteria 3 - FAR Part 77 Surfaces

This evaluation was done relative to the existing precision instrument approach. Tower Site No. 1 is located within the Part 77 transitional surface, which has an elevation of 722.0 feet at this location. The proposed tower site would have a maximum elevation of 766.0 feet and would penetrate the Part 77 surface elevation by 44 feet. The ATCT would be lighted with red FAA L-801 obstruction lighting in accordance with FAA Advisory Circular (AC) 70/7460-1K.

3.1.3.4 Criteria 4 – Sunlight/Daylight

Tower Site No. 1 is located on the west side of the runway, and therefore sun glare during sunset is not an impact. The site would experience moderate glare early in the morning when scanning left hand traffic to Runway 20. This can be easily mitigated with appropriate sun shades in the cab.

There was no sun glare off natural and manmade surfaces, thermal distortion, etc. that will impact the operation of the ATCT. Photographs are included in Appendix B.

CHAPTER THREE
PREFERRED SITES



3.1.3.5 Criteria 5 – Artificial Lighting

The main area of concern for external light sources is the lighting associated with the aircraft apron area in front of the terminal building. However, due to the height of the proposed tower (96.0 feet eye level), it is not anticipated that the external light source would be a problem. The existing beacon would be relocated to the top of the cab.

There was no other night time ground and airborne operation caused by airport lighting/background clutter, municipal lighting, industrial lighting that will impact the operation of the ATCT.

3.1.3.6 Criteria 6 – Atmospheric Conditions

Weather data was obtained from the State Climate Office of North Carolina for Concord Regional Airport. There were 20,548 records of hourly reporting with 11,588 missing records of hourly reporting for Concord Regional Airport. Therefore, data was also obtained from Charlotte/Douglas International Airport. There were 32,204 records of hourly reporting with 68 missing records. Charlotte/Douglas International Airport was utilized in the analyzed reported in the paragraphs below. The data was reviewed to assess the number of hours during which the ceiling was less than the proposed tower height plus 100 feet, and the visibility was less than 1 mile. The 1 mile visibility was chosen based on the distance from the proposed tower location to the farthest point on the airport. A summary of this data can be found in Table 3-1 (Table only contains data til 8-31 for 2009).

The distance from the proposed Tower Site No. 1 to the farther point on the airport is 4,386 feet or 0.83 mile. The data reported visibilities on 0.25 mile increments. The visibility was 1 mile or less an average of 116 times per year. The hourly reports showing visibilities 1 mile or less ranged from 80 times per year to 170 times per year.

The proposed tower height for Site No. 1 is 112 feet AGL (including antennas) plus the 100 feet criteria in the FAA Tower Siting Order gave a total height of 212 feet AGL. In order to be conservative the data analysis was review based on using 300 foot ceilings. Ceilings of 300 or less where reported an average of 146 times per year (this includes ceilings of 200 or less and 100 or less). The hourly reports showing ceilings 300 or less range from 95 times per year to 209 times per year.

Concord Regional Airport is served by an ILS approach to Runway 20. The approach minimums for Runway 20 are visibility of ½ mile and a minimum decision height of 200 feet AGL or 905 feet MSL. Runway 2 is served by a RNAV (GPS) approach. The RNAV (GPS) approach minimums are 1 ¼ mile and a decision altitude of 316 feet AGL or 983 feet MSL. The top of proposed tower

CHAPTER THREE
PREFERRED SITES



being at an elevation of 782 feet MSL. The proposed tower height is 123 feet below the minimum decision height for the ILS to Runway 20, and is 201 feet below the decision altitude for the RNAV (GPS) to Runway 2.

Table 3-1 Weather ASOS/AWOS Observations (Hours Reported)				
Charlotte/Douglas International Airport - CLT (17.5 nm from JQF)				
Year	Ceiling ≤ 100	Ceiling ≤ 200	Ceiling ≤ 300	Visibility ≤ 1
2006	21	68	45	120
2007	37	45	64	80
2008	39	86	84	170
2009	20	28	47	93
Average	29	57	60	116
Concord Regional Airport - JQF				
Year	Ceiling ≤ 100	Ceiling ≤ 200	Ceiling ≤ 300	Visibility ≤ 1
2006	32	56	44	85
2007	11	24	35	54
2008	32	46	63	56
2009	13	37	3	33
Average	22	41	36	57

3.1.3.7 Criteria 7 – Industrial Municipal Discharge

The proposed Tower Site No.1 is just north of the existing tower. The Concord Regional Airport is located between a large commercial shopping center to the south and a rock quarry to the north. No industrial or municipal discharges are evident in the area surrounding the Airport.

3.1.3.8 Criteria 8 – Site Access

Access to the site would not require crossing of any aircraft operations areas. The site will be accessed from the terminal parking lot, through a secure pedestrian gate that will be installed.

3.1.3.9 Criteria 9 – Interior Physical Barriers

An eight sided tower cab is anticipated to be utilized. Using an eight sided tower cab, sight lines were analyzed for impacts caused by mullion layouts, and anticipated equipment layouts. There were no impacts to runway approach and departure ends, or runway/taxiway intersections. A drawing depicting these lines of sights is found in Figure 3-3.

CHAPTER THREE
PREFERRED SITES



3.1.3.10 Criteria 10 – Security

This control tower will be sponsor owned, and will be a contract tower. There are no physical security requirements of this facility, with the exception of being able to lock the doors and secure the access to the tower cab. This control tower will have card access, and there will be a video camera that will be sited on the door. The elevator will be coded that only certain cards can access to the tower cab.

3.1.4 Environmental Impacts

This environmental analysis does not represent a comprehensive and detailed review of potential environmental impacts. The purpose of this analysis is to determine what environmental issues should be considered for this proposed tower site. This proposed area is currently developed (paved parking area); therefore, no environmental issues are anticipated.

3.1.5 Miscellaneous Considerations

3.1.5.1 Utilities

Utilities required for development of this site (water, wastewater, electric, telephone) are available in this area of the Airport.

3.1.5.2 Field Cabling

Installation of a new duct bank and fiber optic control cabling would be required between the new facility and existing electrical vaults. The proposed location is 750.0 feet away from the existing electrical vault.

3.1.6 Conclusions

Tower Site No. 1 is an acceptable location with good views of aircraft on the airfield and airborne traffic. The height of this location is determined by the angle of incidence/depth perception requirement. No access roads are required to be built for this site, and utilities are located in the general vicinity of the site which reduces the cost of this location.

3.1.7 Preliminary Opinion of Probable Cost

The preliminary opinion of probable cost for this site was developed in September 2009 when the original siting report was completed. These costs are for budgeting only and have not been based on any design, and therefore are subject to change. The preliminary opinion of probable cost for this site is \$3,600,000.

CHAPTER THREE
PREFERRED SITES



3.1.8 NASWATCH Summary

An FAA review of the Form 7460-1 resulted in a Final Determination Letter citing no objection. A copy of the Final Determination Letter and NASWATCH summary is included in Appendix D.

3.2 Tower Site No. 6

3.2.1 Description

Proposed Tower Site No. 6 is located approximately 575 feet northwest of the existing terminal at the end of Hanger 'A' that houses the ARFF equipment. The site has a ground elevation of 671.0 feet MSL. The ATCT cab will have northerly, easterly, and southerly views of the airfield. This site would allow for visibility of airborne traffic patterns. No anticipated conditions exist that would block or prevent air traffic controllers from seeing aircraft in the air. The location of Tower Site No. 6 would allow direct observation of the runway approaches and landing areas. The result of the 3DAAP analysis conducted indicated that for the tower to clear all the buildings for a clear line of sight, the tower would not penetrate the Part 77 transitional surface. Based on this analysis, the controller eye height would be 99 feet, and the tower height would be 115.0 feet. The location would limit the size and location of future expansion for the Airport to the north. The critical point for the location of Tower Site No. 6 is the northeastern-most standard hangar, with a crown height of 719.5 feet. The critical point is approximately 890.0 feet away from the proposed tower location (refer to Appendix I). The minimum height for depth perception would be 64.76 feet above the runway threshold elevation of 640.04 MSL. This would require an eye-level elevation of 700.0 feet, which is lower (70.0 feet) than the required height for visibility based on the line-of-sight requirements (770.0 feet MSL).

The proposed tower height of the cab level is 99 feet AGL (770 feet MSL). The overall height is estimated to the tops of the antennas and lightning rods is 115 feet AGL (786 feet MSL). Future development in the vicinity of proposed Tower Site No. 6 is limited because most of the area has already been developed.

3.2.2 Site Reference Data

The site is located at Latitude 35° 23' 12.08" N and Longitude 80° 42' 49.59" W (State Plane Northing 600,070.71 and Easting 1,489,237.57).

3.2.3 Siting Criteria

3.2.3.1 Criteria 1 - Visual Performance

A visibility siting analysis was performed to assess the impact of tower height on

CHAPTER THREE
PREFERRED SITES



ATCT ability to notice the presence of an object on the airport surface, ability to discriminate a class of objects, and line of sight angle of a distant object intersects the airport surface. The analysis was performed using the FAA's tower visibility analysis tool for each end of the runway. The line of sight angle of incidence furthest point on the airport was the end of Runway 20. The distance to this point from Tower Site No. 6 is 4,530 feet. Tower Site No. 6 "passed" the minimum requirements with a 99.7% detection and 63.7% recognition. There were no impacts from the Shadow Study (see Appendix I).

3.2.3.2 Criteria 2 - TERPS

An evaluation of the United States Standard for Terminal Instrument Procedures was conducted by FAA - Flight Procedures Team / AJV-E24. There were no impacts to any of the existing and future planned instrument procedures for this site. The result of this analysis is included in Appendix C.

An FAA review of Form 7460- resulted in a Final Determination Letter citing no objection, provided applicable requirements are met during construction. A copy of the Final Determination Letter is included in Appendix C.

3.2.3.3 Criteria 3 - FAR Part 77 Surfaces

This evaluation was done relative to the existing precision instrument approach. Tower Site No. 6 is located within the Part 77 transitional surface, which has an elevation of 780.0 feet at this location. The proposed tower site would have a maximum elevation of 786.0 feet and would penetrate the Part 77 surface elevation by 6 feet. The ATCT would be lighted with red FAA L-801 obstruction lighting in accordance with FAA Advisory Circular (AC) 70/7460-1K.

3.2.3.4 Criteria 4 – Sunlight/Daylight

Tower Site No. 6 is located on the west side of the runway, and therefore sun glare during sunset is not an impact. The site would experience moderate glare early in the morning when scanning left hand traffic to Runway 20. This can be easily mitigated with appropriate sun shades in the cab.

There was no sun glare off natural and manmade surfaces, thermal distortion, etc. that will impact the operation of the ATCT. Photographs are included in Appendix B.

3.2.3.5 Criteria 5 – Artificial Lighting

The main area of concern for external light sources is the lighting associated with the aircraft apron area in front of the terminal building. However, due to the height of the proposed tower (99.0 feet eye level), it is not anticipated that the external light source would be a problem. The existing beacon would be relocated to the top of the cab.

CHAPTER THREE
PREFERRED SITES



There was no other night time ground and airborne operation caused by airport lighting/background clutter, municipal lighting, industrial lighting that will impact the operation of the ATCT.

3.2.3.6 Criteria 6 – Atmospheric Conditions

Weather data was obtained from the State Climate Office of North Carolina for Concord Regional Airport. There were 20,548 records of hourly reporting with 11,588 missing records of hourly reporting for Concord Regional Airport. Therefore, data was also obtained from Charlotte/Douglas International Airport. There were 32,204 records of hourly reporting with 68 missing records. Charlotte/Douglas International Airport was utilized in the analyzed reported in the paragraphs below. The data was reviewed to assess the number of hours during which the ceiling was less than the proposed tower height plus 100 feet, and the visibility was less than 1 mile. The 1 mile visibility was chosen based on the distance from the proposed tower location to the farthest point on the airport. A summary of this data can be found in Table 3-1 (Table only contains data till 8-31 for 2009).

The distance from the proposed Tower Site No. 6 to the farther point on the airport is 4,530 feet or 0.86 mile. The data reported visibilities on 0.25 mile increments. The visibility was 1 mile or less an average of 116 times per year. The hourly reports showing visibilities 1 mile or less ranged from 80 times per year to 170 times per year.

The proposed tower height for Tower Site No. 6 is 115 feet AGL (including antennas) plus the 100 feet criteria in the FAA Tower Siting Order gave a total height of 215 feet AGL. In order to be conservative the data analysis was review based on using 300 foot ceilings. Ceilings of 300 or less where reported an average of 146 times per year (this includes ceilings of 200 or less and 100 or less). The hourly reports showing ceilings 300 or less range from 95 times per year to 209 times per year.

Concord Regional Airport is served by an ILS approach to Runway 20. The approach minimums for Runway 20 are visibility of ½ mile and a minimum decision height of 200 feet AGL or 905 feet MSL. Runway 2 is served by a RNAV (GPS) approach. The RNAV (GPS) approach minimums are 1 ¼ mile and a decision altitude of 316 feet AGL or 983 feet MSL. The top of proposed tower being at an elevation of 786 feet MSL. The proposed tower height is 119 feet below the minimum decision height for the ILS to Runway 20, and is 197 feet below the decision altitude for the RNAV (GPS) to Runway 2.

CHAPTER THREE
PREFERRED SITES



3.2.3.7 Criteria 7 – Industrial Municipal Discharge

The proposed Tower Site No. 6 is located approximately 575 feet northwest of the existing tower. The Concord Regional Airport is located between a large commercial shopping center to the south and a rock quarry to the north. No industrial or municipal discharges are evident in the area surrounding the Airport.

3.2.3.8 Criteria 8 – Site Access

Access to the site would not require crossing of any aircraft operations areas. The site will be accessed from the terminal parking lot, through a secure pedestrian gate that will be installed.

3.2.3.9 Criteria 9 – Interior Physical Barriers

An eight sided tower cab is anticipated to be utilized. Using an eight sided tower cab, sight lines were analyzed for impacts caused by mullion layouts, and anticipated equipment layouts. There were no impacts to runway approach and departure ends, or runway/taxiway intersections. A drawing depicting these lines of sights is found in Figure 3-3.

3.2.3.10 Criteria 10 – Security

This control tower will be sponsor owned, and will be a contract tower. There are no physical security requirements of this facility, with the exception of being able to lock the doors and secure the access to the tower cab. This control tower will have card access, and there will be a video camera that will be sited on the door. The elevator will be coded that only certain cards can access to the tower cab.

3.2.4 Environmental Impacts

This environmental analysis does not represent a comprehensive and detailed review of potential environmental impacts. The purpose of this analysis is to determine what environmental issues should be considered for this proposed tower site. This proposed area is currently developed (paved parking area); therefore, no environmental issues are anticipated.

3.2.5 Miscellaneous Considerations

3.2.5.1 Utilities

Utilities required for development of this site (water, wastewater, electric, telephone) are available in this area of the Airport.

3.2.5.2 Field Cabling

Installation of a new duct bank and fiber optic control cabling would be required between the new facility and existing vaults. This site is located 585.0 feet from the existing electrical vault.

CHAPTER THREE
PREFERRED SITES



3.2.6 Conclusions

Tower Site No. 6 is an acceptable location with good views of aircraft on the airfield and airborne traffic. The height of this location is determined by the line of sight requirement. No access roads are required to be built for this site, and utilities are located in the general vicinity of the site which reduces the cost of this location.

3.2.7 Preliminary Opinion of Probable Cost

The preliminary opinion of probable cost for this site was developed in September 2009 when the original siting report was completed. These cost are for budgeting only and have not been based on any design, and therefore are subject to change. The preliminary opinion of probable cost for this site is \$3,780,000.

3.2.8 NASWATCH Summary

An FAA review of the Form 7460-1 resulted in a Final Determination Letter citing no objection. A copy of the Final Determination Letter and NASWATCH summary is included in Appendix D.

3.3 Tower Site No. 8

3.3.1 Description

Proposed Tower Site No. 8 is located approximately 66.0 feet south of the existing terminal in the location where the proposed terminal expansion is illustrated on the ALP. The site has a ground elevation of 662.0 feet MSL. The ATCT cab will have northerly, easterly, and southerly views of the airfield. This site would allow for visibility of airborne traffic patterns. No anticipated conditions exist that would block or prevent air traffic controllers from seeing aircraft in the air. The location of Tower Site No. 8 would allow direct observation of the runway approaches and landing areas. The result of the 3DAAP analysis conducted indicated that for the tower to clear all the buildings for a clear line of sight, the tower would penetrate the Part 77 transitional surface. Based on this analysis, the controller eye height would be 68.0 feet, and the tower height would be 84.0 feet, and the location would limit the size and location of future expansion for the Airport to the north. There are no line of sight critical points for the location of Tower Site No. 8 (refer to Appendix I). The minimum height for depth perception would be 68.0 feet above the runway threshold elevation of 703.7 MSL. This would require an eye-level elevation of 772.0 feet, which is higher (42.0 feet) than the required height for visibility based on the line-of-sight requirements (730.0 feet MSL).

The proposed tower height of the cab level is 110 feet AGL (772 feet MSL). The overall height is estimated to the tops of the antennas and lightning rods is 126 feet AGL (788

CHAPTER THREE
PREFERRED SITES



feet MSL). Future development in the vicinity of proposed Tower Site No. 8 is limited because most of the area has already been developed. Parking would utilize parking lots for the existing terminal building.

3.3.2 Site Reference Data

The site is located at Latitude 35° 23' 07.04" and Longitude 80° 42' 45.28" (Northing 599,555.30 and Easting 1,489,585.62).

3.3.3 Siting Criteria

3.3.3.1 Criteria 1 - Visual Performance

A visibility siting analysis was performed to assess the impact of tower height on ATCT ability to notice the presence of an object on the airport surface, ability to discriminate a class of objects, and line of sight angle of a distant object intersects the airport surface. The analysis was performed using the FAA's tower visibility analysis tool for each end of the runway. The line of sight angle of incidence furthest point on the airport was the end of Runway 20. The distance to this point from Tower Site No. 8 is 4,851 feet. Tower Site No. 8 "passed" the minimum requirements with a 99.6% detection and 56.7% recognition. There were no impacts from the Shadow Study (see Appendix I).

3.3.3.2 Criteria 2 - TERPS

An evaluation of the United States Standard for Terminal Instrument Procedures was conducted by FAA - Flight Procedures Team / AJV-E24. There were no impacts to any of the existing and future planned instrument procedures for this site. The result of this analysis is included in Appendix C.

An FAA review of Form 7460- resulted in a Final Determination Letter citing no objection, provided applicable requirements are met during construction. A copy of the Final Determination Letter is included in Appendix C.

3.3.3.3 Criteria 3 - FAR Part 77 Surfaces

This evaluation was done relative to the existing precision instrument approach. Tower Site No. 8 is located within the Part 77 transitional surface, which has an elevation of 715.0 feet at this location. The proposed tower site would have a maximum elevation of 788.0 feet and would penetrate the Part 77 surface elevation by 73 feet. The ATCT would be lighted with red FAA L-801 obstruction lighting in accordance with FAA Advisory Circular (AC) 70/7460-1K.

CHAPTER THREE
PREFERRED SITES



3.3.3.4 Criteria 4 – Sunlight/Daylight

Tower Site No. 8 is located on the west side of the runway, and therefore sun glare during sunset is not an impact. The site would experience moderate glare early in the morning when scanning left hand traffic to Runway 20. This can be easily mitigated with appropriate sun shades in the cab.

There was no sun glare off natural and manmade surfaces, thermal distortion, etc. that will impact the operation of the ATCT. Photographs are included in Appendix B.

3.3.3.5 Criteria 5 – Artificial Lighting

The main area of concern for external light sources is the lighting associated with the aircraft apron area in front of the terminal building. However, due to the height of the proposed tower (110.0 feet eye level), it is not anticipated that the external light source would be a problem. The existing beacon would be relocated to the top of the cab.

There was no other night time ground and airborne operation caused by airport lighting/background clutter, municipal lighting, industrial lighting that will impact the operation of the ATCT.

3.3.3.6 Criteria 6 – Atmospheric Conditions

Weather data was obtained from the State Climate Office of North Carolina for Concord Regional Airport. There were 20,548 records of hourly reporting with 11,588 missing records of hourly reporting for Concord Regional Airport. Therefore, data was also obtained from Charlotte/Douglas International Airport. There were 32,204 records of hourly reporting with 68 missing records. Charlotte/Douglas International Airport was utilized in the analyzed reported in the paragraphs below. The data was reviewed to assess the number of hours during which the ceiling was less than the proposed tower height plus 100 feet, and the visibility was less than 1 mile. The 1 mile visibility was chosen based on the distance from the proposed tower location to the farthest point on the airport. A summary of this data can be found in Table 3-1 (Table only contains data till 8-31 for 2009).

The distance from the proposed Tower Site No. 8 to the farther point on the airport is 4,851 feet or 0.92 mile. The data reported visibilities on 0.25 mile increments. The visibility was 1 mile or less an average of 116 times per year. The hourly reports showing visibilities 1 mile or less ranged from 80 times per year to 170 times per year.

The proposed tower height for Tower Site No. 8 is 126 feet AGL (including antennas) plus the 100 feet criteria in the FAA Tower Siting Order gave a total

CHAPTER THREE
PREFERRED SITES

height of 226 feet AGL. In order to be conservative the data analysis was review based on using 300 foot ceilings. Ceilings of 300 or less were reported an average of 146 times per year (this includes ceilings of 200 or less and 100 or less). The hourly reports showing ceilings 300 or less range from 95 times per year to 209 times per year.

Concord Regional Airport is served by an ILS approach to Runway 20. The approach minimums for Runway 20 are visibility of ½ mile and a minimum decision height of 200 feet AGL or 905 feet MSL. Runway 2 is served by a RNAV (GPS) approach. The RNAV (GPS) approach minimums are 1 ¼ mile and a decision altitude of 316 feet AGL or 983 feet MSL. The top of proposed tower being at an elevation of 788 feet MSL. The proposed tower height is 117 feet below the minimum decision height for the ILS to Runway 20, and is 195 feet below the decision altitude for the RNAV (GPS) to Runway 2.

3.3.3.7 Criteria 7 – Industrial Municipal Discharge

The proposed Tower Site No. 8 is located approximately 66 feet south of the existing tower. The Concord Regional Airport is located between a large commercial shopping center to the south and a rock quarry to the north. No industrial or municipal discharges are evident in the area surrounding the Airport.

3.3.3.8 Criteria 8 – Site Access

Access to the site would not require crossing of any aircraft operations areas. The site will be accessed from the terminal parking lot, through a secure pedestrian gate that will be installed. See Figure 3-2.

3.3.3.9 Criteria 9 – Interior Physical Barriers

An eight sided tower cab is anticipated to be utilized. Using an eight sided tower cab, sight lines were analyzed for impacts caused by mullion layouts, and anticipated equipment layouts. There were no impacts to runway approach and departure ends, or runway/taxiway intersections. A drawing depicting these lines of sights is found in Figure 3-3.

3.3.3.10 Criteria 10 – Security

This control tower will be sponsor owned, and will be a contract tower. There are no physical security requirements of this facility, with the exception of being able to lock the doors and secure the access to the tower cab. This control tower will have card access, and there will be a video camera that will be sited on the door. The elevator will be coded that only certain cards can access to the tower cab.

CHAPTER THREE
PREFERRED SITES



3.3.4 Environmental Impacts

This environmental analysis does not represent a comprehensive and detailed review of potential environmental impacts. The purpose of this analysis is to determine what environmental issues should be considered for this proposed tower site. This proposed area is currently developed (paved parking area); therefore, no environmental issues are anticipated.

3.3.5 Miscellaneous Considerations

3.3.5.1 Utilities

Utilities required for development of this site (water, wastewater, electric, telephone) are available in this area of the Airport.

3.3.5.2 Field Cabling

Installation of a new duct bank and fiber optic control cabling would be required between the new facility and existing vaults. This site is located 400.0 feet from the existing electrical vault.

3.3.6 Conclusions

Tower Site No. 8 is an acceptable location with good views of aircraft on the airfield and airborne traffic. The height of this location is determined by the angle of incidence/depth perception requirement. No access roads are required to be built for this site, and utilities are located in the general vicinity of the site which reduces the cost of this location.

3.3.7 Preliminary Opinion of Probable Cost

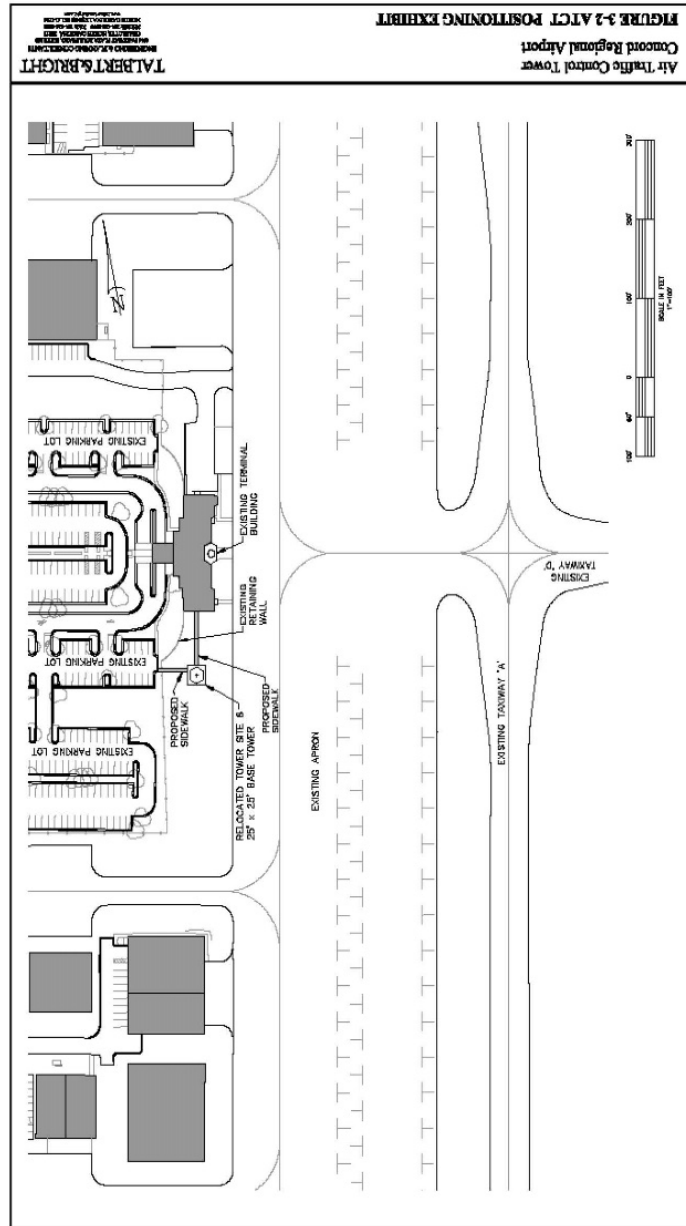
The preliminary opinion of probable cost for this site was developed in September 2009 when the original siting report was completed. These cost are for budgeting only and have not been based on any design, and therefore are subject to change. The preliminary opinion of probable cost for this site is \$3,950,000.

3.3.8 NASWATCH Summary

An FAA review of the Form 7460-1 resulted in a Final Determination Letter citing no objection. A copy of the Final Determination Letter and NASWATCH summary is included in Appendix D.

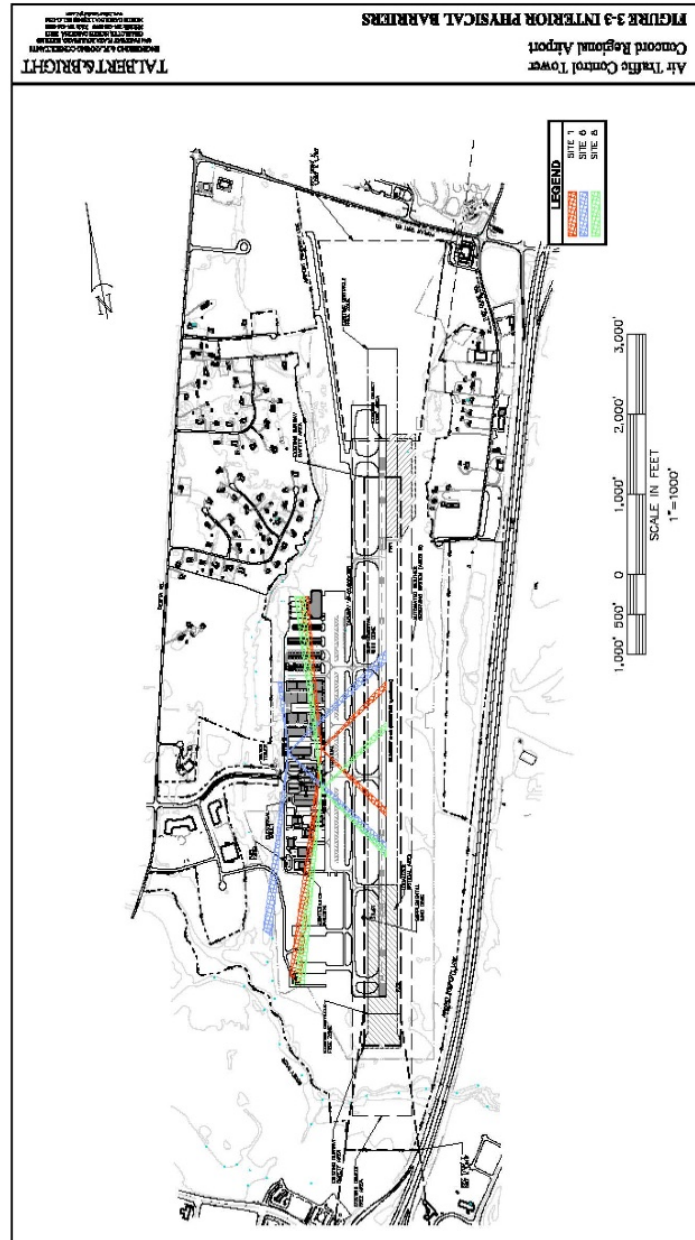


CHAPTER THREE
PREFERRED SITES



Concord Regional Airport
ATCT Site Selection Study

TALBERT & BRIGHT



CHAPTER FOUR
SITE COMPARISON CHART



4.0 SITE COMPARISON CHART

Figure 4-1
ATCT Site Comparison Chart
Concord Regional Airport

Item Description	Site 1	Site 6	Site 8
Recommended Site	No	No	Yes
Eye Level	96' AGL, 766' MSL	99' AGL, 770' MSL	110' AGL, 772' MSL
Latitude/Longitude	Lat: 35° 23' 11.71" N Long: 80° 42' 44.08" W	Lat: 35° 23' 12.08" N Long: 80° 42' 49.59" W	Lat: 35° 23' 07.04" N Long: 80° 42' 45.28" W
ATCT Height (incl. antennas)	112' AGL, 782' MSL	115' AGL, 786' MSL	126' AGL, 788' MSL
Maximum Distance (to farthest point on all runways and taxiways)	4400'	4540'	5020'
2-Point Lateral Discrimination			
Object Discrimination, Pass/Fail, Front View, Dodge Caravan	Pass Detection: 99.7% Recognition: 66.5%	Pass Detection: 99.7% Recognition: 63.7%	Pass Detection: 99.6% Recognition: 56.7%
Line of Sight (LOS) Angle of Incidence	0.81°	0.84°	0.81°
ATCT Orientation Direction	East	East	East
Access to ATCT Site	Yes, Access from Aviation Blvd.	Yes, Access from Hangar Access Road	Yes, Access from Aviation Blvd.
Environmental Issues	None Anticipated	None Anticipated	None Anticipated
ATCT Potential Impacts to Future and Existing NAVAIDS	None to Existing, CAT II/III Missed Approach Penetration - Minimums Increased	No Potential Impacts	None to Existing, CAT II/III Missed Approach Penetration - Minimums Increased
TERPS/Part 77 Impacts	Transitional Surface 37 ft. penetration Obstruction Lighting Required	Transitional Surface 6 ft. penetration Obstruction Lighting Required	Transitional Surface 73 ft. penetration Obstruction Lighting Required
Total Construction Cost Estimate	\$3,600,000	\$3,780,000	\$3,980,000
Safety Assessment Initial Risk Ranking	High: 0 Medium: 0 Low: 1	High: 0 Medium: 0 Low: 0	High: 0 Medium: 0 Low: 1
Safety Assessment Predicted Residual Risk Ranking	High: 0 Medium: 0 Low: 0	High: 0 Medium: 0 Low: 0	High: 0 Medium: 0 Low: 0

CHAPTER FIVE
FINAL SITE RECOMMENDATION AND APPROVAL



5.0 SUMMARY AND RECOMMENDATIONS

Since the original completion of this Tower Site Study, development has occurred at Sites 2 and 7 making these sites unavailable for an Air Traffic Control Tower. Table 5-1 presents a summary of the proposed tower sites. Based on review of Table 5-1 it would appear that Site 4 is the best location for the proposed tower. However, Sites 3 and 4 has a risk hazard due to the main traffic pattern being behind the controller. This leaves sites 1, 5, 6, and 8 for possible locations of the Air Traffic Control Tower. Based on all factors, including safety assessment for locating a control tower, it is recommended that the proposed tower be relocated to Site 8.

CHAPTER FIVE
FINAL SITE RECOMMENDATION AND APPROVAL



Final Site Recommendation and CSA Approval

ATCT Site Recommendation

JQF Airport Traffic Control Tower

This Agreement is made by and between ATO Terminal Program Operations, and the Terminal Area Office, collectively known as the “Parties.” The purpose of this agreement is to address the siting requirements for the new JQF ATCT planned for construction at Concord Regional Airport in Concord, North Carolina.

Section 1. The parties agree that the siting requirements must be as follows:

Article 1: The location of the ATCT, herein after referred to as Site #8. (NAD-83)

Latitude N35° 23' 06.74"

Longitude W80° 42' 45.17"

Article 2: The Air Traffic Control Specialist (ATCS) eye height used in the Alternate Siting Process for the purposes of this agreement is 772 feet Mean Sea Level (MSL) or 110 feet AGL, assuming 662 feet MSL site elevation.

Article 3: The total ATCT height including antennae and all other obstructions will be approximately 788 feet MSL or 126 feet AGL, assuming 26 feet from eye height level to top of structure and 662 feet MSL site elevation.

Article 4: The parties are in general concurrence with the assumptions documented in the final site selection report.

Section 2. The Airport Sponsor agrees to notify the assigned Technical Operations Engineering Services (Terminal) project engineer of any proposed, planned, envisioned projects that would be constructed on airport property that could possibly impact the LOS from the recommended ATCT sites.

Section 3. This agreement does not constitute a waiver of any right guaranteed by law, rule, regulation, or contract on behalf of any party. The undersigned unanimously agree with the choice of Site #3 for the new Airport Traffic Control Tower at the Concord Regional Airport (JQF):

Service Area Director of Terminal Operations Date

Service Area Director of Technical Operations Date

Director of Terminal Program Operations Date

Concord Regional Airport
ATCT Site Selection Study

TALBERT&BRIGHT 28

CHAPTER FIVE
FINAL SITE RECOMMENDATION AND APPROVAL



Final Recommended Site Comparative Safety Assessment

Final Site Approval
Regional Lines of Business
JQF Airport Traffic Control Tower
FAA Headquarters

The undersigned concur with the choice of Site #8 for the new Airport Traffic Control Tower at the Concord Regional Airport (JQF). The Terminal Facilities signature on this document indicates they accept Hazard #7, 8, 9, 9a and 10 that have been identified through the SMS process for this site as identified below. The signature of the Director of ATO Terminal, Safety and Operations confirms the safety analysis was performed correctly.

Hazard #17 – Exterior physical barriers create sight limitations, current tower slightly impacted by construction of proposed ATCT, however approaches will still be visible.

Mitigation – Radar will be used as an aide to mitigate the blind spot created by the construction of the new ATCT. In addition, the controllers will move the closed traffic pattern to the east side of the airport. RISK - LOW

Director, ATO Terminal Safety and Operations	Date
--	------

ATO Safety Service Unit**	Date
---------------------------	------

Director/Manager ATO Safety Service Unit/LOB	Date
--	------

Vice President ATO Safety Service Unit/LOB	Date
--	------

**As required per the latest version of the FAA Safety Management System Manual. Additional signatories may be required based upon identified hazards and assessments.

Concord Regional Airport
ATCT Site Selection Study

TALBERT&BRIGHT 29

APPENDIX A
LIST OF CONTACTS AND SIGN-IN SHEET



APPENDIX A
LIST OF CONTACTS AND SIGN-IN SHEET

Contact	Agency/Company	Phone	Email
Brian Salyers	Talbert & Bright, Inc.	704-426-6070	bsalyers@tbclt.com
Jim McKenna	FAA - SRM Specialist (Quality Control Group)	404-305-7491	james.ctr.mckenna@faa.gov
Rusty Nealis	FAA-ATL-ADO	404-305-7142	rusty.nealis@faa.gov
Ron Hubbard	FAA – Eastern Terminal Requirements	404-389-8258	ron.ctr.hubbard@faa.gov
John Dennis	FAA - Carolina District Operations Support Specialist	404-305-5614	john.ctr.dennis@faa.gov
Dion Viventi	NCDOT – Division of Aviation (State Block Grant)	919-840-0112	djviventi@ncdot.gov
Rick Barkes	NCDOT – Division of Aviation (State Block Grant)	919-840-0112	rbarkes@ncdot.gov
Ken Johnson	JQF ATCT Tower Manager	704-996-5964	jquf@rvainc.com
Rob Walter	Concord Regional Airport (JQF) – Airport Manager	704-920-5913	walterr@ci.concord.nc.us
Ray Farrington	Concord Regional Airport (JQF) – Assistant Aviation Director	704-920-5914	farrinr@ci.concord.nc.us
Richard Lewis	Concord Regional Airport (JQF) – Aviation Director	704-920-5912	lewISR@ci.concord.nc.us

APPENDIX A
LIST OF CONTACTS AND SIGN-IN SHEET



2/23/10

ATCT Safety Risk Assessment Meeting

1. Brian Salyers 704-426-6070 bsalyers@haidt.com
2. Jim McRae 404-305-7491 james.mcr@faa.gov
3. Rusty Neal 404-305-7142 Rusty.Neal@FAA.GOV
4. Rex Hubbard 404-389-5258 rex.hubbard@FAA.GOV
5. John Dennis 404-305-5614 JOHN.C.DENNIS@FAA.GOV
6. Dion Viventi 919 840 0112 d.viventi@ncdot.gov
7. Marc Barnes 919 840 0112 RBARNES@ncdot.gov
8. Ken Johnson 704 946 5964 JKF@RWAINC.COM
9. Ed Farrington 704-920-5913 FARRING@CI.CONCORD.NC.US
10. Richard Lewis 704-920-5912 lewisr@ci.concord.nc.us
11. Rob Walter 704-920-5914 walterr@ci.concord.nc.us

APPENDIX B
RECOMMENDED TOWER SITE PHOTOS



*Concord Regional Airport
ATCT Site Selection Study*

TALBERT&BRIGHT

B-1

APPENDIX B
RECOMMENDED TOWER SITE PHOTOS



*Concord Regional Airport
ATCT Site Selection Study*

TALBERT&BRIGHT

B-2

APPENDIX B
RECOMMENDED TOWER SITE PHOTOS



*Concord Regional Airport
ATCT Site Selection Study*

TALBERT&BRIGHT

B-3

APPENDIX B
RECOMMENDED TOWER SITE PHOTOS



*Concord Regional Airport
ATCT Site Selection Study*

TALBERT&BRIGHT

B-4

APPENDIX B
RECOMMENDED TOWER SITE PHOTOS



*Concord Regional Airport
ATCT Site Selection Study*

TALBERT&BRIGHT

B-5

APPENDIX B
RECOMMENDED TOWER SITE PHOTOS



*Concord Regional Airport
ATCT Site Selection Study*

TALBERT&BRIGHT

B-6

APPENDIX B
RECOMMENDED TOWER SITE PHOTOS



*Concord Regional Airport
ATCT Site Selection Study*

TALBERT&BRIGHT

B-7

APPENDIX B
RECOMMENDED TOWER SITE PHOTOS



*Concord Regional Airport
ATCT Site Selection Study*

TALBERT&BRIGHT

B-8

APPENDIX B
RECOMMENDED TOWER SITE PHOTOS



*Concord Regional Airport
ATCT Site Selection Study*

TALBERT&BRIGHT

B-9

APPENDIX B
RECOMMENDED TOWER SITE PHOTOS



*Concord Regional Airport
ATCT Site Selection Study*

TALBERT&BRIGHT

B-1

existing or planned traffic patterns of neighboring airports, the effects it would have on the existing airspace structure and projected programs of the FAA, the effects it would have on the safety of persons and property on the ground, and the effects that existing or proposed manmade objects (on file with the FAA), and known natural objects within the affected area would have on the airport proposal.

Page 1 of 2

ATCT Siting Study
Concord Regional Airport (KJQF)
Concord, NC

2011-ASO-2047-NRA Tower Site 1	No IFR Effect However; if the airport upgraded the ILS to CAT II, Then the location would penetrate the CAT II/III missed approach surface. See attached document for detailed explanation.
2011-ASO-2046-NRA Tower Site 6	No IFR Effect
2011-ASO-1218-NRA Tower Site 8	No IFR Effect However; if the airport upgraded the ILS to CAT II, Then the location would penetrate the CAT II/III missed approach surface. See attached document for detailed explanation.

When the final site is selected, the sponsor should provide the ADO with a certified/stamped survey of the new control tower with 1A accuracy. This information needs to be sent to the EFPT and the AeroNav Products Data Branch (Joseph A. Jackson). This ensures the new ATCT becomes an obstruction in the obstacle database.

APPENDIX C
TERPS CALCULATIONS AND FAA DETERMINATION



Tower Site No. 1

Federal Aviation Administration
Civilian Part 77 Report
ASN: 2011-ASO-2047-NRA
Wed Dec 21 09:26:45 EST 2011

Obstruction Evaluation

Latitude:	35-23-11.71N	SE:	670
Longitude:	80-42-44.08W	AGL:	121
Case Information & Part 77 results use NAD 83 datum		AMSL:	791

Airports with FAR77 Category Issues

No Airports with FAR77 Category Issues Found

Notice Criteria

77.9 Instrument Approach Area	Does not exceed
77.9 Facility Screening	Further Study Required
FAR 77.9(a)	Does not exceed 200 ft AGL
FAR 77.9(b)	<ul style="list-style-type: none"> *JQF[EXISTING][NASR] - RWY 20/02[PROPOSED][OEAAA]: --> Exceeds by 94 ft. *JQF[EXISTING][NASR] - RWY 02/20[EXISTING][OEAAA]: --> Exceeds by 116 ft. *JQF[EXISTING][NASR] - RWY 02/20[EXISTING][NASR]: --> Exceeds by 116 ft.
FAR 77.9(c)	Not a traverseway
FAR 77.9(d)	Not on an airport

Obstruction Standards

FAR 77.17(a)(1)	DNE 499 ft AGL
FAR 77.17(a)(2)	Does not exceed
FAR 77.19(a)	Does not apply
FAR 77.19(b)	DNE Conical surface
FAR 77.19(c)	Outside Primary surface
FAR 77.19(d)	DNE Approach surface
FAR 77.19(e)	<ul style="list-style-type: none"> *JQF[EXISTING][NASR] - RWY 20/02[PROPOSED][OEAAA]: Transitional Surface --> Exceeds by 54 ft. *JQF[EXISTING][NASR] - RWY 02/20[EXISTING][OEAAA]: Transitional Surface --> Exceeds by 77 ft. *JQF[EXISTING][NASR] - RWY 02/20[EXISTING][NASR]: Transitional Surface --> Exceeds by 77 ft.
FAR 77.23(a)	DNE Heliport primary surface
FAR 77.23(b)	DNE Heliport approach surface

Note: Military surfaces have not been evaluated

Closest Runway Data

Runway End 20		
Apt: JQF[EXISTING][NASR]	Runway: 20/02	Runway Type: PIR / C(NP1)
Latitude: 35-23-33.49N	Runway End Type: PIR	Azimuth: 209.54°
Longitude: 80-42-28.94W	Side: R	CD: -2391
Elevation: 690	Heading: 190.42°	PD: 832
Length: 5500	Data Source: OEAAA	DD: 2534
Width: 150	Status: PROPOSED	

Page 1 of 5

APPENDIX C
TERPS CALCULATIONS AND FAA DETERMINATION



This is a proposed runway

Public Use Airports & Surfaces

*JQF	Name: CONCORD RGNL Data Source: NASR Status: EXISTING	Latitude: 35-23-15.99N Longitude: 80-42-32.89W Elevation: 705	Azimuth: 244.87° APT-STR: 0.17 NM or 1023 ft.
U_JQF	Name: CONCORD RGNL	Latitude: 35-23-11.98N Longitude: 80-42-33.78W Elevation: 705	Azimuth: 268.16° APT-STR: 0.14 NM or 853 ft.

Runway 20/02

Data Source: OEAAA	Length: 5500	Type: PIR / C(NP1)
Status: PROPOSED	Width: 150	RWY-STR: 0.12 NM or 756 ft.

This is a proposed runway

Structure top exceeds the Transitional Surface [77.19(e)] by 54 ft.

Runway End 20

Latitude: 35-23-33.49N	Type: PIR	CD: -2391
Longitude: 80-42-28.94W	Heading: 190.42°	DD: 2534
Elevation: 690	Azimuth: 209.54°	PD: 832
Side: R		

Runway End 02

Latitude: 35-22-40.00N	Type: C(NP1)	CD: -3107
Longitude: 80-42-41.00W	Heading: 10.41°	DD: 3216
Elevation: 690	Azimuth: 355.47°	PD: 832
Side: L		

Runway 02/20

Data Source: NASR	Length: 7400	Type: C(NP1) / PIR
Status: EXISTING	Width: 100	RWY-STR: 0.13 NM or 781 ft.

Structure top exceeds the Transitional Surface [77.19(e)] by 77 ft.

Runway End 02

Latitude: 35-22-39.99N	Type: C(NP1)	CD: -3108
Longitude: 80-42-41.00W	Heading: 10.42°	DD: 3217
Elevation: 640	Azimuth: 355.47°	PD: 833
Side: L		

Runway End 20

Latitude: 35-23-51.98N	Type: PIR	CD: -4293
Longitude: 80-42-24.76W	Heading: 190.42°	DD: 4374
Elevation: 705	Azimuth: 201.36°	PD: 833
Side: R		

Runway 02/20

Data Source: OEAAA	Length: 7400	Type: PIR / PIR
Status: EXISTING	Width: 100	RWY-STR: 0.13 NM or 781 ft.

Structure top exceeds the Transitional Surface [77.19(e)] by 77 ft.

APPENDIX C
TERPS CALCULATIONS AND FAA DETERMINATION



Runway End 02			
	Latitude: 35-22-39.99N	Type: PIR	CD: -3108
	Longitude: 80-42-41.00W	Heading: 10.42°	DD: 3217
	Elevation: 640	Azimuth: 355.47°	PD: 833
	Side: L		
Runway End 20			
	Latitude: 35-23-51.98N	Type: PIR	CD: -4293
	Longitude: 80-42-24.76W	Heading: 190.42°	DD: 4374
	Elevation: 705	Azimuth: 201.36°	PD: 833
	Side: R		
8A6	Name: WILGROVE AIR PA Data Source: NASR Status: EXISTING	Latitude: 35-12-49.52N Longitude: 80-40-12.24W Elevation: 799	Azimuth: 348.75° APT-STR: 10.56 NM or 64157 ft.
U_8A6	Name: WILGROVE AIR PA	Latitude: 35-12-48.74N Longitude: 80-40-05.42W Elevation: 799	Azimuth: 348.27° APT-STR: 10.59 NM or 64348 ft.
Runway 17/35			
	Data Source: OEAAA	Length: 2707	Type: A(V) / A(V)
	Status: EXISTING	Width: 40	RWY-STR: 10.39 NM or 63123 ft.
Runway End 17			
	Latitude: 35-13-01.80N	Type: A(V)	CD: 63021
	Longitude: 80-40-08.97W	Heading: 167.47°	DD: 62994
	Elevation: 780	Azimuth: 348.29°	PD: 846
	Side: L		
Runway End 35			
	Latitude: 35-12-35.67N	Type: A(V)	CD: -65729
	Longitude: 80-40-01.86W	Heading: 347.47°	DD: 65700
	Elevation: 797	Azimuth: 348.25°	PD: 846
	Side: R		
Runway 17/35			
	Data Source: NASR	Length: 2835	Type: A(V) / A(V)
	Status: EXISTING	Width: 40	RWY-STR:
Runway End 17			
	Latitude: <NULL>	Type: A(V)	CD:
	Longitude: <NULL>	Heading: 0.00°	DD:
	Elevation: <NULL>	Azimuth: 0.00°	PD:
	Side:		
Runway End 35			
	Latitude: <NULL>	Type: A(V)	CD:
	Longitude: <NULL>	Heading: 0.00°	DD:
	Elevation: <NULL>	Azimuth: 0.00°	PD:
	Side:		
8A6	Name: WILGROVE AIR PA Data Source: OEAAA Status: EXISTING	Latitude: 35-12-48.74N Longitude: 80-40-05.41W Elevation: 799	Azimuth: 348.27° APT-STR: 10.59 NM or 64348 ft.

Page 3 of 5

APPENDIX C
TERPS CALCULATIONS AND FAA DETERMINATION



U_8A6 Name: WILGROVE AIR PA Latitude: 35-12-48.74N Azimuth: 348.27°
Longitude: 80-40-05.42W APT-STR: 10.59 NM or 64348 ft.
Elevation: 799

Runway 17/35
Data Source: OEAAA Length: 2707 Type: A(V) / A(V)
Status: EXISTING Width: 40 RWY-STR: 10.39 NM or 63123 ft.

Runway End 17
Latitude: 35-13-01.80N Type: A(V) CD: 63021
Longitude: 80-40-08.97W Heading: 167.47° DD: 62994
Elevation: 780 Azimuth: 348.29° PD: 846
Side: L

Runway End 35
Latitude: 35-12-35.67N Type: A(V) CD: -65729
Longitude: 80-40-01.86W Heading: 347.47° DD: 65700
Elevation: 797 Azimuth: 348.25° PD: 846
Side: R

Runway 17/35
Data Source: NASR Length: 2835 Type: A(V) / A(V)
Status: EXISTING Width: 40 RWY-STR:

Runway End 17
Latitude: <NULL> Type: A(V) CD:
Longitude: <NULL> Heading: 0.00° DD:
Elevation: <NULL> Azimuth: 0.00° PD:
Side:

Runway End 35
Latitude: <NULL> Type: A(V) CD:
Longitude: <NULL> Heading: 0.00° DD:
Elevation: <NULL> Azimuth: 0.00° PD:
Side:

Alert: Public Airports Within 5 Nautical Miles

Ident	Name	Distance	Latitude	Longitude
*JQF	CONCORD RGNL	0.17	35-23-15.99N	80-42-32.89W

Public Use Heliports & Surfaces

No Public Use Heliports Found

Alert: Heliports Within 5 Nautical Miles

Ident	Name	Distance	Latitude	Longitude
2548	HENDRICK MOTORSPORTS	1.77	35-21-28.00N	80-42-15.00W

Private Use Airports (in NAD 83 Datum)

APPENDIX C
TERPS CALCULATIONS AND FAA DETERMINATION



Ident	Name	Distance	Latitude	Longitude
NC05	BRADFORD FLD	4.24	35-24-31.50N	80-47-39.26W
NC35	SPENCER	4.53	35-24-10.50N	80-37-19.24W
4NC8	BUFFALO CREEK	4.98	35-25-20.50N	80-37-14.24W
3NC6	MC CACHREN FIELD	5.59	35-18-42.51N	80-38-39.24W
NC19	PROPST	6.71	35-23-30.50N	80-34-32.24W
NC77	CHALFANT	7.88	35-27-20.50N	80-34-32.24W
NC64	BARRINGER FIELD	8.49	35-31-40.00N	80-41-48.00W
NC39	ENOCHVILLE	8.83	35-31-27.50N	80-38-52.24W
2NC8	GOODNIGHT'S	9.04	35-31-31.50N	80-38-23.24W
35NC	JOHNSTON	9.29	35-32-18.00N	80-45-05.00W
50NC	ERVIN AIRFIELD	9.73	35-32-42.00N	80-40-07.00W
44NC	BROADWAY AIRFIELD	9.84	35-32-36.00N	80-39-07.00W
N128	JOHNSTON AIRPORT	9.90	35-32-55.00N	80-45-06.00W
6NC2	WILHELM	10.62	35-30-40.50N	80-33-29.23W
41NC	SLOOP	12.35	35-31-18.50N	80-31-19.20W

Private Use Heliports (in NAD 83 Datum)

Ident	Name	Distance	Latitude	Longitude
NC41	HENDRICK MOTORSPORTS	1.77	35-21-28.00N	80-42-15.00W
NC79	5100 WEST W.T. HARRIS BLV	6.04	35-20-09.51N	80-49-07.26W
NC60	NORTHEAST MEDICAL CENTER	6.17	35-26-06.40N	80-36-05.00W
31NC	PRESBYTERIAN HOSPITAL HUNTERSVILLE	7.31	35-24-24.00N	80-51-33.00W
NC24	DELTA AIR BASE	10.51	35-12-40.52N	80-43-09.24W
NN15	ENTERPRISE	10.63	35-14-27.00N	80-50-09.00W
02NC	RACE CITY	10.82	35-32-28.00N	80-35-52.00W
2684	Landis	11.21	35-32-28.00N	80-35-00.00W
NN71	WESTOVER HELIPORT	11.36	35-12-36.00N	80-47-48.00W
2677	Lowe's Mooresville Heliport	11.73	35-32-37.02N	80-51-18.80W
2677	Lowe's Mooresville Heliport	11.73	35-32-37.02N	80-51-18.80W
2677	Lowe's Mooresville Heliport	11.73	35-32-37.02N	80-51-18.80W
*4NC4	LOWE'S MOORESVILLE	11.76	35-32-41.45N	80-51-15.37W
2040	PRESBYTERIAN HOSPITAL	11.80	35-12-44.00N	80-49-26.00W
2678	Hunter Construction LZ	12.04	35-33-46.00N	80-49-49.00W
NR06	HUNTER CONSTRUCTION	12.04	35-33-46.00N	80-49-49.00W
N118	LAKE NORMAN REG MED CTR	12.06	35-33-01.30N	80-51-19.60W
NC90	WBTW	12.19	35-13-43.51N	80-52-08.26W

Legend

Distances:

CD = Along centerline from threshold
PD = Perpendicular to the centerline
DD = Direct from threshold

* Standard or Special Instrument Approach Procedures

APPENDIX C
TERPS CALCULATIONS AND FAA DETERMINATION



U.S. Department
of Transportation

Federal Aviation
Administration

March 20, 2012

Concord Regional Airport
Attn: Richard K. Lewis
9000 Aviation Boulevard
Concord, NC 28027

Atlanta Airports District Office
1701 Columbia Ave., Suite 2-260
College Park, GA 30337

RE: (See attached Table 1 for referenced case(s))
FINAL DETERMINATION

Table 1 - Letter Referenced Case(s)

ASN	Prior ASN	Location	Latitude (NAD83)	Longitude (NAD83)	AGL (Feet)	AMSL (Feet)
2011-ASO-2047-NRA		CONCORD, NC	35-23-11.71N	80-42-44.08W	121	791

Description: Potential ATCT Site 1. -Not Preferred

We do not object with conditions to the construction described in this proposal provided:

You comply with the requirements set forth in FAA Advisory Circular 150/5370-2E, "Operational Safety on Airports During Construction."

The airport sponsor is hereby notified that if the proposed tower is constructed at the location indicated in this study, it will create an approximate 11 ft. penetration to any future CAT II/III missed approach surface area "D".

If this tower site is selected, please coordinate with the Atlanta ADO prior to design/construction. We will provide a more detailed analysis of the impacts.

A separate notice to the FAA is required for any construction equipment, such as temporary cranes, whose working limits would exceed the height and lateral dimensions of your proposal.

This determination does not constitute FAA approval or disapproval of the physical development involved in the proposal. It is a determination with respect to the safe and efficient use of navigable airspace by aircraft and with respect to the safety of persons and property on the ground.

In making this determination, the FAA has considered matters such as the effects the proposal would have on existing or planned traffic patterns of neighboring airports, the effects it would have on the existing airspace structure and projected programs of the FAA, the effects it would have on the safety of persons and property on the ground, and the effects that existing or proposed manmade objects (on file with the FAA), and known natural objects within the affected area would have on the airport proposal.

Page 1 of 2

Concord Regional Airport
ATCT Site Selection Study

TALBERT&BRIGHT

C-7

APPENDIX C
TERPS CALCULATIONS AND FAA DETERMINATION



If you have any questions concerning this determination contact Peter Hughes, (404) 305-7162,
peter.hughes@faa.gov.

Peter Hughes
ADO

APPENDIX C
TERPS CALCULATIONS AND FAA DETERMINATION



Tower Site No. 6

Federal Aviation Administration
Civilian Part 77 Report
ASN: 2011-ASO-2046-NRA
Mon Dec 19 14:03:32 EST 2011

Obstruction Evaluation

Latitude:	35-23-12.08N	SE:	671
Longitude:	80-42-49.59W	AGL:	124
Case Information & Part 77 results use NAD 83 datum		AMSL:	795

Airports with FAR77 Category Issues

No Airports with FAR77 Category Issues Found

Notice Criteria

77.9 Instrument Approach Area	Does not exceed
77.9 Facility Screening	Further Study Required
FAR 77.9(a)	Does not exceed 200 ft AGL
FAR 77.9(b)	*JQF[EXISTING][NASR] - RWY 20/02[PROPOSED][OEAAA]: --> Exceeds by 93 ft. *JQF[EXISTING][NASR] - RWY 02/20[EXISTING][OEAAA]: --> Exceeds by 116 ft. *JQF[EXISTING][NASR] - RWY 02/20[EXISTING][NASR]: --> Exceeds by 116 ft.
FAR 77.9(c)	Not a traverseway
FAR 77.9(d)	Not on an airport

Obstruction Standards

FAR 77.17(a)(1)	DNE 499 ft AGL
FAR 77.17(a)(2)	Does not exceed
FAR 77.17(a)	Does not apply
FAR 77.19(b)	DNE Conical surface
FAR 77.19(c)	Outside Primary surface
FAR 77.19(d)	DNE Approach surface
FAR 77.19(e)	*JQF[EXISTING][NASR] - RWY 02/20[EXISTING][OEAAA]: Transitional Surface --> Exceeds by 16 ft. *JQF[EXISTING][NASR] - RWY 02/20[EXISTING][NASR]: Transitional Surface --> Exceeds by 16 ft.
FAR 77.23(a)	DNE Heliport primary surface
FAR 77.23(b)	DNE Heliport approach surface

Note: Military surfaces have not been evaluated

Closest Runway Data

Runway End 20		
Apt: JQF[EXISTING][NASR]	Runway: 20/02	Runway Type: PIR / C(NP1)
Latitude: 35-23-33.49N	Runway End Type: PIR	Azimuth: 218.18°
Longitude: 80-42-28.94W	Side: R	CD: -2437
Elevation: 690	Heading: 190.42°	PD: 1288
Length: 5500	Data Source: OEAAA	DD: 2758
Width: 150	Status: PROPOSED	
This is a proposed runway		

Page 1 of 5

Concord Regional Airport
ATCT Site Selection Study

TALBERT&BRIGHT

C-9

APPENDIX C
TERPS CALCULATIONS AND FAA DETERMINATION



Public Use Airports & Surfaces

*JQF	Name: CONCORD RGNL Data Source: NASR Status: EXISTING	Latitude: 35-23-15.99N Longitude: 80-42-32.89W Elevation: 705	Azimuth: 253.98° APT-STR: 0.24 NM or 1439 ft.
U_JQF	Name: CONCORD RGNL	Latitude: 35-23-11.98N Longitude: 80-42-33.78W Elevation: 705	Azimuth: 270.45° APT-STR: 0.22 NM or 1309 ft.

Runway 20/02

Data Source: OEAAA Length: 5500 Type: PIR / C(NP1)
Status: PROPOSED Width: 150 RWY-STR: 0.20 NM or 1210 ft.
This is a proposed runway

Runway End 20

Latitude: 35-23-33.49N Type: PIR CD: -2437
Longitude: 80-42-28.94W Heading: 190.42° DD: 2758
Elevation: 690 Azimuth: 218.18° PD: 1288
Side: R

Runway End 02

Latitude: 35-22-40.00N Type: C(NP1) CD: -3062
Longitude: 80-42-41.00W Heading: 10.41° DD: 3320
Elevation: 690 Azimuth: 347.69° PD: 1288
Side: L

Runway 02/20

Data Source: NASR Length: 7400 Type: C(NP1) / PIR
Status: EXISTING Width: 100 RWY-STR: 0.20 NM or 1236 ft.
Structure top exceeds the Transitional Surface [77.19(e)] by 16 ft.

Runway End 02

Latitude: 35-22-39.99N Type: C(NP1) CD: -3063
Longitude: 80-42-41.00W Heading: 10.42° DD: 3321
Elevation: 640 Azimuth: 347.69° PD: 1288
Side: L

Runway End 20

Latitude: 35-23-51.98N Type: PIR CD: -4338
Longitude: 80-42-24.76W Heading: 190.42° DD: 4527
Elevation: 705 Azimuth: 206.90° PD: 1288
Side: R

Runway 02/20

Data Source: OEAAA Length: 7400 Type: PIR / PIR
Status: EXISTING Width: 100 RWY-STR: 0.20 NM or 1236 ft.
Structure top exceeds the Transitional Surface [77.19(e)] by 16 ft.

Runway End 02

Latitude: 35-22-39.99N Type: PIR CD: -3063
Longitude: 80-42-41.00W Heading: 10.42° DD: 3321
Elevation: 640 Azimuth: 347.69° PD: 1288

Page 2 of 5

APPENDIX C
TERPS CALCULATIONS AND FAA DETERMINATION



Side: L

Runway End 20			
	Latitude: 35-23-51.98N	Type: PIR	CD: -4338
	Longitude: 80-42-24.76W	Heading: 190.42°	DD: 4527
	Elevation: 705	Azimuth: 206.90°	PD: 1288
	Side: R		

8A6	Name: WILGROVE AIR PA	Latitude: 35-12-49.52N	Azimuth: 348.36°
	Data Source: NASR	Longitude: 80-40-12.24W	APT-STR: 10.58 NM or 64285 ft.
	Status: EXISTING	Elevation: 799	

U_8A6	Name: WILGROVE AIR PA	Latitude: 35-12-48.74N	Azimuth: 347.88°
		Longitude: 80-40-05.42W	APT-STR: 10.61 NM or 64479 ft.
		Elevation: 799	

Runway 17/35			
	Data Source: OEAAA	Length: 2707	Type: A(V) / A(V)
	Status: EXISTING	Width: 40	RWY-STR: 10.41 NM or 63254 ft.

Runway End 17			
	Latitude: 35-13-01.80N	Type: A(V)	CD: 63156
	Longitude: 80-40-08.97W	Heading: 167.47°	DD: 63125
	Elevation: 780	Azimuth: 347.89°	PD: 409
	Side: L		

Runway End 35			
	Latitude: 35-12-35.67N	Type: A(V)	CD: -65863
	Longitude: 80-40-01.86W	Heading: 347.47°	DD: 65832
	Elevation: 797	Azimuth: 347.87°	PD: 409
	Side: R		

Runway 17/35			
	Data Source: NASR	Length: 2835	Type: A(V) / A(V)
	Status: EXISTING	Width: 40	RWY-STR:

Runway End 17			
	Latitude: <NULL>	Type: A(V)	CD:
	Longitude: <NULL>	Heading: 0.00°	DD:
	Elevation: <NULL>	Azimuth: 0.00°	PD:
	Side:		

Runway End 35			
	Latitude: <NULL>	Type: A(V)	CD:
	Longitude: <NULL>	Heading: 0.00°	DD:
	Elevation: <NULL>	Azimuth: 0.00°	PD:
	Side:		

8A6	Name: WILGROVE AIR PA	Latitude: 35-12-48.74N	Azimuth: 347.88°
	Data Source: OEAAA	Longitude: 80-40-05.41W	APT-STR: 10.61 NM or 64479 ft.
	Status: EXISTING	Elevation: 799	

U_8A6	Name: WILGROVE AIR PA	Latitude: 35-12-48.74N	Azimuth: 347.88°
		Longitude: 80-40-05.42W	APT-STR: 10.61 NM or 64479 ft.
		Elevation: 799	

Page 3 of 5

APPENDIX C
TERPS CALCULATIONS AND FAA DETERMINATION



Runway 17/35				
Data Source: OEAAA	Length: 2707	Type: A(V) / A(V)		
Status: EXISTING	Width: 40	RWY-STR: 10.41 NM or 63254 ft.		
Runway End 17				
Latitude: 35-13-01.80N	Type: A(V)	CD: 63156		
Longitude: 80-40-08.97W	Heading: 167.47°	DD: 63125		
Elevation: 780	Azimuth: 347.89°	PD: 409		
Side: L				
Runway End 35				
Latitude: 35-12-35.67N	Type: A(V)	CD: -65863		
Longitude: 80-40-01.86W	Heading: 347.47°	DD: 65832		
Elevation: 797	Azimuth: 347.87°	PD: 409		
Side: R				
Runway 17/35				
Data Source: NASR	Length: 2835	Type: A(V) / A(V)		
Status: EXISTING	Width: 40	RWY-STR:		
Runway End 17				
Latitude: <NULL>	Type: A(V)	CD:		
Longitude: <NULL>	Heading: 0.00°	DD:		
Elevation: <NULL>	Azimuth: 0.00°	PD:		
Side:				
Runway End 35				
Latitude: <NULL>	Type: A(V)	CD:		
Longitude: <NULL>	Heading: 0.00°	DD:		
Elevation: <NULL>	Azimuth: 0.00°	PD:		
Side:				

Alert: Public Airports Within 5 Nautical Miles

Ident	Name	Distance	Latitude	Longitude
*JQF	CONCORD RGNL	0.24	35-23-15.99N	80-42-32.89W

Public Use Heliports & Surfaces

No Public Use Heliports Found

Alert: Heliports Within 5 Nautical Miles

Ident	Name	Distance	Latitude	Longitude
2548	HENDRICK MOTORSPORTS	1.79	35-21-28.00N	80-42-15.00W

Private Use Airports (in NAD 83 Datum)

Ident	Name	Distance	Latitude	Longitude
NC05	BRADFORD FLD	4.16	35-24-31.50N	80-47-39.26W
NC35	SPENCER	4.61	35-24-10.50N	80-37-19.24W
4NC8	BUFFALO CREEK	5.04	35-25-20.50N	80-37-14.24W
3NC6	MC CACHREN FIELD	5.64	35-18-42.51N	80-38-39.24W

APPENDIX C
TERPS CALCULATIONS AND FAA DETERMINATION



Ident	Name	Distance	Latitude	Longitude
NC19	PROPST	6.78	35-23-30.50N	80-34-32.24W
NC77	CHALFANT	7.94	35-27-20.50N	80-34-32.24W
NC64	BARRINGER FIELD	8.49	35-31-40.00N	80-41-48.00W
NC39	ENOCHVILLE	8.86	35-31-27.50N	80-38-52.24W
2NC8	GOODNIGHT'S	9.07	35-31-31.50N	80-38-23.24W
35NC	JOHNSTON	9.27	35-32-18.00N	80-45-05.00W
50NC	ERVIN AIRFIELD	9.74	35-32-42.00N	80-40-07.00W
44NC	BROADWAY AIRFIELD	9.86	35-32-36.00N	80-39-07.00W
N128	JOHNSTON AIRPORT	9.88	35-32-55.00N	80-45-06.00W
6NC2	WILHELM	10.67	35-30-40.50N	80-33-29.23W
41NC	SLOOP	12.41	35-31-18.50N	80-31-19.20W

Private Use Heliports (in NAD 83 Datum)

Ident	Name	Distance	Latitude	Longitude
NC41	HENDRICK MOTORSPORTS	1.79	35-21-28.00N	80-42-15.00W
NC79	5100 WEST W.T. HARRIS BLV	5.98	35-20-09.51N	80-49-07.26W
NC60	NORTHEAST MEDICAL CENTER	6.23	35-26-06.40N	80-36-05.00W
31NC	PRESBYTERIAN HOSPITAL HUNTERVILLE	7.23	35-24-24.00N	80-51-33.00W
NC24	DELTA AIR BASE	10.51	35-12-40.52N	80-43-09.24W
NN15	ENTERPRISE	10.60	35-14-27.00N	80-50-09.00W
02NC	RACE CITY	10.86	35-32-28.00N	80-35-52.00W
2684	Landis	11.25	35-32-28.00N	80-35-00.00W
NN71	WESTOVER HELIPORT	11.34	35-12-36.00N	80-47-48.00W
2677	Lowe's Mooresville Heliport	11.68	35-32-37.02N	80-51-18.80W
2677	Lowe's Mooresville Heliport	11.68	35-32-37.02N	80-51-18.80W
2677	Lowe's Mooresville Heliport	11.68	35-32-37.02N	80-51-18.80W
*4NC4	LOWE'S MOORESVILLE	11.71	35-32-41.45N	80-51-15.37W
2040	PRESBYTERIAN HOSPITAL	11.77	35-12-44.00N	80-49-26.00W
2678	Hunter Construction LZ	11.99	35-33-46.00N	80-49-49.00W
NR06	HUNTER CONSTRUCTION	11.99	35-33-46.00N	80-49-49.00W
N118	LAKE NORMAN REG MED CTR	12.01	35-33-01.30N	80-51-19.60W
NC90	WBTW	12.15	35-13-43.51N	80-52-08.26W
027E	MORRIS FIELD	12.45	35-28-41.36N	80-56-30.31W

Legend

Distances:

- CD = Along centerline from threshold
- PD = Perpendicular to the centerline
- DD = Direct from threshold

* Standard or Special Instrument Approach Procedures

APPENDIX C
TERPS CALCULATIONS AND FAA DETERMINATION



U.S. Department
of Transportation

Federal Aviation
Administration

March 20, 2012

Concord Regional Airport
Attn: Richard K. Lewis
9000 Aviation Boulevard
Concord, NC 28027

Atlanta Airports District Office
1701 Columbia Ave., Suite 2-260
College Park, GA 30337

RE: (See attached Table 1 for referenced case(s))
FINAL DETERMINATION

Table 1 - Letter Referenced Case(s)

ASN	Prior ASN	Location	Latitude (NAD83)	Longitude (NAD83)	AGL (Feet)	AMSL (Feet)
2011-ASO-2046-NRA		CONCORD, NC	35-23-12.08N	80-42-49.59W	124	795

Description: Potential ATCT Site 6. -Not Preferred

We do not object with conditions to the construction described in this proposal provided:

You comply with the requirements set forth in FAA Advisory Circular 150/5370-2E, "Operational Safety on Airports During Construction."

A separate notice to the FAA is required for any construction equipment, such as temporary cranes, whose working limits would exceed the height and lateral dimensions of your proposal.

This determination does not constitute FAA approval or disapproval of the physical development involved in the proposal. It is a determination with respect to the safe and efficient use of navigable airspace by aircraft and with respect to the safety of persons and property on the ground.

In making this determination, the FAA has considered matters such as the effects the proposal would have on existing or planned traffic patterns of neighboring airports, the effects it would have on the existing airspace structure and projected programs of the FAA, the effects it would have on the safety of persons and property on the ground, and the effects that existing or proposed manmade objects (on file with the FAA), and known natural objects within the affected area would have on the airport proposal.

This determination expires on September 20, 2013 unless:

- (a) extended, revised or terminated by the issuing office.
- (b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for the completion of construction, or the date the FCC denies the application.

APPENDIX C
TERPS CALCULATIONS AND FAA DETERMINATION



NOTE: Request for extension of the effective period of this determination must be obtained at least 15 days prior to expiration date specified in this letter.

If you have any questions concerning this determination contact Peter Hughes, (404) 305-7162, peter.hughes@faa.gov.

Peter Hughes
ADO

APPENDIX C
TERPS CALCULATIONS AND FAA DETERMINATION



Tower Site No. 8

Federal Aviation Administration
Civilian Part 77 Report
ASN: 2011-ASO-1218-NRA
Mon Nov 21 13:43:39 EST 2011

Obstruction Evaluation

Latitude:	35-23-06.74N	SE:	662
Longitude:	80-42-45.17W	AGL:	135
Case Information & Part 77 results use NAD 83 datum		AMSL:	797

Airports with FAR77 Category Issues

No Airports with FAR77 Category Issues Found

Notice Criteria

77.9 Instrument Approach Area	Does not exceed
77.9 Facility Screening	Further Study Required
FAR 77.9(a)	Does not exceed 200 ft AGL
FAR 77.9(b)	<p>*JQF[EXISTING][NASR] - RWY 20/02[PROPOSED][OEAAA]: —> Exceeds by 100 ft.</p> <p>*JQF[EXISTING][NASR] - RWY 02/20[EXISTING][OEAAA]: —> Exceeds by 127 ft.</p> <p>*JQF[EXISTING][NASR] - RWY 02/20[EXISTING][NASR]: —> Exceeds by 127 ft.</p>
FAR 77.9(c)	Not a traverseway
FAR 77.9(d)	Not on an airport

Obstruction Standards

FAR 77.17(a)(1)	DNE 499 ft AGL
FAR 77.17(a)(2)	Does not exceed
FAR 77.19(a)	Does not apply
FAR 77.19(b)	DNE Conical surface
FAR 77.19(c)	Outside Primary surface
FAR 77.19(d)	DNE Approach surface
FAR 77.19(e)	<p>*JQF[EXISTING][NASR] - RWY 20/02[PROPOSED][OEAAA]: Transitional Surface —> Exceeds by 60 ft.</p> <p>*JQF[EXISTING][NASR] - RWY 02/20[EXISTING][OEAAA]: Transitional Surface —> Exceeds by 88 ft.</p> <p>*JQF[EXISTING][NASR] - RWY 02/20[EXISTING][NASR]: Transitional Surface —> Exceeds by 87 ft.</p>
FAR 77.23(a)	DNE Heliport primary surface
FAR 77.23(b)	DNE Heliport approach surface

Note: Military surfaces have not been evaluated

Closest Runway Data

Runway End 02		
Apt: JQF[EXISTING][NASR]	Runway: 20/02	Runway Type: PIR / C(NP1)
Latitude: 35-22-40.00N	Runway End Type: C(NP1)	Azimuth: 352.75°
Longitude: 80-42-41.00W	Side: L	CD: -2597
Elevation: 690	Heading: 10.41°	PD: 830
Length: 5500	Data Source: OEAAA	DD: 2725
Width: 150	Status: PROPOSED	

Page 1 of 5

Concord Regional Airport
ATCT Site Selection Study

TALBERT&BRIGHT

C-16

APPENDIX C
TERPS CALCULATIONS AND FAA DETERMINATION



This is a proposed runway

Public Use Airports & Surfaces

*JQF	Name: CONCORD RGNL Data Source: NASR Status: EXISTING	Latitude: 35-23-15.99N Longitude: 80-42-32.89W Elevation: 705	Azimuth: 227.26° APT-STR: 0.23 NM or 1382 ft.
U_JQF	Name: CONCORD RGNL	Latitude: 35-23-11.98N Longitude: 80-42-33.78W Elevation: 705	Azimuth: 240.55° APT-STR: 0.18 NM or 1082 ft.

Runway 20/02

Data Source: OEAAA Length: 5500 Type: PIR / C(NP1)
Status: PROPOSED Width: 150 RWY-STR: 0.12 NM or 753 ft.

This is a proposed runway

Structure top exceeds the Transitional Surface [77.19(e)] by 60 ft.

Runway End 20

Latitude: 35-23-33.49N Type: PIR CD: -2902
Longitude: 80-42-28.94W Heading: 190.42° DD: 3020
Elevation: 690 Azimuth: 206.32° PD: 830
Side: R

Runway End 02

Latitude: 35-22-40.00N Type: C(NP1) CD: -2597
Longitude: 80-42-41.00W Heading: 10.41° DD: 2725
Elevation: 690 Azimuth: 352.75° PD: 830
Side: L

Runway 02/20

Data Source: NASR Length: 7400 Type: C(NP1) / PIR
Status: EXISTING Width: 100 RWY-STR: 0.13 NM or 779 ft.

Structure top exceeds the Transitional Surface [77.19(e)] by 87 ft.

Runway End 02

Latitude: 35-22-39.99N Type: C(NP1) CD: -2598
Longitude: 80-42-41.00W Heading: 10.42° DD: 2726
Elevation: 640 Azimuth: 352.75° PD: 830
Side: L

Runway End 20

Latitude: 35-23-51.98N Type: PIR CD: -4803
Longitude: 80-42-24.76W Heading: 190.42° DD: 4876
Elevation: 705 Azimuth: 200.19° PD: 830
Side: R

Runway 02/20

Data Source: OEAAA Length: 7400 Type: PIR / PIR
Status: EXISTING Width: 100 RWY-STR: 0.13 NM or 779 ft.

Structure top exceeds the Transitional Surface [77.19(e)] by 88 ft.

APPENDIX C
TERPS CALCULATIONS AND FAA DETERMINATION



Runway End 02			
	Latitude: 35-22-39.99N	Type: PIR	CD: -2598
	Longitude: 80-42-41.00W	Heading: 10.42°	DD: 2726
	Elevation: 640	Azimuth: 352.75°	PD: 830
	Side: L		
Runway End 20			
	Latitude: 35-23-51.98N	Type: PIR	CD: -4803
	Longitude: 80-42-24.76W	Heading: 190.42°	DD: 4876
	Elevation: 705	Azimuth: 200.19°	PD: 830
	Side: R		
8A6	Name: WILGROVE AIR PA Data Source: NASR Status: EXISTING	Latitude: 35-12-49.52N Longitude: 80-40-12.24W Elevation: 799	Azimuth: 348.58° APT-STR: 10.48 NM or 63682 ft.
U_8A6	Name: WILGROVE AIR PA	Latitude: 35-12-48.74N Longitude: 80-40-05.42W Elevation: 799	Azimuth: 348.10° APT-STR: 10.51 NM or 63875 ft.
Runway 17/35			
	Data Source: OEAAA	Length: 2707	Type: A(V) / A(V)
	Status: EXISTING	Width: 40	RWY-STR: 10.31 NM or 62648 ft.
Runway End 17			
	Latitude: 35-13-01.80N	Type: A(V)	CD: 62550
	Longitude: 80-40-08.97W	Heading: 167.47°	DD: 62520
	Elevation: 780	Azimuth: 348.11°	PD: 649
	Side: L		
Runway End 35			
	Latitude: 35-12-35.67N	Type: A(V)	CD: -65257
	Longitude: 80-40-01.86W	Heading: 347.47°	DD: 65227
	Elevation: 797	Azimuth: 348.09°	PD: 649
	Side: R		
Runway 17/35			
	Data Source: NASR	Length: 2835	Type: A(V) / A(V)
	Status: EXISTING	Width: 40	RWY-STR:
Runway End 17			
	Latitude: <NULL>	Type: A(V)	CD:
	Longitude: <NULL>	Heading: 0.00°	DD:
	Elevation: <NULL>	Azimuth: 0.00°	PD:
	Side:		
Runway End 35			
	Latitude: <NULL>	Type: A(V)	CD:
	Longitude: <NULL>	Heading: 0.00°	DD:
	Elevation: <NULL>	Azimuth: 0.00°	PD:
	Side:		
8A6	Name: WILGROVE AIR PA Data Source: OEAAA Status: EXISTING	Latitude: 35-12-48.74N Longitude: 80-40-05.41W Elevation: 799	Azimuth: 348.10° APT-STR: 10.51 NM or 63874 ft.

Page 3 of 5

APPENDIX C
TERPS CALCULATIONS AND FAA DETERMINATION



U_8A6 Name: WILGROVE AIR PA Latitude: 35-12-48.74N Azimuth: 348.10°
Longitude: 80-40-05.42W APT-STR: 10.51 NM or 63875 ft.
Elevation: 799

Runway 17/35
Data Source: OEAAA Length: 2707 Type: A(V) / A(V)
Status: EXISTING Width: 40 RWY-STR: 10.31 NM or 62648 ft.

Runway End 17
Latitude: 35-13-01.80N Type: A(V) CD: 62550
Longitude: 80-40-08.97W Heading: 167.47° DD: 62520
Elevation: 780 Azimuth: 348.11° PD: 649
Side: L

Runway End 35
Latitude: 35-12-35.67N Type: A(V) CD: -65257
Longitude: 80-40-01.86W Heading: 347.47° DD: 65227
Elevation: 797 Azimuth: 348.09° PD: 649
Side: R

Runway 17/35
Data Source: NASR Length: 2835 Type: A(V) / A(V)
Status: EXISTING Width: 40 RWY-STR:

Runway End 17
Latitude: <NULL> Type: A(V) CD:
Longitude: <NULL> Heading: 0.00° DD:
Elevation: <NULL> Azimuth: 0.00° PD:
Side:

Runway End 35
Latitude: <NULL> Type: A(V) CD:
Longitude: <NULL> Heading: 0.00° DD:
Elevation: <NULL> Azimuth: 0.00° PD:
Side:

Alert: Public Airports Within 5 Nautical Miles

Ident	Name	Distance	Latitude	Longitude
*JQF	CONCORD RGNL	0.23	35-23-15.99N	80-42-32.89W

Public Use Heliports & Surfaces

No Public Use Heliports Found

Alert: Heliports Within 5 Nautical Miles

Ident	Name	Distance	Latitude	Longitude
2548	HENDRICK MOTORSPORTS	1.69	35-21-28.00N	80-42-15.00W

Private Use Airports (in NAD 83 Datum)

APPENDIX C
TERPS CALCULATIONS AND FAA DETERMINATION



Ident	Name	Distance	Latitude	Longitude
NC05	BRADFORD FLD	4.25	35-24-31.50N	80-47-39.26W
NC35	SPENCER	4.57	35-24-10.50N	80-37-19.24W
4NC8	BUFFALO CREEK	5.03	35-25-20.50N	80-37-14.24W
3NC6	MC CACHREN FIELD	5.53	35-18-42.51N	80-38-39.24W
NC19	PROPST	6.73	35-23-30.50N	80-34-32.24W
NC77	CHALFANT	7.93	35-27-20.50N	80-34-32.24W
NC64	BARRINGER FIELD	8.58	35-31-40.00N	80-41-48.00W
NC39	ENOCHVILLE	8.92	35-31-27.50N	80-38-52.24W
2NC8	GOODNIGHT'S	9.13	35-31-31.50N	80-38-23.24W
35NC	JOHNSTON	9.37	35-32-18.00N	80-45-05.00W
50NC	ERVIN AIRFIELD	9.81	35-32-42.00N	80-40-07.00W
44NC	BROADWAY AIRFIELD	9.93	35-32-36.00N	80-39-07.00W
N128	JOHNSTON AIRPORT	9.98	35-32-55.00N	80-45-06.00W
6NC2	WILHELM	10.69	35-30-40.50N	80-33-29.23W
41NC	SLOOP	12.42	35-31-18.50N	80-31-19.20W

Private Use Heliports (in NAD 83 Datum)

Ident	Name	Distance	Latitude	Longitude
NC41	HENDRICK MOTORSPORTS	1.69	35-21-28.00N	80-42-15.00W
NC79	5100 WEST W.T. HARRIS BLV	5.99	35-20-09.51N	80-49-07.26W
NC60	NORTHEAST MEDICAL CENTER	6.22	35-26-06.40N	80-36-05.00W
31NC	PRESBYTERIAN HOSPITAL HUNTERSVILLE	7.31	35-24-24.00N	80-51-33.00W
NC24	DELTA AIR BASE	10.43	35-12-40.52N	80-43-09.24W
NN15	ENTERPRISE	10.56	35-14-27.00N	80-50-09.00W
02NC	RACE CITY	10.90	35-32-28.00N	80-35-52.00W
NN71	WESTOVER HELIPORT	11.28	35-12-36.00N	80-47-48.00W
2684	Landis	11.28	35-32-28.00N	80-35-00.00W
2040	PRESBYTERIAN HOSPITAL	11.72	35-12-44.00N	80-49-26.00W
2677	Lowe's Mooresville Heliport	11.79	35-32-37.02N	80-51-18.80W
2677	Lowe's Mooresville Heliport	11.79	35-32-37.02N	80-51-18.80W
2677	Lowe's Mooresville Heliport	11.79	35-32-37.02N	80-51-18.80W
*4NC4	LOWE'S MOORESVILLE	11.82	35-32-41.45N	80-51-15.37W
2678	Hunter Construction LZ	12.10	35-33-46.00N	80-49-49.00W
NR06	HUNTER CONSTRUCTION	12.10	35-33-46.00N	80-49-49.00W
NC90	WBTU	12.12	35-13-43.51N	80-52-08.26W
N118	LAKE NORMAN REG MED CTR	12.12	35-33-01.30N	80-51-19.60W
34NC	CAROLINAS MEDICAL CENTER	12.49	35-12-20.00N	80-50-30.00W

Legend

Distances:

CD = Along centerline from threshold
PD = Perpendicular to the centerline
DD = Direct from threshold

* Standard or Special Instrument Approach Procedures

APPENDIX C
TERPS CALCULATIONS AND FAA DETERMINATION



U.S. Department
of Transportation

Federal Aviation
Administration

November 21, 2011

Concord Regional Airport
Attn: Richard K. Lewis
9000 Aviation Boulevard
Concord, NC 28027

1701 Columbia Ave., Suite 2-260
College Park, GA 30337

RE: (See attached Table 1 for referenced case(s))
FINAL DETERMINATION

Table 1 - Letter Referenced Case(s)

ASN	Prior ASN	Location	Latitude (NAD83)	Longitude (NAD83)	AGL (Feet)	AMSL (Feet)
2011-ASO-1218-NRA		CONCORD, NC	35-23-06.74N	80-42-45.17W	135	797

Description: New Air Traffic Control Tower

We do not object with conditions to the construction described in this proposal provided:

You comply with the requirements set forth in FAA Advisory Circular 150/5370-2E, "Operational Safety on Airports During Construction."

The airport sponsor is hereby notified that if the proposed tower is constructed at the location indicated in this study, it will create a 28 ft. penetration to any future CAT II missed approach surface area "D". With all other requirements of CAT II minimums being addressed, the charted results will be a restricted CAT II with 100 FT HAT and 1200 RVR. No further improvements to CAT III operations will be available.

A separate notice to the FAA is required for any construction equipment, such as temporary cranes, whose working limits would exceed the height and lateral dimensions of your proposal.

This determination does not constitute FAA approval or disapproval of the physical development involved in the proposal. It is a determination with respect to the safe and efficient use of navigable airspace by aircraft and with respect to the safety of persons and property on the ground.

In making this determination, the FAA has considered matters such as the effects the proposal would have on existing or planned traffic patterns of neighboring airports, the effects it would have on the existing airspace structure and projected programs of the FAA, the effects it would have on the safety of persons and property on the ground, and the effects that existing or proposed manmade objects (on file with the FAA), and known natural objects within the affected area would have on the airport proposal.

This determination expires on May 21, 2013 unless:

APPENDIX C
TERPS CALCULATIONS AND FAA DETERMINATION



- (a) extended, revised or terminated by the issuing office.
- (b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for the completion of construction, or the date the FCC denies the application.

NOTE: Request for extension of the effective period of this determination must be obtained at least 15 days prior to expiration date specified in this letter.

If you have any questions concerning this determination contact Peter Hughes, (404) 305-7162, peter.hughes@faa.gov.

Peter Hughes
ADO

APPENDIX D
NASWATCH REPORT



Tower Site No. 1

Federal Aviation Administration
Tech Ops NASWatch Report
Generated By SYSTEM OEAAA on Wed Dec 21 09:26:58 EST 2011

Facility Search results:

10 Facilities were found within 5.0 nautical miles of NRA Case: 2011-ASO-2047-NRA SE: 670 AGL:121 AMSL: 791

Facility Id	Facility Apt ID	Latitude Longitude	Ground Elev (FT)	Vertical Angle (Degs)	Azimuth	Dist FT Dist NM	Source
ATCT	JQF JQF	35-23-08.20N 80-42-44.30W	664.0	19.67	182.94	355.37 0.06	OEAAA
**Proposal <= 5 NM of ATCT							
AWOS	JQF JQF	35-23-07.00N 80-42-35.00W	664.0	6.09	122.35	889.98 0.15	OEAAA
**Proposal <= 1000' of ASOS/AWOS/AWSS and proposal height >= (ASOS/AWOS/AWSS height - 10')							
AWOS	JQF JQF	35-23-07.00N 80-42-35.00W	0.0	41.63	122.35	889.98 0.15	NASR
**Proposal <= 1000' of ASOS/AWOS/AWSS and proposal height >= (ASOS/AWOS/AWSS height - 10')							
GS / 20	JQF JQF	35-23-35.45N 80-42-25.34W	690.0	2.02	32.88	2858.23 0.47	NASR
**Proposal <= 3000 Ft from ILS Glide Slope facility							
REIL / 02	JQF JQF	35-22-39.99N 80-42-41.00W	639.9	2.69	175.45	3217.08 0.53	NASR
PAPI / 02	JQF JQF	35-22-39.99N 80-42-41.00W	639.9	2.69	175.45	3217.08 0.53	NASR
DME / 20	JQF JQF	35-22-34.77N 80-42-45.60W	615.0	2.70	181.93	3737.18 0.62	NASR
**Proposal is <= 2 NM of VOR / TACAN / VORTAC / VOT / DME and proposal AGL >= 20'							
LOC / 20	JQF JQF	35-22-34.36N 80-42-42.27W	627.0	2.48	177.73	3779.49 0.62	NASR
**Proposal is < 2 NM and within 25dgr of RWY CL at LOC Ant.							
MALSR / 20	JQF JQF	35-23-51.98N 80-42-24.76W	704.7	1.13	21.44	4374.56 0.72	NASR
PAPI / 20	JQF JQF	35-23-51.98N 80-42-24.76W	704.7	1.13	21.44	4374.56 0.72	NASR

Long Range Radar Search results:

1 Long Range Radar(s) were found for NRA Case: 2011-ASO-2047-NRA SE: 670 AGL:121 AMSL: 791

Facility Id	Facility Apt ID	Latitude Longitude	Ground Elev (FT)	Vertical Angle (Degs)	Azimuth	Dist FT Dist NM	Source
ARSR-DNT	QRM	35-36-38.90N 81-14-17.70W	852.0	-0.03	297.68	176572.79 29.06	OEAAA

****Long Range Radar Conflict. Further study required.**

USAF Radar Search results:

0 Radar(s) were found for NRA Case: 2011-ASO-2047-NRA SE: 670 AGL:121 AMSL: 791

Concord Regional Airport
ATCT Site Selection Study

TALBERT&BRIGHT

D-1

APPENDIX D
NASWATCH REPORT



Tower Site No. 6

Federal Aviation Administration
Tech Ops NASWatch Report
Generated By SYSTEM OEAAA on Mon Dec 19 14:03:46 EST 2011

Facility Search results:

10 Facilities were found within 5.0 nautical miles of NRA Case: 2011-ASO-2046-NRA SE: 671 AGL:124 AMSL: 795

Facility	Facility Id	Apt ID	Latitude Longitude	Ground Elev (FT)	Vertical Angle (Degs)	Azimuth	Dist FT Dist NM	Source
ATCT	JQF	JQF	35-23-08.20N 80-42-44.30W	664.0	12.56	131.85	588.03 0.10	OEAAA
**Proposal <= 5 NM of ATCT								
AWOS	JQF	JQF	35-23-07.00N 80-42-35.00W	664.0	4.31	113.03	1312.75 0.22	OEAAA
AWOS	JQF	JQF	35-23-07.00N 80-42-35.00W	0.0	31.20	113.03	1312.75 0.22	NASR
GS / 20	JQF	JQF	35-23-35.45N 80-42-25.34W	690.0	1.94	40.35	3100.83 0.51	NASR
REIL / 02	JQF	JQF	35-22-39.99N 80-42-41.00W	639.9	2.67	167.63	3321.44 0.55	NASR
PAPI / 02	JQF	JQF	35-22-39.99N 80-42-41.00W	639.9	2.67	167.63	3321.44 0.55	NASR
DME / 20	JQF	JQF	35-22-34.77N 80-42-45.60W	615.0	2.72	174.99	3786.91 0.62	NASR
**Proposal is <= 2 NM of VOR / TACAN / VORTAC / VOT / DME and proposal AGL >= 20'								
LOC / 20	JQF	JQF	35-22-34.36N 80-42-42.27W	627.0	2.49	170.97	3861.79 0.64	NASR
**Proposal is < 2 NM and within 25deg of RWY CL at LOC Ant.								
MALSR / 20	JQF	JQF	35-23-51.98N 80-42-24.76W	704.7	1.14	27.00	4527.77 0.75	NASR
PAPI / 20	JQF	JQF	35-23-51.98N 80-42-24.76W	704.7	1.14	27.00	4527.77 0.75	NASR

Long Range Radar Search results:

1 Long Range Radar(s) were found for NRA Case: 2011-ASO-2046-NRA SE: 671 AGL:124 AMSL: 795

Facility	Facility Apt ID	Latitude Longitude	Ground Elev (FT)	Vertical Angle (Degs)	Azimuth	Dist FT Dist NM	Source
ARSR-INT	QRM	35-36-38.90N 81-14-17.70W	852.0	-0.03	297.74	176151.48 28.99	OEAAA

****Long Range Radar Conflict. Further study required.**

USAF Radar Search results:

0 Radar(s) were found for NRA Case: 2011-ASO-2046-NRA SE: 671 AGL:124 AMSL: 795

Concord Regional Airport
ATCT Site Selection Study

TALBERT&BRIGHT

D-2

APPENDIX D
NASWATCH REPORT



Tower Site No. 8

Federal Aviation Administration
Tech Ops NASWatch Report
Generated By Shafat Ahmad on Mon Aug 22 08:53:13 EDT 2011

Facility Search results:

10 Facilities were found within 5.0 nautical miles of NRA Case: 2011-ASO-1218-NRA SE: 662 AGL:135 AMSL: 797

Facility Id	Facility Apt ID	Latitude Longitude	Ground Elev (FT)	Vertical Angle (Degs)	Azimuth	Dist FT Dist NM	Source
ATCT	JQF JQF	35-23-08.20N 80-42-44.30W	664.0	39.00	26.01	164.26 0.03	OEAAA
**Proposal <= 5 NM of ATCT							
AWOS	JQF JQF	35-23-07.00N 80-42-35.00W	664.0	6.84	88.21	842.52 0.14	OEAAA
**Proposal <= 1000' of ASOS/AWOS/AWSS and proposal height >= (ASOS/AWOS/AWSS height - 10')							
AWOS	JQF JQF	35-23-07.00N 80-42-35.00W	0.0	43.41	88.21	842.52 0.14	NASR
**Proposal <= 1000' of ASOS/AWOS/AWSS and proposal height >= (ASOS/AWOS/AWSS height - 10')							
PAPI / 02	JQF JQF	35-22-39.99N 80-42-41.00W	639.9	3.30	172.72	2726.39 0.45	NASR
REIL / 02	JQF JQF	35-22-39.99N 80-42-41.00W	639.9	3.30	172.72	2726.39 0.45	NASR
DME / 20	JQF JQF	35-22-34.77N 80-42-45.60W	615.0	3.22	180.63	3232.73 0.53	NASR
**Proposal is <= 2 NM of VOR / TACAN / VORTAC / VOT / DME and proposal AGL >= 20'							
LOC / 20	JQF JQF	35-22-34.33N 80-42-42.25W	627.0	2.96	175.78	3285.93 0.54	NASR
**Proposal is < 2 NM and within 25dgr of RWY CL at LOC Ant.							
GS / 20	JQF JQF	35-23-35.45N 80-42-25.34W	690.0	1.84	29.49	3335.08 0.55	NASR
MALSR / 20	JQF JQF	35-23-51.98N 80-42-24.77W	704.7	1.08	20.27	4876.31 0.80	NASR
PAPI / 20	JQF JQF	35-23-51.98N 80-42-24.77W	704.7	1.08	20.27	4876.31 0.80	NASR

Long Range Radar Search results:

1 Long Range Radar(s) were found for NRA Case: 2011-ASO-1218-NRA SE: 662 AGL:135 AMSL: 797

Facility Id	Facility Apt ID	Latitude Longitude	Ground Elev (FT)	Vertical Angle (Degs)	Azimuth	Dist FT Dist NM	Source
ARSR-INT	QRM	35-36-38.90N 81-14-17.70W	852.0	-0.03	297.84	176727.00 29.09	OEAAA

****Long Range Radar Conflict. Further study required.**

USAF Radar Search results:

0 Radar(s) were found for NRA Case: 2011-ASO-1218-NRA SE: 662 AGL:135 AMSL: 797

Concord Regional Airport
ATCT Site Selection Study

TALBERT&BRIGHT

D-3

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

**Safety Risk Management Document
Comparative Safety Assessment
For Airport Traffic Control Tower Siting**

**Concord Regional Airport
(JQF)**



**For
Federal Aviation Administration
Version 1.0**

July 8, 2011

Page 1

12/2/2011

***Concord Regional Airport
ATCT Site Selection Study***

TALBERT&BRIGHT

E-1

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

SRMD Change Page

Action/Change made to the SRMD	Date	Version Number
Initial SRMD	July 8, 2011	1.0

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

Signature Page

Title: Concord Regional Airport ATCT Comparative Safety Assessment (CSA) Safety Risk Management Document (SRMD)
Initiator: Brian Salyers, P.E.
Initiator's Organization: Talbert & Bright, Inc.
Initiator's Phone Number: 704-426-6070
Submission Date: July 8, 2011
SRMD Revision Number: Version 1.0
SRMD Revision Date:

Reviewed by:

Larry Ayers Date
Eastern Service Center Quality Control Group, SRM Specialist, (AJV-E11)

Steve Kimsey Date
Operations Support Group, ESC, (AJV-E2)

Larry K. Johnson Date
Air Traffic Manager, Concord (JQF) ATCT

SRMD Approval Signature(s):

Jim Koon Date
SMS/SRM POC, Carolina District, (TEG-CLT)

Risk Acceptance Signature(s):

Mark Clark Date
District Manager, Carolina District (TEG-CLT)

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



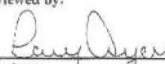
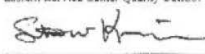
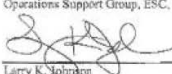

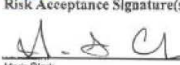
047 10/ 0000 02110 / 0047331246 CONCORD TWR
RECEIVED 02/16/2008 09:02 7047931246
SEP-20-2011 TUE 03:32 PM FAX NO. CONCORD TWR P. 01/01

Safety Risk Management Document
Comparative Safety Assessment

Signature Page

Title: Concord Regional Airport ATCT Comparative Safety Assessment (CSA) Safety Risk Management Document (SRMD)
Initiator: Brian Salyers, P.E.
Initiator's Organization: Talbert & Bright, Inc.
Initiator's Phone Number: 704-426-6070
Submission Date: July 3, 2011
SRMD Revision Number: Version 1.0
SRMD Revision Date:

Reviewed by:

	9/15/2011
Larry Ayers Eastern Service Center Quality Control Group, SRM Specialist. (AJV-E11)	Date
	9-19-2011
Steve Kimsey Operations Support Group, ESC. (AJV-E2)	Date
	9/21/11
Larry K. Johnston Air Traffic Manager, Concord (JQF) ATCT	Date
SRMD Approval Signature(s):	
	9-23-11
Jim Koch SMS/SHM POC, Carolina District. (TEG-C.T)	Date
Risk Acceptance Signature(s):	
	9/23/2011
Mark Clark District Manager, Carolina District (TEG-CLT)	Date

Page 3 9/14/2011

Concord Regional Airport
ATCT Site Selection Study

TALBERT&BRIGHT

E-4

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

Executive Summary

A Comparative Safety Assessment (CSA) has been completed on the Airport Traffic Control Tower (ATCT) Siting for the Concord Regional Airport (JQF). The purpose of conducting the CSA was to apply the Safety Risk Management (SRM) process defined in the Federal Aviation Administration (FAA) Safety Management System (SMS) Manual version 2.1, dated May 27, 2008, to the ATCT Siting Process in order to make the JQF ATCT Siting Report compliant with the goals and objectives of the FAA SMS Manual.

The CSA is a comparison of the relative risk among the three (3) viable sites as identified in the ATCT Siting Report, Concord Regional Airport, Final Report dated November 10, 2009. A Preliminary Hazard List (PHL) was used to identify the hazards, and hazard analysis worksheets were used to document the severity of consequence and likelihood of occurrence to assess the risk. The three (3) viable sites, as identified in the ATCT Siting Report, Concord Regional Airport, Final Report dated November 10, 2009, were evaluated against each of the system safety hazards identified in the PHL. The hazards were compared using a risk matrix for relative hazard ranking. The CSA only considers hazards that may impact aviation safety.

The siting of the new JQF ATCT has certain risks associated with it, and a SMS Risk Analysis is necessary to identify such risks, eliminate risks when possible, and to mitigate the remaining risks as necessary. The Safety Assessment is also limited to only the siting hazards until the Cab and Shaft Design has been selected and approved.

The evaluation team consisted of representatives from JQF ATCT, Eastern Service Area, Atlanta ADO, Concord Regional Airport management, NCDOT Division of Aviation, and Talbert & Bright, Inc. (report preparer). The JQF Safety Risk Management Panel (SRMP) discussed hazard identification using the ATCT Siting PHL. The SRMP team validated the ATCT Siting PHL. Table 1 (page 4) represents the initial risk findings "without" the recommended safety requirements in place. The ATCT is a contract tower.

Findings

The JQF SRMP has recommended Site 8 as the location for the new ATCT. The recommendation for Site 8 in lieu of Site 6 was JQF has plans for future development at Site 6. All hazards were identified by the SRMP. Tables 2 and 3 (page 5) depict both the initial and predicted residual risks. Table 2 contains a summary of the initial risks, recommended safety requirements, and the predicted residual risk after implementation of the safety requirements.

Table 1 – CSA Initial Risk Ranking Results

SITE	HI	MEDIUM	LOW	COMMENTS
SITE 1	0	0	1	
SITE 6	0	0	0	
SITE 8	0	0	1	Recommended Site

In order to mitigate the potential risks identified, the SRMP has identified the necessary safety requirement depicted in Table 2. A detailed listing of hazards for the three recommended sites can be found in appendices A, B, and C.

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

Table 2 – JQF Initial and Predicted Residual Risk Summary

SITE #	HAZARD DESCRIPTION	INITIAL RISK	SAFETY REQUIREMENT	PREDICTED RESIDUAL RISK
8-17	Exterior Physical Barriers: Controller's restricted view slightly impacted from the existing tower as new tower is constructed. Runway and taxiway views not restricted.	5A Low	Radar will be used as an aide to mitigate the blind spot created by the construction of the new ATCT. In addition, the controllers will move the closed traffic pattern to the east side of the airport.	None

During the CSA the original mitigation strategy was to install a camera with monitor to see around new tower construction. During review it was suggested that the radar be used as an aide in mitigating the blind spot, and to move the closed traffic pattern to the east side of the airport. This suggestion was coordinated with the SRMP through email, and received unanimous concurrence.

Table 3 – CSA Predicted Residual Risk Ranking Results

SITE	HI	MEDIUM	LOW	COMMENTS
SITE 1	0	0	1	
SITE 6	0	0	0	
SITE 8	0	0	1	Recommended Site

History

The final Airport Traffic Control Tower (ATCT) Siting Report for Concord Regional Airport (JQF) was submitted on November 10, 2009. A Safety Risk Management panel was coordinated and a Comparative Safety Assessment (CSA) was conducted with the panel on February 23, 2010 on the ATCT Siting for the Concord Regional Airport (JQF). After the CSA was conducted, FAA Security had determined that the ATCT did not meet the setback requirements of FAA Order 1600.69B, and JQF was notified on August 8, 2010 that a blast analysis would need to be completed for ATCT Site 8. Another version of the ATCT Siting Report was submitted on May 23, 2011, but has been withdrawn. On June 20, 2011, JQF was notified that the FAA will no longer require blast, setback, fences, and other physical security requirements at the sponsor-owned/leased facilities. At a meeting held with FAA and JQF representatives on July 7, 2011 it was concurred that security was not an issue, and it was requested that the Safety Risk Management Document be submitted for signatures.

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

Table of Contents

Signature Page	3
Executive Summary	4
Table of Contents	6
List of Tables	7
List of Figures	7
Introduction	8
Section 1 – Current System (System Baseline)	9
Section 2 – Proposed Change	11
Section 3 – Safety Risk Management Planning and Impacted Organizations	13
Section 4 – Assumptions	13
Section 5 – Phase 1: System Description	14
Section 6 – Phase 2: Identified Hazards	15
Section 7 - Phases 3 and 4: Risk Analysis and Risk Assessment	17
Section 8 – Phase 5: Treatment of Risks / Mitigation of Hazards	21
Section 9 – Tracking and Monitoring of Hazards	22
Appendix A – Hazard Worksheets for Site #1	24
Appendix B – Hazard Worksheets for Site #6	25
Appendix C – Hazard Worksheets for Site #8	26
Appendix D – Photos of Hazards for Site #1	27
Appendix E – Photos of Hazards for Site #8	29
Appendix F - Hazard Tracking System (HTS), Validation & Verification (V&V)	31
Appendix G – TERP's Analysis	32
Appendix H – Acroyms	32
Appendix I – Resources	32

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

List of Tables

Table 1 – CSA Initial Risk Ranking Results	4
Table 2 – JQF Initial and Predicted Residual Risk Summary	5
Table 3 – CSA Predicted Residual Risk Ranking Results	5
Table 4 – Proposed Sites Location and Heights	11
Table 5 – ATCT Preliminary Hazard List	15
Table 6 – Severity Definitions	18
Table 7 – Likelihood Definitions	19
Table 8 – Hazard – 8-17 Exterior Physical Barriers	23

List of Figures

Figure 1 – Current Airport Layout	10
Figure 2 – Proposed Site Locations	12
Figure 3 – 5M Model	14
Figure 4 – JQF Initial Risk Matrix	20
Figure 5 - Hazard 1-17: Visual Performance	28
Figure 6 - Hazard 8-17: Exterior Physical Barrier	30

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

Introduction

The ATCT at JQF is being replaced in order to accommodate air traffic growth and to provide for increased operational efficiency. A CSA has been completed on the ATCT siting for the Concord Regional Airport. The purpose of conducting the CSA was to apply the SRM process defined in the FAA SMS Manual version 2.1, dated May, 27, 2008, to the ATCT Siting Process in order to make the JQF ATCT siting report compliant with the goals and objectives in the FAA SMS Manual.

The CSA is a comparison of the relative risk among the three (3) viable sites as identified in the ATCT Siting Report, Concord Regional Airport, Final Report dated November 10, 2009. A PHL was used to identify the hazards, and hazard analysis worksheets were used to document the severity of consequence and likelihood of occurrence to assess the risk. The three (3) viable sites, as identified in the ATCT Siting Report, Concord Regional Airport, Final Report dated November 10, 2009, were evaluated against each of the system safety hazards identified in the PHL. The hazards were compared using a Risk Matrix for relative hazard ranking. The CSA only considers hazards that may impact aviation safety. A TERP's analysis was completed by Jon Walker, ESA (Atlanta) Flight Procedures Specialist and the results are included in Appendix 'G'. If a future Cat II/III approach is developed an adjustment to the minimums would be required. The airport is aware that the minimums would have to be adjusted if their ILS capabilities are expanded in the future.

FAA Order 8040.4 requires that all high-consequence decisions must undergo a formal, disciplined, and decision-making process to address safety risks.¹ This process is called SRM and is a key element of an FAA initiative, the SMS, to formalize and institutionalize an FAA-wide safety process.

A SRMP was formed to identify the potential hazards, assess and analyze the associated risks, and determine existing and recommended safety requirements to mitigate or control the safety risk(s) associated with this tower siting. See Section 3 for membership of the SRMP.

The results of the SRMP deliberations are documented in Appendix A, B, and C, Hazard Analysis and Risk Matrix, and Appendix F, Hazard Tracking System (HTS) Validation & Verification (V&V) Fields/Rationale for Safety Requirements/Controls.

The Concord Regional Airport ATCT SRMP followed the SMS policy and SRM Process when conducting the safety analysis.

The SRM process involves the following steps: Planning, System Description, Hazard Identification, Hazard Analysis and Assessment, and Hazard Tracking.

This document describes how the SRM process was applied to the Concord Regional Airport ATCT siting hazards and summarizes the results from this process. It is organized to follow the SRM steps. The SRMD does not address Occupational Health and Safety Administration (OSHA) and security issues.

¹ A high consequence decision is one that is thought to create or result in an increase/decrease in loss of life and health, a change in property values, loss of or damage to property, costs or savings, or other economic impacts values at \$100 million per annum.

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

Section 1 – Current System (System Baseline)

The existing Concord Regional Airport ATCT is currently on top of the existing terminal building, and the top of the ATCT is at an elevation of 701 MSL, with an estimated eye-level height of 693 feet, which is approximately 11 feet lower than the end of Runway 20. In addition, the existing control tower cab size is not sufficient to accommodate new technological equipment, additional workstations, and counter space. The airport has 1 active runway: Runway 2-20.

Runway 2-20 is constructed of grooved asphalt and is 7,400 feet long and 100 feet wide and is capable of accommodating aircraft weighing up to 128,000 pounds with a Dual wheel configuration. Runway 2-20 is equipped with High Intensity Runway Lights (HIRLs), Touch Down Zone Lights, Centerline Lights, and Visual Approach Slope Indicator (VASI). Runway 20 has a displaced threshold of 650 feet.

Runway 20 has a Category One Instrument Landing System/Distance Measuring Equipment (CAT I ILS/DME), and MALSR - 1,400-foot Medium Intensity Approach Lighting System with Runway Alignment Identifier Lights.

Airport and runway usage at JQF is primarily corporate aviation and unscheduled commercial aviation. In 2009, the JQF traffic count averaged 183 operations per day, or a total of 66,816. This traffic is primarily generated by itinerant aircraft. The airport has 192 based aircraft. The airport operates on a 24-hour-per-day schedule, and the tower operates from 0700 to 2300. The primary runway used is Runway 20. JQF operates year-round to service local transportation of businesses, residents, government, and recreational industries of the area.

Figure 1 (page 10) is an airport diagram of JQF as it exists today.

APPENDIX E

COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

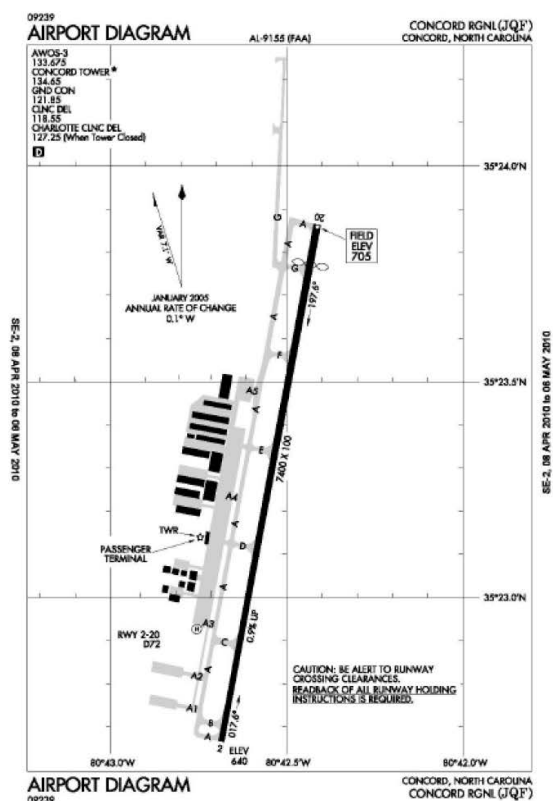


Figure 1 - Current Airport Layout

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

Section 2 – Proposed Change

Figure 2 (page 12) depicts the three (3) viable sites that were determined feasible locations from the ATCT Siting Report, Concord Regional Airport, Report dated November 10, 2009. This safety assessment was conducted on the three (3) viable sites concentrating on system safety hazards. The intent was to compare all three (3) sites against an identified set of system safety criteria. The detailed results are included in Appendices A, B, and C. This value-added effort meets the intent and goals of the FAA Safety Management System.

Table 4 (page 11) lists the locations of the three (3) sites:

Table 4 - Proposed Sites Location and Heights

Site 1	Site 6	Site 8
Latitude 35° 23' 17.81"	Latitude 35° 23' 12.08"	Latitude 35° 23' 06.74"
Longitude 80° 42' 44.07"	Longitude 80° 42' 49.59"	Longitude 80° 42' 45.17"
AMSL: 782'	AMSL: 786'	AMSL: 788'
AGL: 112'	AGL: 115'	AGL: 126'

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment



Figure 2 - Proposed Site Locations

Page 12

12/2/2011

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

Section 3 – Safety Risk Management Planning and Impacted Organizations

A JQF ATCT SRMP was formed and developed this CSA to identify the potential hazards, assess and analyze the associated risks, and determine existing and recommended safety requirements to mitigate or control the safety risk associated with the siting of the new JQF ATCT. The panel met on February 23, 2010, to identify and review hazards associated with the siting of the new JQF ATCT.

SRMP members as of February 23, 2010:

Brian Salyers	Talbert & Bright, Inc.
Jim McKenna	FAA - SRM Specialist (Quality Control Group)
Rusty Nealis	FAA-ATL-ADO
Ron Hubbard	FAA – Eastern Terminal Requirements
John Dennis	FAA - Carolina District Operations Support Specialist
Dion Viventi	NCDOT – Division of Aviation
Rick Barkes	NCDOT – Division of Aviation
Ken Johnson	JQF ATCT Tower Manager
Rob Walter	Concord Regional Airport (JQF)
Ray Farrington	Concord Regional Airport (JQF)
Richard Lewis	Concord Regional Airport (JQF)

Section 4 – Assumptions

The assumptions associated with the ATCT CSA Siting Report are discussed below:

1. Any changes to the ATCT Siting Report for the JQF CSA SRMD will be made upon concurrence of the JQF SRMP.
2. It is expected that risk will increase should the existing safety requirements not be followed or implemented.
3. The CSA is not all-inclusive in that there may be unknown hazards within any operation or process.
4. The existing and recommended safety requirements will be implemented and verified.

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

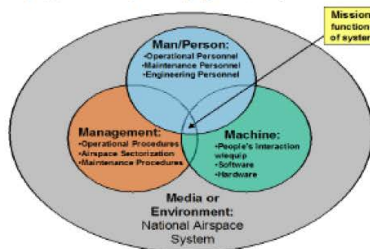
Section 5 – Phase 1: System Description

The ATCT is a complex structure of equipment and material designed to allow humans to interact with aircraft, vehicles, and personnel involved in the transportation of passengers and cargo from one location to another. This broad definition includes the physical attributes of the control tower structure, electronic systems and sub-systems, and design features created to allow personnel to see, monitor, communicate with, and direct operations over the Concord Regional Airport property. There are a multitude of requirements for ATC personnel to see (visually), communicate with, observe (remotely or otherwise), direct, and control operations within the areas designed as the control (movement) area.

The scope of this effort is a CSA of the three (3) viable ATCT sites and documents the process and methodology by which the recommended site was determined.

5 M Model

- **Man** – Includes the following human elements: all operational personnel at JQF Tower.
- **Mission** – Reduce risks associated with the operation of the new ATCT at JQF airport.
- **Media** – The terminal Air Traffic Control (ATC) facility that provides traffic advisories, spacing, sequencing, and separation services to visual flight rules (VFR) and instrument flight rules (IFR) aircraft operating on the surface of the airport and within the designated class B airspace surrounding the airport. In addition, the air traffic controllers at JQF give pilots instructions to operate on the airport movement area so traffic flows smoothly and efficiently.
- **Management** – The Management element is bounded by FAA Order 6480.4A, Tower Siting Order Process; FAA Order 7110.65, Air Traffic Control; and local standard operating procedures (SOPs), which describe how operational personnel conduct/apply required procedures in the tower environment.
- **Machine** - Normal facility operational position equipment (RADAR, communications, information display, weather system equipment, etc.).



**Figure 3 –
5 M Model**

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

Section 6 – Phase 2: Identified Hazards

The JQF ATCT siting hazards were pre-identified using an experienced team of ATC consultants and SMS safety experts. This team utilized the ATCT Siting PHL as identified in FAA Order 6480.4A. This hazard list is identified in Table 5 (page 15).

Table 5 - ATCT Preliminary Hazard List

1. Potential interference with navigation equipment both planned and existing
2. Potential interference with communication equipment both planned and existing
3. Potential interference with existing and or proposed surveillance equipment
4. TERPS surfaces penetrations
5. Part 77 surfaces penetrations
6. Relevant Airport Design standards violated
7. Direction of view
7 a. North
7 b. East
7 c. West
7 d. South
8. Line of sight/angle of view
8 a. Up
8 b. Down
9. Visual Performance
9 a. Unobstructed view
9 b. Object Discrimination
9 c. Line of Sight (LOS) Angle of Incidence
9 d. Two-Point Lateral Discrimination
10. Lighting and Atmospheric Limitations – Daylight
10 a. Sun Angle
10 b. Sun Glare
10 c. Sun Shadows
10 d. Thermal Distortion
10 e. Light changes/contrast eye adaptation
11. Lighting and Atmospheric Limitations – Night
11 a. Dawn
11 b. Dusk
11 c. Night
12. Artificial Lighting
12 a. Airport lighting equipment outages
12 b. Lighting shadows
12 c. Airport lighting
12 d. Construction lighting
12 e. Residential/industrial lighting
12 f. Background clutter
13. Naturally occurring atmospheric conditions

Page 15

12/2/2011

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

13 a. Dust
13 b. Ash
13 c. Smoke
13 d. Haze
13 e. Fog
13 f. Rain
13 g. Sleet
13 h. Snow
13 i. Sun glare off snow
13 j. Minimum ceiling heights (historical data)
14. Industrial/municipal discharges
14 a. Dust
14 b. Ash
14 c. Smoke
15. Access to proposed site does not cross existing ground/air traffic patterns
16. Interior physical barriers
16 a. Position of ATC in Tower Cab
16 b. Position of Tower Cab equipment
16 c. Position of Tower Cab mullions
17. Exterior physical barriers
17 a. Construction equipment
17 b. Proposed new structures and Airport expansion (ALP)
17 c. Existing ATCT
18. Other

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

Section 7 - Phases 3 and 4: Risk Analysis and Risk Assessment

Risk Assessment Ratings

Risk assessment ratings were defined by utilizing the Risk Matrix Tool (see Figure 4, page 20). The tool is a grid that plots the relative severity of a hazard against the relative likelihood of its occurrence.

For a given hazard description, the severity is first determined using the methodology provided in SMS Manual Version 2.1. The likelihood of occurrence was determined based on a qualitative judgment using the experience of the SRMP and consulting with experts familiar with the system and its operation. The intersection of Severity and Likelihood determines the region of risk on the matrix.

Severity Definition

Severity is determined by the worst credible potential outcome. Less severe effects may be considered analytically in addition to this, but at a minimum, the most severe effects are considered. Likelihood is not considered when determining severity. Determination of severity is independent of likelihood. The Severity Definitions are listed in Table 6 (page 18).

Likelihood Definition

Likelihood is determined by how often the resulting harm can be expected to occur at the worst credible severity. When determining likelihood, the worst credible system states will usually determine the worst credible severity. The Likelihood Definitions are listed in Table 7 (page 19).

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

Table 6 - Severity Definitions

Effect On:	Hazard Severity Classification				
	Minimal 5	Minor 4	Major 3	Hazardous 2	Catastrophic 1
ATC Services	Conditions resulting in a minimal reduction in ATC services, or a loss of separation resulting in a Category D Runway Incursion (RI) ¹ , Operational Deviation (OD) ² , or Proximity Event (PE)	Conditions resulting in a slight reduction in ATC services, or a loss of separation resulting in a Category C RI ¹ or Operational Error (OE) ²	Conditions resulting in a partial loss of ATC services, or a loss of separation resulting in a Category B RI ¹ or OE ²	Conditions resulting in a total loss of ATC services, (ATC Zero) or a loss of separation resulting in a Category A RI ¹ or OE ²	Conditions resulting in a collision between aircraft, obstacles or terrain
Flight Crew	<ul style="list-style-type: none"> Flightcrew receives TCAS Traffic Advisory (TA) informing of nearby traffic, or, PD where loss of airborne separation falls within the same parameters of a Category D OE² or PE Minimal effect on operation of aircraft 	<ul style="list-style-type: none"> Potential for Pilot Deviation (PD) due to TCAS Preventive Resolution Advisory (PRA) advising crew not to deviate from present vertical profile or, PD where loss of airborne separation falls within the same parameters of Category C (OE)² or Reduction of functional capability of aircraft but does not impact overall safety (e.g. normal procedures as per AFM) 	<ul style="list-style-type: none"> PD due to response to TCAS Corrective Resolution Advisory (CRA) issued advising crew to take vertical action to avoid developing conflict with traffic or, PD where loss of airborne separation falls within the same parameters of a Category B OE² or, Reduction in safety margin or functional capability of the aircraft, requiring crew to follow abnormal procedures as per AFM 	<ul style="list-style-type: none"> Near mid-air collision (NMAC) results due to proximity of less than 500 feet from another aircraft or a report is filed by pilot or flight crew member that a collision hazard existed between two or more aircraft Reduction in safety margin and functional capability of the aircraft requiring crew to follow emergency procedures as per AFM 	<ul style="list-style-type: none"> Conditions resulting in a mid-air collision (MAC) or impact with obstacle or terrain resulting in hull loss, multiple fatalities, or fatal injury

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

Table 7 - Likelihood Definitions

	NAS Systems & ATC Operational	NAS Systems		ATC Operational		Flight Procedures
	Quantitative	Qualitative Individual Item/System	Qualitative ATC Service/ NAS Level System	Per Facility	NAS-wide	
Frequent A	Probability of occurrence per operation/operational hour is equal to or greater than 1×10^{-2}	Expected to occur about once every 3 months for an item	Continuously experienced in the system	Expected to occur more than once per week	Expected to occur more than every 1-2 days	Probability of occurrence per operation/operational hour is equal to or greater than 1×10^{-5}
Probable B	Probability of occurrence per operation/operational hour is less than 1×10^{-3} , but equal to or greater than 1×10^{-4}	Expected to occur about once per year for an item	Expected to occur frequently in the system	Expected to occur about once every month	Expected to occur about several times per month	
Remote C	Probability of occurrence per operation/operational hour is less than or equal to 1×10^{-5} but equal to or greater than 1×10^{-7}	Expected to occur several times in the life cycle of an item	Expected to occur numerous times in system life cycle	Expected to occur about once every year	Expected to occur about once every few months	Probability of occurrence per operation/operational hour is less than or equal to 1×10^{-6} but equal to or greater than 1×10^{-7}
Extremely Remote D	Probability of occurrence per operation/operational hour is less than or equal to 1×10^{-7} but equal to or greater than 1×10^{-9}	Unlikely to occur, but possible in an item's life cycle	Expected to occur several times in the system life cycle	Expected to occur about once every 10-100 years	Expected to occur about once every 3 years	Probability of occurrence per operation/operational hour is less than or equal to 1×10^{-7} but equal to or greater than 1×10^{-9}
Extremely Improbable E	Probability of occurrence per operation/operational hour is less than 1×10^{-9}	So unlikely that it can be assumed that it will not occur in an item's life cycle	Unlikely to occur, but possible in system life cycle	Expected to occur less than once every 100 years	Expected to occur less than once every 30 years	Probability of occurrence per operation/operational hour is less than 1×10^{-9}

The ATCT CSA Siting Report uses criteria identified in the FAA SMS Manual version 2.1 for both severity of consequence and likelihood of occurrence. These criteria are listed in the FAA SMS Manual and found in tables 3.3 and 3.4. The Risk Assessment Matrix can be found in Figure 4, and the criteria for risk acceptability are found in the SMS Manual in Figure 3.9. Figure 5 (page 28) and Figure 6 (page 30) depict both the initial risks and the predicted residual risks for all three (3) sites.

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

The Risk Levels used in the matrix in Figure 4 can be defined as:

High risk – Unacceptable risk - proposal cannot be implemented unless hazards are further mitigated so that risk is reduced to medium or low level and AOV approves the mitigating controls. Tracking and management are required. Catastrophic hazards that are caused by: (1) single-point events or failures, (2) common cause events or failures, or (3) undetectable latent events in combination with single point or common cause events are considered high risk, even if extremely remote. (Note: high risk is unacceptable at the time of hazard closure. However, for short periods of time, high risk may exist while mitigation plans are put into affect.)

Medium risk – Acceptable risk - minimum acceptable safety objective; proposal may be implemented, but tracking and management are required.

Low risk – Target - acceptable without restriction or limitation; hazards are not required to be actively managed but are documented.

Severity \ Likelihood	Minimal 5	Minor 4	Major 3	Hazardous 2	Catastrophic 1
Frequent A	High Risk 17	Medium Risk	High Risk	High Risk	High Risk
Probable B	High Risk	Medium Risk	High Risk	High Risk	High Risk
Remote C	High Risk	High Risk	Medium Risk	High Risk	High Risk
Extremely Remote D	High Risk	High Risk	High Risk	Medium Risk	High Risk
Extremely Improbable E	High Risk	High Risk	High Risk	High Risk	High Risk *

High Risk

Medium Risk

Low Risk

* Unacceptable with Single Point and/or Common Cause Failures

Site 1 =

Site 6 =

Site 8 =

Figure 4 – JQF Initial Risk Matrix

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

Section 8 – Phase 5: Treatment of Risks / Mitigation of Hazards

Mitigation of Hazards

The Safety Risk Management Panel methodology for risk analysis is based on the approach outlined in the FAA's System Safety Management Program. The approach is the five-step process detailed in the SMS Manual: Describe the System, Identify the Hazards, Analyze the Hazards, Assess the Risk, and Treat the Risk. One (1) hazard was identified for Sites 1 and 8 by using this approach.

Describing and Bounding the System

The SRMP identified the system as the controllers' ability to safely use the ATCT in the new location. Safety issues were limited to those within the purview of the ATO.

Hazard Analysis

A worksheet was completed to record the hazards, causes, possible effects, system states, severity rationale, likelihood rationale, current risk, existing safety requirements, recommended safety requirements, and predicted residual risk. The SRMP held a discussion on the identified hazards. The purpose of the discussion was to examine the hazard causes, validate the severity of consequences for the hazards on the worksheet and assign a qualitative likelihood of occurrence based on the operational expertise of the JQF ATCS.

Risk Determination

Risk is the composite of predicted severity and likelihood of the potential effect of a hazard in the worst credible system state. Risk is determined by two factors: severity of consequence and the likelihood of occurrence. Risk is not determined simply by the likelihood that the hazard will occur, but that the worst credible outcome will occur. The Risk Matrix from section 3.10.2 of the SMS Manual was used to identify and document the risk levels.

Risk Treatment

For each hazard, the SRMP identified existing and recommended safety requirements that mitigate or control the hazards using the safety order of precedence from Table 3.5 of the SMS Manual. After the hazards were defined and possible effects were identified, means to control the hazards were defined.

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

Section 9 – Tracking and Monitoring of Hazards

The SMS requires that each high and medium hazard is tracked until its risk is mitigated to low (when possible) and that the effectiveness of the mitigations be verified. David Knight, RVA, Inc. Safety Manager/Quality Assurance Specialist, 904-209-0854, has the responsibility to enter the hazards in the FAA's Hazard Tracking System "HTS" for archival and tracking purposes. Mr. Knight will track and monitor hazard activities.

See Appendix F (page 32), HTS Validation & Verification (V&V) Fields/Rationale for Safety Requirements/Controls, for specific SRMP V&V analysis.

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

Table 8 - Hazard 8-17 Exterior Physical Barriers

New ATCT will create exterior physical barrier for existing ATCT			
Mitigation Strategy	Safety Assessment Hazard No.	Responsible Party(s)	Planned Completion Date
See Below *	8-17	Richard Lewis, Concord Regional Airport	Prior to start of construction on new ATCT

Mitigation Strategy: The radar will be used as an aide to mitigate the blind spot created by the construction of the new ATCT. In addition, the controllers will move the closed traffic pattern to the east side of the airport.

Background/Rationale: The existing tower height is only 31 feet tall and will block the view of hangars and airspace to the south by the construction of a new 126-foot tall tower in close proximity. The blind spot primarily is the left base to Runway 2. The radar is currently used as an aide so no additional training is required. According to the ATM, traffic rarely enters from the west due to CLT airspace to the west.

Recommended Safety Requirements: Use of the radar and a right handed (east side) traffic pattern will be used as an aide to mitigate the blind spot created by the construction of the new ATCT.

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

Appendix A – Hazard Worksheets for Site 1

Hazard#	Hazard Description	Causes	System State	Existing Control or Requirement	Possible Effect	Severity/ Rationale	Likelihood Rationale	Initial / Current Risk	Recommended Safety Requirement	Predicted Residual Risk
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1-17	Exterior Physical Barriers: The construction of the new ATCT will block the view of controllers to airspace to the north.	New ATCT construction.	VMC	ATCT shall use JO 7110.65 para. 3-1-7 for validating and/or verifying aircraft ID and position. Pilot Reports	Temporary loss of aircraft in airport airspace.	5 – Minimal Blocked view only for width of tower.	A – Frequent Airspace blocked continuous until new ATCT is complete.	5A-Low	Radar will be used as an aide to mitigate the blind spot created by the construction of the new ATCT. In addition, the controllers will move the closed traffic pattern to the east side of the airport.	None

In addition to the identified hazards in the PHL for Site 1, the following potential hazards were discussed with the panel members: Potential Interferences, TERPS, Part 77, Airport Design Standards, Direction of View, Up-Down-Flat Angles, Visibility, Impacts to Airborne Ops from Light, Industrial Discharge, Site Access, and Interior Barriers. The panel determined there was one (1) hazard associated with the aforementioned common hazards for Site 1.

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

Appendix B – Hazard Worksheets for Site 6

Hazard#	Hazard Description	Cause	System State	Existing Control or Requirement	Possible Effect	Severity/Rationale	Likelihood/Rationale	Initial/Current Risk	Recommended Safety Requirement	Predicted Residual Risk
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
None										

In addition to the identified hazards in the PHL for Site 6, the following potential hazards were discussed with the panel members: Potential Interferences, TERPS, Part 77, Airport Design Standards, Direction of View, Up-Down-Flat Angles, Visibility, Impacts to Airborne Ops from Light, Industrial Discharge, Site Access, and Interior Barriers. The panel determined there was no hazard associated with the aforementioned common hazards for Site 6.

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

Appendix C – Hazard Worksheets for Site 8

Hazard#	Hazard Description	Causes	System State	Existing Control or Requirement	Possible Effect	Severity/Rationale	Likelihood/Rationale	Initial/Current Risk	Recommended Safety Requirements	Predicted Residual Risk
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
8-17	Exterior Physical Barriers: The construction of the new ATCT will block the view of controllers to airspace to the south.	New ATCT construction.	VMC	ATCT shall use JO 7110.65 para. 3-1-7 for validating and/or verifying aircraft ID and position. Pilot Reports	Temporary loss of aircraft in airport airspace.	5 – Minimal Blocked view only for width of tower.	A – Frequent Airspace blocked continuously until new ATCT is complete.	5A-Low	Radar will be used as an aide to mitigate the blind spot created by the construction of the new ATCT. In addition, the controllers will move the closed traffic pattern to the east side of the airport.	None

In addition to the identified hazards in the PHL for Site 8, the following potential hazards were discussed with the panel members: Potential Interferences, TERPS, Part 77, Airport Design Standards, Direction of View, Up-Down-Flat Angles, Visibility, Impacts to Airborne Ops from Light, Industrial Discharge, Site Access, and Interior Barriers. The panel determined there was one (1) hazard associated with the aforementioned common hazards for Site 8.

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

Appendix D – Aerial Photo of Hazards for Site 1

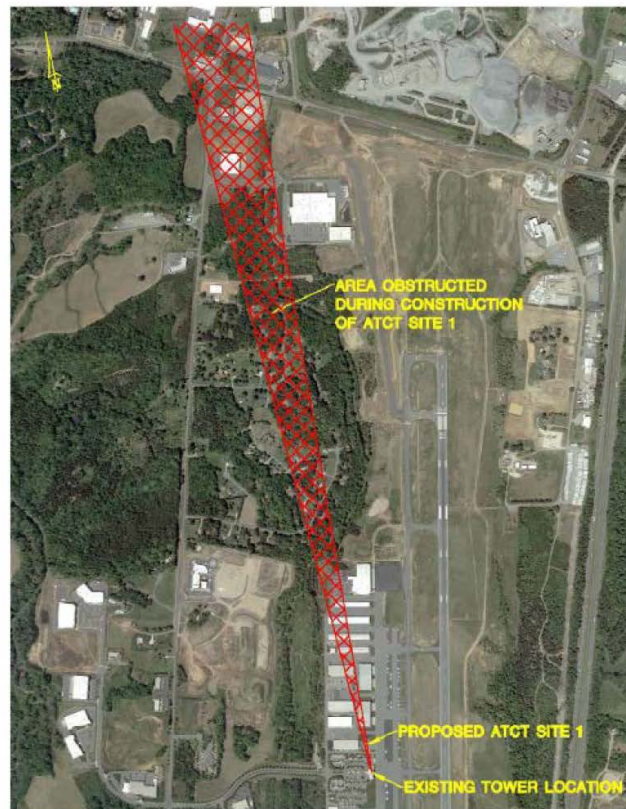
Page 27

12/2/2011

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment



New ATCT construction will block view of airspace for controllers from the existing ATCT.

Figure 5 - Hazard 1-17: Visual Performance

Page 28

12/2/2011

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

Appendix E – Aerial Photo of Hazards for Site 8

Page 29

12/2/2011

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment



New ATCT construction will block view of airspace for controllers from the existing ATCT.

Figure 6 - Hazard 8-17: Exterior Physical Barriers

Page 30

12/2/2011

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

Appendix F

Hazard Tracking System (HTS) Validation & Verification (V&V) Fields/Rationale for Safety Requirements/Controls

Hazard #	Safety Control Existing Safety Requirements	Safety Control Recommended Safety Requirements	V&V Status 1- No Data 2- Validated Only 3- V&V	Verification Method 1- Test 2- Assessment 3- Test & Assessment 0- Undefined	Control Implemented No Yes	Control Specification Rationale	Control Verification
8-17	ATCT shall use JO 7110.65 para. 3-1.7 & 3-1.9 procedures for validating and/or verifying aircraft ID, and position. Pilot Reports The Human Factors Design Standard HF-STD-001	A camera will be positioned to the south of the new ATCT construction with a monitor placed in the existing ATCT	1	2	Yes	Camera will allow controllers to see around construction of new ATCT	JQF ATM

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

Appendix G – TERP's Analysis

Concord RGNL (KJQF), NC / Control Tower Evaluation
Jon S Walker to: James CTR McKenna 02/05/2010 02:31 PM
A/W-3742, Eastern Flight Procedures
Cc: John P Haggerty

Jim,

I finished the proposed control tower re-evaluation of sites # 1, 6 & 8 at Concord, NC, using the provided LATLONs and heights, none of the JQF instrument flight procedures had any negative IFR effects. However, should the airport ever expand the existing ILS to CAT III/II capabilities, then site # 8 would have an IFR effect...the missed approach would be penetrated by 8 FT and an adjustment to the minimums would be necessary (it's unknown whether there's any future plans to expand the ILS capabilities).

Advise whether anything else is needed. Thanks,

JON S. WALKER
ATL FPO / AVN-102C
jon.s.walker@faa.gov
404-305-7405

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

FILE: KJQFTST.06 - CASE NO: 09-0000 DATE: 11-03-2009 START TIME: 11:14:06
LAT: 352307 LON: 804245 AMSL: 789 AGL: 126 A-CODE: 4D
CITY: CONCORD STATE: NC REMARKS:

***** RADAR EVALUATION *****

NO RADAR EFFECTS WERE NOTED IN THIS CASE.

***** DEPARTURE EVALUATION *****

NO DEPARTURE EFFECTS WERE NOTED IN THIS CASE.

***** CIRCLING EVALUATION *****

NO CIRCLING EFFECTS WERE NOTED IN THIS CASE.

***** NON PRECISION - EVALUATION *****

CASE NO:09-0000 APRT:JQF APPROACH:VNAV RWY:02 AMT:0 SUF: - OK
CASE NO:09-0000 APRT:JQF APPROACH:LNAV RWY:02 AMT:0 SUF: - OK
CASE NO:09-0000 APRT:JQF APPROACH:ILS-LOC RWY:20 AMT:2 SUF: - OK
CASE NO:09-0000 APRT:JQF APPROACH:VNAV RWY:20 AMT:0 SUF: - OK
CASE NO:09-0000 APRT:JQF APPROACH:LNAV RWY:20 AMT:0 SUF: - OK

***** PRECISION EVALUATION *****

CASE NO:09-0000 APRT:JQF APPROACH:LPV RWY:02 AMT:0 SUF: - OK
CASE NO:09-0000 APRT:JQF APPROACH:ILS RWY:20 AMT:2 SUF: - OK
CASE NO:09-0000 APRT:JQF APPROACH:LPV RWY:20 AMT:0 SUF: - OK

***** INTERMEDIATE EVALUATION *****

NO INTERMEDIATE EFFECTS WERE NOTED IN THIS CASE.

***** THOUSAND FOOT EVALUATION *****

NO THOUSAND FOOT EFFECTS WERE NOTED IN THIS CASE.

***** AIRWAY EVALUATION *****

DATA FILE NAME: KJQFTST.06 AIRSPACE CASE NO: 09-0000
VOR IDENT: SILSE VOR MAGNETIC VARIATION, (+)WEST: 0

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

MIN ENROUTE ALT (MEA): 1260 MIN OBST CLEAR ALT (MOCA): 1260
AIRWAY: CUT-LILLSIMERILL+NE OBSTRUCTION HEIGHT: 788
OBJECT IS IN THE AIRWAY SECONDARY AND LOCATED BETWEEN 0 AND 6.6 NM.
OBJECT DISTANCE OUT (NM): 3.13 OBJECT DISTANCE OVER (NM): 4.07
VOR RADIAL: 266 DIRECT DISTANCE (NM): 5.14
UNCORRECTED MEA/MOCA (AMSL): 1269.98 MAX TO AVOID (MTA): 778.02

***** MSA EVALUATION *****

NO MSA EFFECTS WERE NOTED IN THIS CASE.

CASE: 09-0000 FINISH TIME: 11:14:16

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

Appendix H - Acronyms

2-D – Two dimensional
3-D – Three dimensional
ADO – Airports District Office
AFTIL – Airport Facilities Terminal Integration Laboratory
AGL – Above Ground Level
ALP – Airport Layout Plan
ALSF2 - Approach Lighting System with Sequenced Flashing Lights
AMSL – Above Mean Seal Level
ANI – NAS Implementation Directorate
AOV – Office of Air Traffic Oversight
ASR – Airport Surveillance Radar
ATC – Air Traffic Control
ATCS – Air Traffic Control Specialist
ATCT – Airport Traffic Control Tower
ATO – Air Traffic Organization
AVS – Aviation Safety Organization
CAT – Category
CAT I ILS/DME – Category One Instrument Landing System/Distance Measuring Equipment
CFR – Code of Federal Regulations
COM – Communications
CSA – Comparative Safety Assessment
DAR – Design Analysis Report
DBRITE – Digital Brite Radar Indicator Terminal Equipment
F & E – Facilities and Equipment
FAA – Federal Aviation Administration
FAR – Federal Aviation Regulation
FPO – Flight Procedures Office
GPS – Global Positioning System
GS – Glide Slope
HAA – Height Above Airport
HAT – Height Above Touchdown
HI – High
HIRL – High Intensity Runway Lights
HTS – Hazard Tracking System
IFR – Instrument Flight Rules
ILS – Instrument Landing System
DMC – Instrument Meteorological Conditions
JQF – Concord Regional Airport
LO – Low
LOC – Localizer
LOS – Line of Sight
MALSR - Medium Intensity Approach Lighting System with Runway Alignment Identifier Lights
MDA – Minimum Decision Altitude
MED – Medium

Page 35

12/2/2011

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

NAS – National Airspace System
NASWATCH – Airway Facilities Radio Frequency Screening Tool
NAV – Navigation
NMAC – Near Mid-Air Collision
OSHA – Occupational Health and Safety Administration
PAPI – Precision Approach Path Indicator
PHA – Preliminary Hazard Analysis
PHL – Preliminary Hazard List
RAC – Risk Assessment Code
RACD – Remote ARTS Color Display
REIL – Runway End Identifier Lights
RVR – Runway Visual Range
RWY – Runway
SME – Subject Matter Expert
SMS – Safety Management System
SRM – Safety Risk Management
SRMD – Safety Risk Management Document
SRMP – Safety Risk Management Panel
JQF – Concord Regional Airport
SSH – System Safety Handbook SSMP – System Safety Management Plan
TERPS – Terminal Instrument Procedures
VASI – Visual Approach Slope Indicator
VFR – Visual Flight Rules

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



Safety Risk Management Document
Comparative Safety Assessment

Appendix I – Resources – Concord Regional Airport ATCT

FAA Order 6480.4A, Airport Traffic Control Tower Siting Criteria

TERPS Analysis

Federal Aviation Administration (FAA) Safety Management System (SMS) Manual version 2.1

NASWATCH Analysis

Operational expertise of the JQF ATCS

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



U.S. Department
of Transportation

Federal Aviation
Administration

November 21, 2011

Concord Regional Airport
Attn: Richard K. Lewis
9000 Aviation Boulevard
Concord, NC 28027

1701 Columbia Ave., Suite 2-260
College Park, GA 30337

RE: (See attached Table 1 for referenced case(s))
FINAL DETERMINATION

Table 1 - Letter Referenced Case(s)

ASN	Prior ASN	Location	Latitude (NAD83)	Longitude (NAD83)	AGL (Feet)	AMSL (Feet)
2011-ASO-1218-NRA		CONCORD, NC	35-23-06.74N	80-42-45.17W	135	797

Description: New Air Traffic Control Tower

We do not object with conditions to the construction described in this proposal provided:

You comply with the requirements set forth in FAA Advisory Circular 150/5370-2E, "Operational Safety on Airports During Construction."

The airport sponsor is hereby notified that if the proposed tower is constructed at the location indicated in this study, it will create a 28 ft. penetration to any future CAT II missed approach surface area "D". With all other requirements of CAT II minimums being addressed, the charted results will be a restricted CAT II with 100 FT HAT and 1200 RVR. No further improvements to CAT III operations will be available.

A separate notice to the FAA is required for any construction equipment, such as temporary cranes, whose working limits would exceed the height and lateral dimensions of your proposal.

This determination does not constitute FAA approval or disapproval of the physical development involved in the proposal. It is a determination with respect to the safe and efficient use of navigable airspace by aircraft and with respect to the safety of persons and property on the ground.

In making this determination, the FAA has considered matters such as the effects the proposal would have on existing or planned traffic patterns of neighboring airports, the effects it would have on the existing airspace structure and projected programs of the FAA, the effects it would have on the safety of persons and property on the ground, and the effects that existing or proposed manmade objects (on file with the FAA), and known natural objects within the affected area would have on the airport proposal.

This determination expires on May 21, 2013 unless:

APPENDIX E
COMPARATIVE SAFETY ASSESSMENT



- (a) extended, revised or terminated by the issuing office.
- (b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for the completion of construction, or the date the FCC denies the application.

NOTE: Request for extension of the effective period of this determination must be obtained at least 15 days prior to expiration date specified in this letter.

If you have any questions concerning this determination contact Peter Hughes, (404) 305-7162, peter.hughes@faa.gov.

Peter Hughes
ADO

APPENDIX F
PRELIMINARY HAZARD ASSESSMENT



Preliminary Hazard Assessment(PHA) Form

Hazard#	Hazard Description	Causes	System State	Existing Control or Requirement	Possible Effect	Severity/Rationale	Likelihood/Rationale	Initial/Current Risk	Recommended Safety Requirements	Predicted Residual Risk
(1) 1-17	Exterior Physical Barriers The construction of the new ATCT will block the view of controllers to airspace to the north.	New ATCT construction.	VMC	ATCT shall use JO 7110.65 para. 3-1-7 for validating and/or verifying aircraft ID and position. Pilot Reports	Temporary loss of aircraft in airport airspace.	5 - Minimal Blocked view only for width of tower.	A - Frequent Airspace blocked continuously until ATCT is complete.	5-A-Low	Radar will be used as an aide to mitigate the blind spot created by the construction of the new ATCT. In addition, the controllers will move the closed traffic pattern to the east side of the airport.	None
6-None										
8-17	Exterior Physical Barriers The construction of the new ATCT will block the view of controllers to airspace to the south.	New ATCT construction.	VMC	ATCT shall use JO 7110.65 para. 3-1-7 for validating and/or verifying aircraft ID and position. Pilot Reports	Temporary loss of aircraft in airport airspace.	5 - Minimal Blocked view only for width of tower.	A - Frequent Airspace blocked continuously until ATCT is complete.	5-A-Low	Radar will be used as an aide to mitigate the blind spot created by the construction of the new ATCT. In addition, the controllers will move the closed traffic pattern to the east side of the airport.	None

In addition to the identified hazards in the PHA, the following potential hazards were discussed with the panel members: Potential Interferences, TERPS, Part 77, Airport Design Standards, Direction of View, Up-Down-Flat Angles, Visibility, Impacts to Airborne Ops from Light, Industrial Discharge, Site Access, and Interior Barriers. The panel determined there was one (1) hazard associated with the aforementioned common hazards for Site 1 and 8.

APPENDIX G
FORM 7460-1



Tower Site No. 1

Notice of Proposed Construction or Alteration - On Airport

Page 1 of 2



« OE/AAA

Notice of Proposed Construction or Alteration - On Airport

Project: Conc-154970791-11 Sponsor: Rick Cloutier

Details for Case

[Show Project Summary](#)

Sponsor (person, company, etc. proposing this action)				
Sponsor: Concord Regional Airport				
Construction / Alteration Information				
Notice Of:	Construction			
Duration:	Permanent			
If Temporary:	Months: Days:			
Work Schedule - Start:	03/04/2013			
Work Schedule - End:	06/26/2014			
Case Information				
ASN:	2011-ASO-2047-NRA			
Component Type:	BUILDINGS			
Development Type:	BUILDINGS - Miscellaneous			
Other Desc:	Air Traffic Control Tower			
Prior Study:				
Date Determined:	03/20/2012			
Letters:	03/20/2012 NC7460			
Documents:	12/20/2011 ATCT-POSITION EXH... 12/19/2011 ATCT-POSITION EXH... 12/09/2011 ATCT-POSITION EXH...			
Project Documents: None				
Structure Details				
Nearest State:	NC			
Loc ID:	XQF			
Airport:	CONCORD RGNL			
City:	CONCORD			
Latitude:	35-23-11.71 N			
Longitude:	80-42-44.08 W			
Horizontal Datum:	NAD83			
Site Elevation (SE):	670 (nearest foot)			
Structure Height (AGL):	121 (nearest foot)			
Describe/Remarks				
Potential ATCT Site 1. -Not Preferred				
Common Frequency Bands				
Low Freq	High Freq	Freq Unit	ERP	ERP Unit
Specific Frequencies				

<https://oeaaa.faa.gov/oeaaa/external/eFiling/nra/locationAction.jsp?action=showLocation...> 10/17/2012

Concord Regional Airport
ATCT Site Selection Study

TALBERT&BRIGHT

G-1

APPENDIX G
FORM 7460-1



Tower Site No. 6

Notice of Proposed Construction or Alteration - On Airport

Page 1 of 2



« OE/AAA

Notice of Proposed Construction or Alteration - On Airport

Project: Conc-154970791-11 Sponsor: Rick Cloutier

Details for Case

[Show Project Summary](#)

Sponsor (person, company, etc. proposing this action)	
Sponsor: Concord Regional Airport	
Construction / Alteration Information	Case Information
Notice Of: Construction	ASN: 2011-ASO-2046-NRA
Duration: Permanent	Component Type: BUILDINGS
If Temporary : Months: Days:	Development Type: BUILDINGS - Miscellaneous
Work Schedule - Start: 03/04/2013	Other Desc: Air Traffic Control Tower
Work Schedule - End: 08/26/2014	Prior Study:
	Date Determined: 03/20/2012
	Letters: 03/20/2012 NO7460
	Documenta: 12/09/2011 ATCT-POSITION EXH...
	Project Documents: None
Structure Details	Common Frequency Bands
Nearest State: NC	Low Freq High Freq Freq Unit ERP ERP Unit
Loc ID: JQF	
Airport: CONCORD RGNL	
City: CONCORD	
Latitude: 35-23-12.08 N	
Longitude: 80-42-49.59 W	
Horizontal Datum: NAD83	
Site Elevation (SE): 671 (nearest foot)	
Structure Height (AGL): 124 (nearest foot)	
Describe/Remarks	Specific Frequencies
Potential ATCT Site 6. -Not Preferred	

<https://oeaaa.faa.gov/oeaaa/external/eFiling/nra/locationAction.jsp?action=showLocation...> 10/17/2012

Concord Regional Airport
ATCT Site Selection Study

TALBERT&BRIGHT

G-2

APPENDIX G
FORM 7460-1



Tower Site No. 8

Notice of Proposed Construction or Alteration - On Airport

Page 1 of 2



Federal Aviation
Administration

OE/AAA

Notice of Proposed Construction or Alteration - On Airport

Project: Conc-154970791-11 Sponsor: Rick Cloutier

Details for Case

[Show Project Summary](#)

Sponsor (person, company, etc. proposing this action)				
Sponsor: Concord Regional Airport				
Construction / Alteration Information				
Notice Of:	Construction			
Duration:	Permanent			
If Temporary:	Months: Days:			
Work Schedule - Start:	03/04/2013			
Work Schedule - End:	08/26/2014			
Case Information				
ASN:	2011-ASO-1218-NRA			
Component Type:	BUILDINGS			
Development Type:	BUILDINGS - Miscellaneous			
Other Desc:	Air Traffic Control Tower			
Prior Study:				
Date Determined:	11/21/2011			
Letters:	11/21/2011 NO7460			
Documents:	07/19/2011 ATCT Position Enh...			
Project Documents:				
None				
Structure Details				
Nearest State:	NC			
Loc ID:	XQF			
Airport:	CONCORD RGNL			
City:	CONCORD			
Latitude:	35-23-6.74 N			
Longitude:	80-42-45.17 W			
Horizontal Datum:	NAD83			
Site Elevation (SE):	662 (nearest foot)			
Structure Height (AGL):	135 (nearest foot)			
Describe/Remarks				
New Air Traffic Control Tower				
Common Frequency Bands				
Low Freq	High Freq	Freq Unit	ERP	ERP Unit
Specific Frequencies				

<https://oeaaa.faa.gov/oeaaa/external/eFiling/nra/locationAction.jsp?action=showLocation...> 10/17/2012

Concord Regional Airport
ATCT Site Selection Study

TALBERT&BRIGHT

G-3

APPENDIX H
RESULTS FROM AFTIL TRIP #2



This study was accomplished by the “Alternate Siting Process”, and therefore no AFTIL was utilized.

APPENDIX I
ATCTVAT PRINTOUTS



Site 1 Runway 2
Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics¹.

Air Traffic Control Tower: **New Tower Concord Regional Airport**
Light Level: **Sunlight Clouds**
Ground Turbulence: **Medium**
Target Object: **Dodge Caravan**, target orientation: **Front View**
Observer Eye Height: **96**
Vertical Elevation Change Between Observer and Key Point (feet): **126**
Ground Elevation at Tower (MSL): **670**
Ground Elevation at Key Point (MSL): **640**
Tower to Key Point Distance: **3230** (feet) **0.98** (km)
Visibility Range: **10**(Miles) **16.09** (km)

Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	99.9%	Pass
probability(recognition)	11.5%	87.9%	Pass

Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	2.23 degrees	PASS: Change in elevation between observer and key point should be no less than 45 feet.

¹Krebs, Hewitt, Murrill, and Driggers, 2005. *How High is High Enough? Quantifying the Impact of Air Traffic Control Tower Observation Height on Distance Perception*, International Symposium on Aviation Psychology, 1-5.

APPENDIX I
ATCTVAT PRINTOUTS



Site 1 Runway 20
Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics¹.

Air Traffic Control Tower: **New Tower Concord Regional Airport**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **96**

Vertical Elevation Change Between Observer and Key Point (feet): **62**

Ground Elevation at Tower (MSL): **670**

Ground Elevation at Key Point (MSL): **704**

Tower to Key Point Distance: **4385** (feet) **1.34** (km)

Visibility Range: **10**(Miles) **16.09** (km)

Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	99.7%	Pass
probability(recognition)	11.5%	66.5%	Pass

Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	.81 degrees	PASS: Change in elevation between observer and key point should be no less than 61 feet.

¹Krebs, Hewitt, Murrill, and Driggers, 2005. *How High is High Enough? Quantifying the Impact of Air Traffic Control Tower Observation Height on Distance Perception*, International Symposium on Aviation Psychology, 1-5.

APPENDIX I
ATCTVAT PRINTOUTS



Site 6 Runway 2:
Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics¹.

Air Traffic Control Tower: **Concord Regional Airport - Proposed New ATCT**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **99**

Vertical Elevation Change Between Observer and Key Point (feet): **130**

Ground Elevation at Tower (MSL): **671**

Ground Elevation at Key Point (MSL): **640**

Tower to Key Point Distance: **3324** (feet) **1.01** (km)

Visibility Range: **10**(Miles) **16.09** (km)

Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	99.9%	Pass
probability(recognition)	11.5%	86.5%	Pass

Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	2.24 degrees	PASS: Change in elevation between observer and key point should be no less than 46 feet.

¹Krebs, Hewitt, Murrill, and Driggers, 2005. *How High is High Enough? Quantifying the Impact of Air Traffic Control Tower Observation Height on Distance Perception*, International Symposium on Aviation Psychology, 1-5.

APPENDIX I
ATCTVAT PRINTOUTS



Site 6 Runway 20:
Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics¹.

Air Traffic Control Tower: **Concord Regional Airport - Proposed New ATCT**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **99**

Vertical Elevation Change Between Observer and Key Point (feet): **66.3**

Ground Elevation at Tower (MSL): **671**

Ground Elevation at Key Point (MSL): **703.7**

Tower to Key Point Distance: **4530** (feet) **1.38** (km)

Visibility Range: **10**(Miles) **16.09** (km)

Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	99.7%	Pass
probability(recognition)	11.5%	63.7%	Pass

Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	.84 degrees	PASS: Change in elevation between observer and key point should be no less than 63 feet.

¹Krebs, Hewitt, Murrill, and Driggers, 2005. *How High is High Enough? Quantifying the Impact of Air Traffic Control Tower Observation Height on Distance Perception*, International Symposium on Aviation Psychology, 1-5.

APPENDIX I
ATCTVAT PRINTOUTS



Site 8 Runway 2:
Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics¹.

Air Traffic Control Tower: **Concord Regional Airport - Proposed New ATCT**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **110**

Vertical Elevation Change Between Observer and Key Point (feet): **132**

Ground Elevation at Tower (MSL): **662**

Ground Elevation at Key Point (MSL): **640**

Tower to Key Point Distance: **2830** (feet) **0.86** (km)

Visibility Range: **10**(Miles) **16.09** (km)

Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	100.0%	Pass
probability(recognition)	11.5%	92.5%	Pass

Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	2.67 degrees	PASS: Change in elevation between observer and key point should be no less than 39 feet.

¹Krebs, Hewitt, Murrill, and Driggers, 2005. *How High is High Enough? Quantifying the Impact of Air Traffic Control Tower Observation Height on Distance Perception*, International Symposium on Aviation Psychology, 1-5.

APPENDIX I
ATCTVAT PRINTOUTS



Site 8 Runway 20:
Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics¹.

Air Traffic Control Tower: **Concord Regional Airport - Proposed New ATCT**
Light Level: **Sunlight Clouds**
Ground Turbulence: **Medium**
Target Object: **Dodge Caravan**, target orientation: **Front View**
Observer Eye Height: **110**
Vertical Elevation Change Between Observer and Key Point (feet): **68.3**
Ground Elevation at Tower (MSL): **662**
Ground Elevation at Key Point (MSL): **703.7**
Tower to Key Point Distance: **4851** (feet) **1.48** (km)
Visibility Range: **10**(Miles) **16.09** (km)

Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	99.6%	Pass
probability(recognition)	11.5%	56.7%	Pass

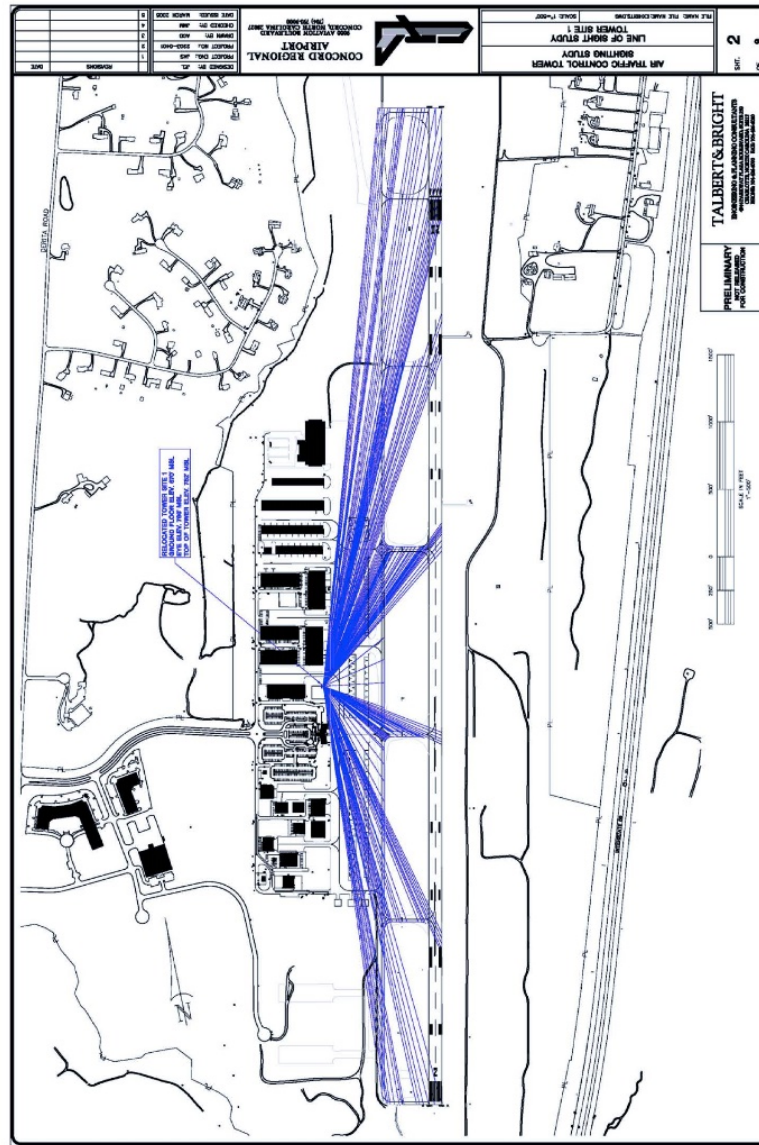
Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	.81 degrees	PASS: Change in elevation between observer and key point should be no less than 68 feet.

¹Krebs, Hewitt, Murrill, and Driggers, 2005. *How High is High Enough? Quantifying the Impact of Air Traffic Control Tower Observation Height on Distance Perception*, International Symposium on Aviation Psychology, 1-5.



APPENDIX I
AIRCRAFT PRELIMINARIES

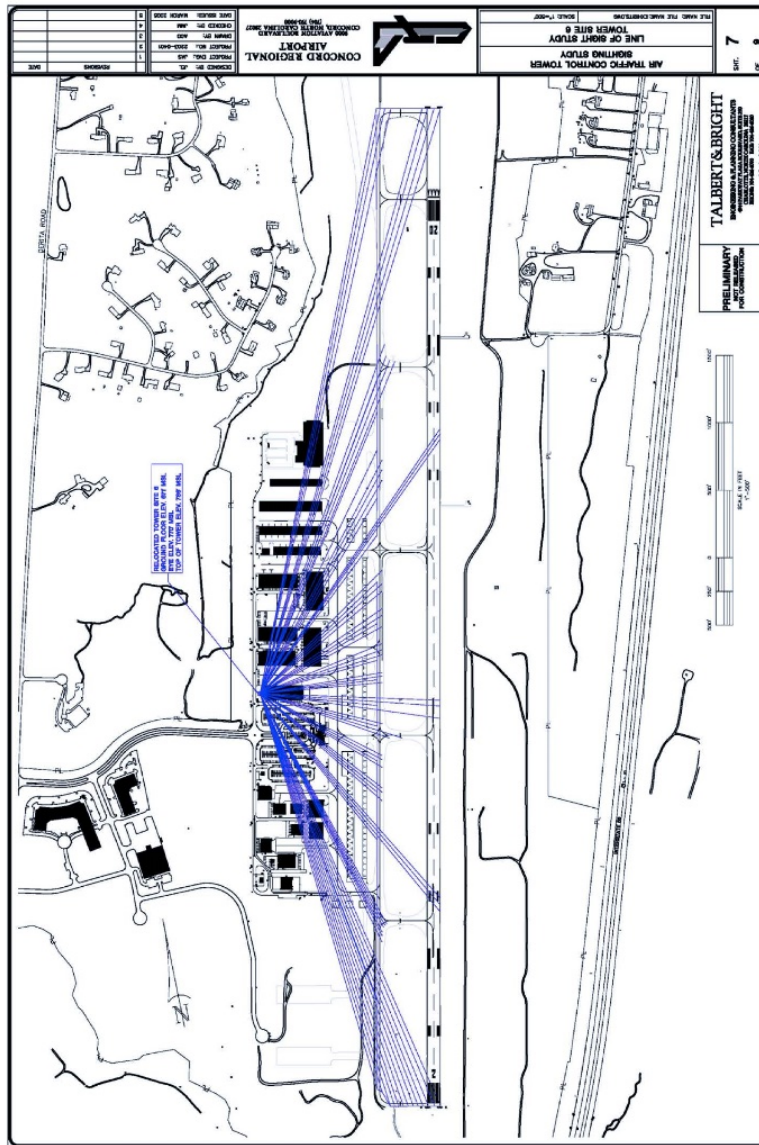


Concord Regional Airport
ATCT Site Selection Study

TALBERT & BRIGHT
1-7



APPENDIX I
ACTUAL PRINTOUTS



Concord Regional Airport
ATCT Site Selection Study

TALBERT & BRIGHT

18



APPENDIX I
A1CTVAT PRINTOUTS



Concord Regional Airport
ATCT Site Selection Study

TALBERT & BRIGHT
19

APPENDIX J
ENVIRONMENTAL INFORMATION



The impact of an airport on its environment is an important consideration in continued development. The objective of this appendix is to note the potential changes in environmental conditions, which could result from the construction and operation of a new Air Traffic Control Tower (ATCT) at Concord Regional Airport. This environmental overview is intended as a review of environmental conditions at Concord Regional Airport in accordance with Appendix A – Analysis of Environmental Impact Categories in FAA Order 1050.1E Change 1 *Environmental Impacts: Policies and Procedures* (March 20, 2006). Detailed environmental analyses will have to be performed, for the proposed ATCT project to determine compliance with environmental rules and regulations.

The table below provides a summary of the potential impacts associated with implementation of a new ATCT at Concord Regional Airport.

Environmental Resource	Preliminary Environmental Impact Assessment
Air Quality	No Impact
Coastal Resources	No Impact
Compatible Land Use	No Impact
Construction Impacts	No Impact
Department of Transportation Act: Section 4(f)	No Impact
Farmlands	No Impact
Fish, Wildlife and Plants	No Impact
Hazardous Materials, Pollution Prevention, and Solid Waste	No Impact
Historical, Architectural, Archeological, and Cultural Resources	No Impact
Light Emissions and Visual Impacts	No Impact
Natural Resources and Energy Supply	No Impact
Noise	No Impact
Secondary (Induced) Impacts	No Impact
Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks	No Impact
Water Quality	No Impact
Wetlands	No Impact
Wild and Scenic Rivers	No Impact

APPENDIX K
AIRPORT CONCURRENCE FORM



This form identifies the siting requirements and impacts of the new FAA Airport Traffic Control Tower (ATCT) planned to be constructed at the Concord Regional Airport (JQF). The signed document will satisfy FAA national policy regarding written confirmation from the Airport owner/operator stating they have advised the JQF airport user community about the new ATCT and the impacts the above project would have on their operations.

Section 1. The siting requirements are as follows:

Item 1: The location of the ATCT (NAD-83)

Latitude N 35° 23' 07.04"

Longitude W 80° 42' 45.28"

Item 2: The ATCT height is 788 feet MSL (126 feet AGL)

Item 3: The ATCS eye height used is 772 feet MSL (110 feet AGL).

Item 4: The exact location of the ATCT is subject to moving no more than 80 feet within the boundaries of the site to efficiently accommodate the base building. This may impact the ATCT height no more than 5 feet.

Item 5: The exact ACTC height is subject to Official Air Space Approval per FAA Form 7460-1.

Item 6: Sunrise, sunset, fog, snow, rain, look down angle, ramp lighting, glare and other issues that can adversely affect the ATCS sight have been considered for the ATCT location.

Section 2. Identified Impacts

No impacts identified.

Section 3. The submission of this signed document constitutes concurrence and adherence to FAA [construction] policy concerning appropriate public notification of the airport community regarding the intent to build a new ATCT and any impacts herein concerning the use of said airfield. The submission of this document does not waive the requirement of public comment as defined in the National Environmental Policy Act, the Council on Environmental Quality regulations, implementing NEPA, Title 40 of the United States Code of Federal Regulations, Parts 1500-1517, and other statutes, orders, directives, or policy concerning environmental assessment and alternatives.

*Concord Regional Airport
ATCT Site Selection Study*

TALBERT&BRIGHT

K-1

APPENDIX K
AIRPORT CONCURRENCE FORM



Section 4. Airport Submission

For the Airport Sponsor
City of Concord
Concord, North Carolina

Name	Date	Name	Date
Title		Title	

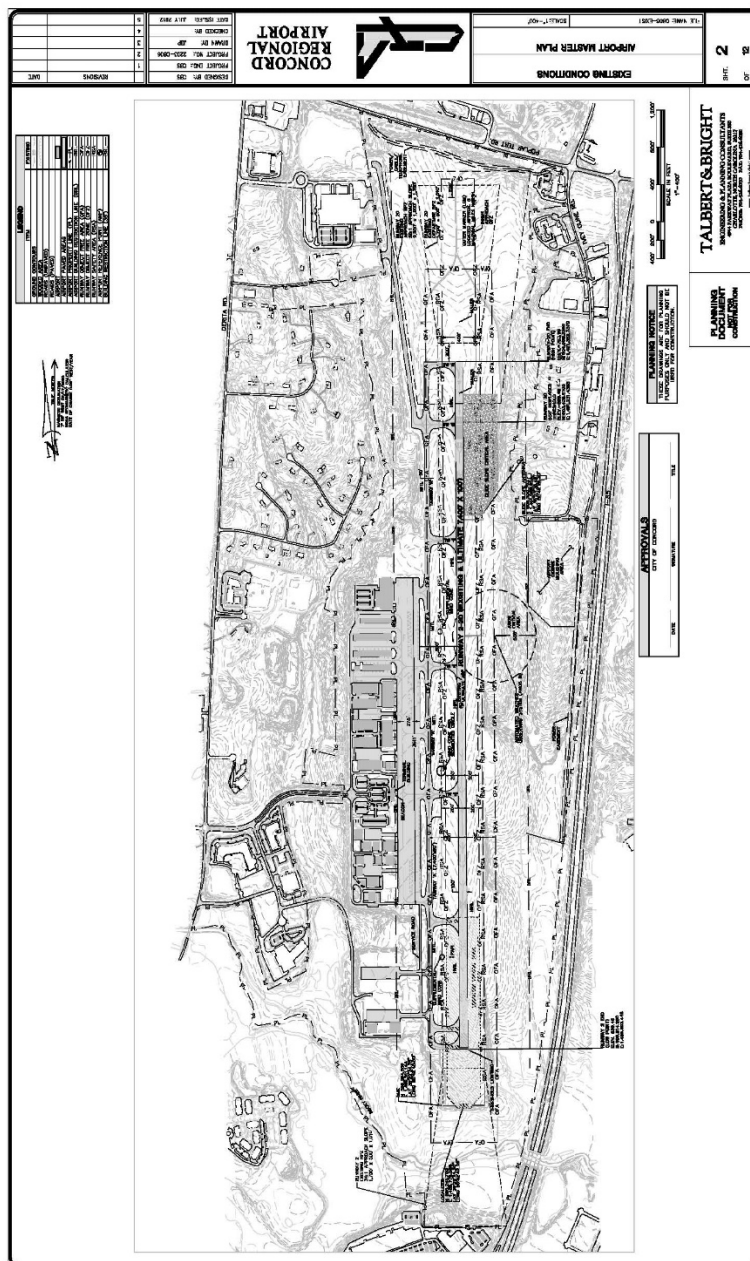
APPENDIX L
PRELIMINARY OPINION OF PROBABLE COST

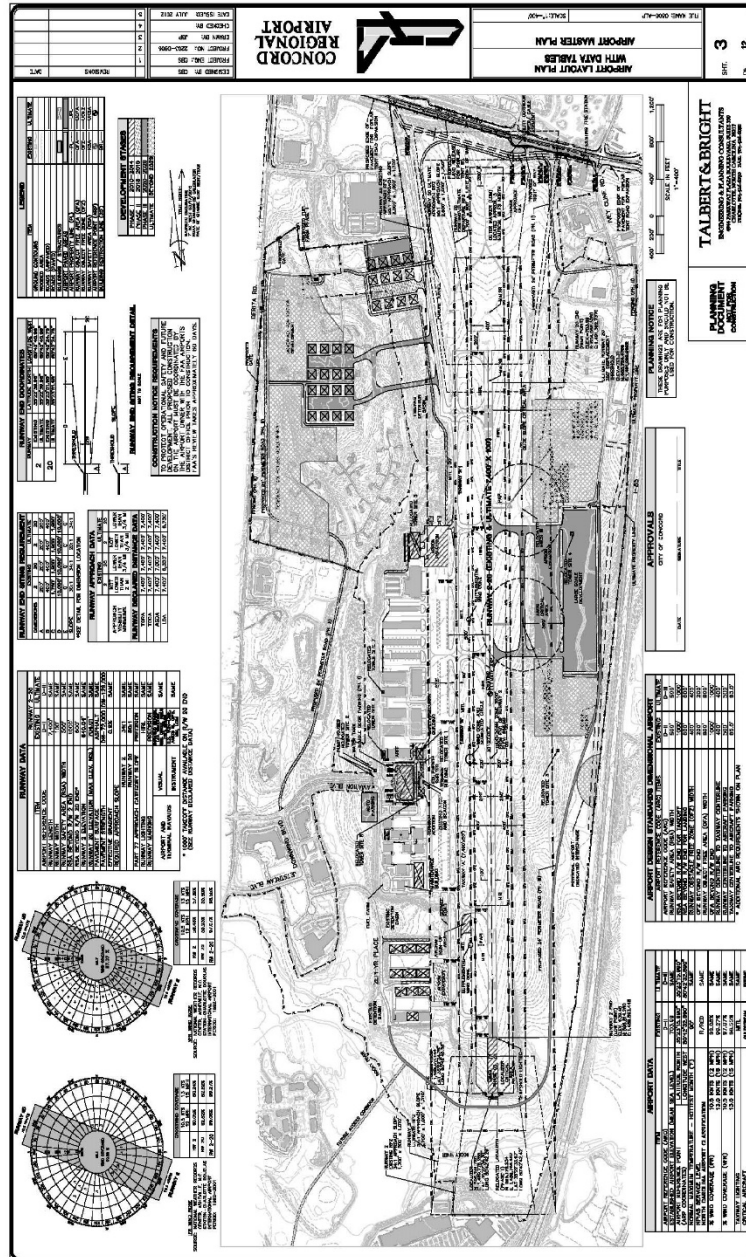


The preliminary opinion of probable cost for this site was developed in September 2009 when the original siting report was completed. These cost are for budgeting only and have not been based on any design, and therefore are subject to change.

PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST
NEW AIRPORT TRAFFIC CONTROL TOWER
CONCORD REGIONAL AIRPORT

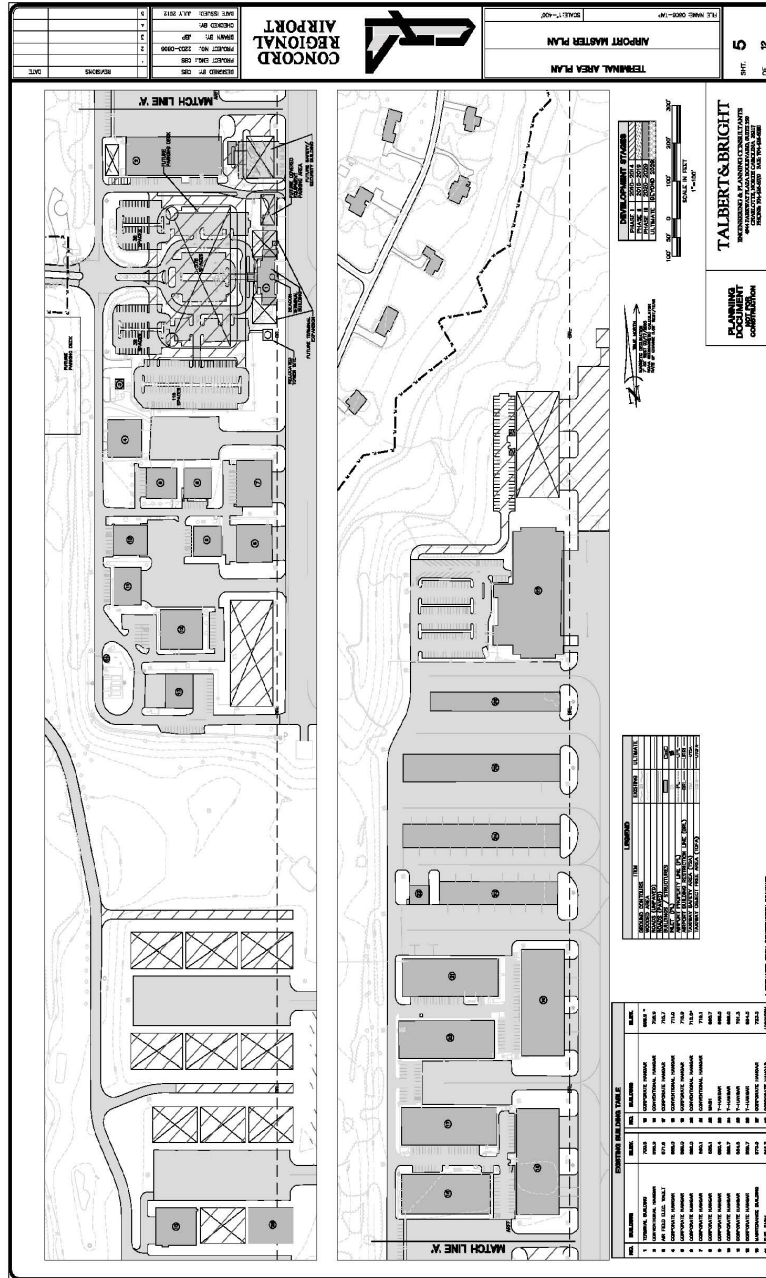
	Site 1	Site 6	Site 8
Tower Building	\$2,200,000.00	\$2,300,000.00	\$2,500,000.00
Controllers' Equipment	\$185,000.00	\$185,000.00	\$185,000.00
Site Work	\$210,000.00	\$250,000.00	\$200,000.00
Engineering	\$650,000.00	\$685,000.00	\$725,000.00
Contingencies	\$355,000.00	\$360,000.00	\$370,000.00
Construction Total	\$3,600,000.00	\$3,780,000.00	\$3,980,000.00





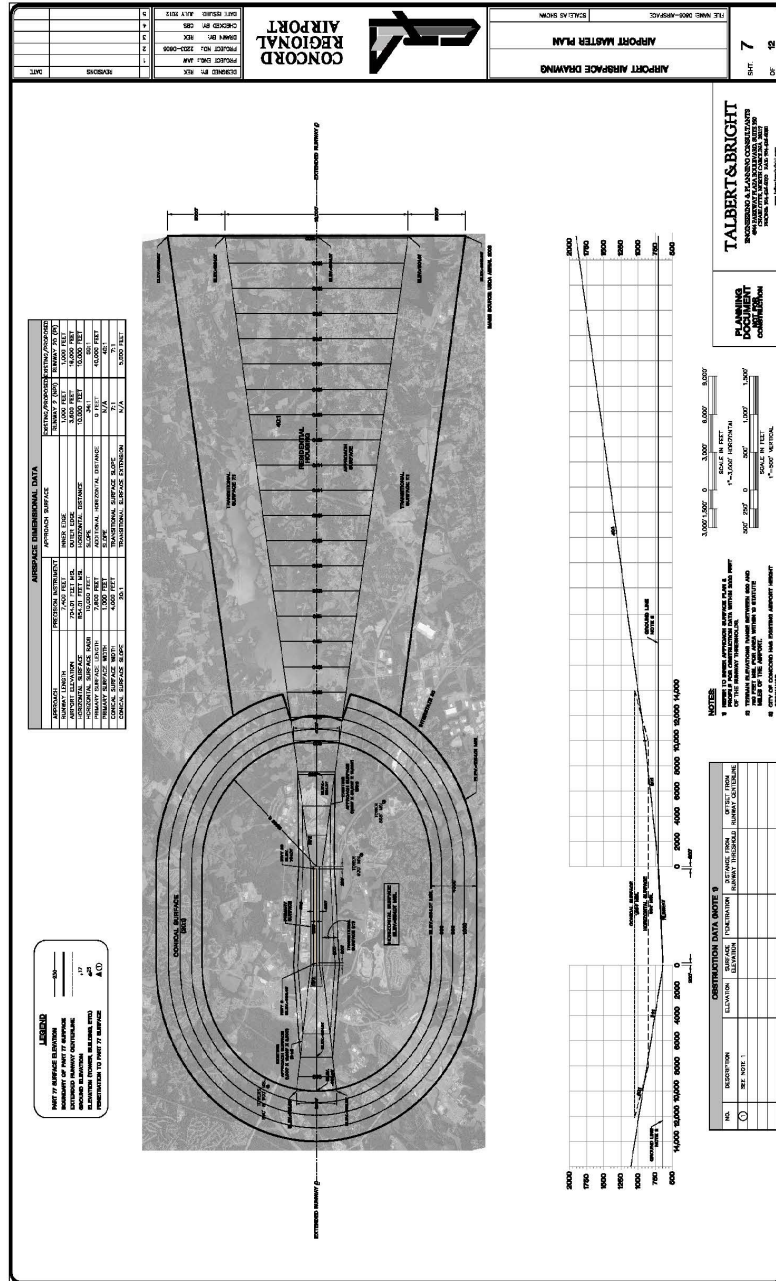


APPENDIX M
DRAWINGS





APPENDIX M
DRAWINGS

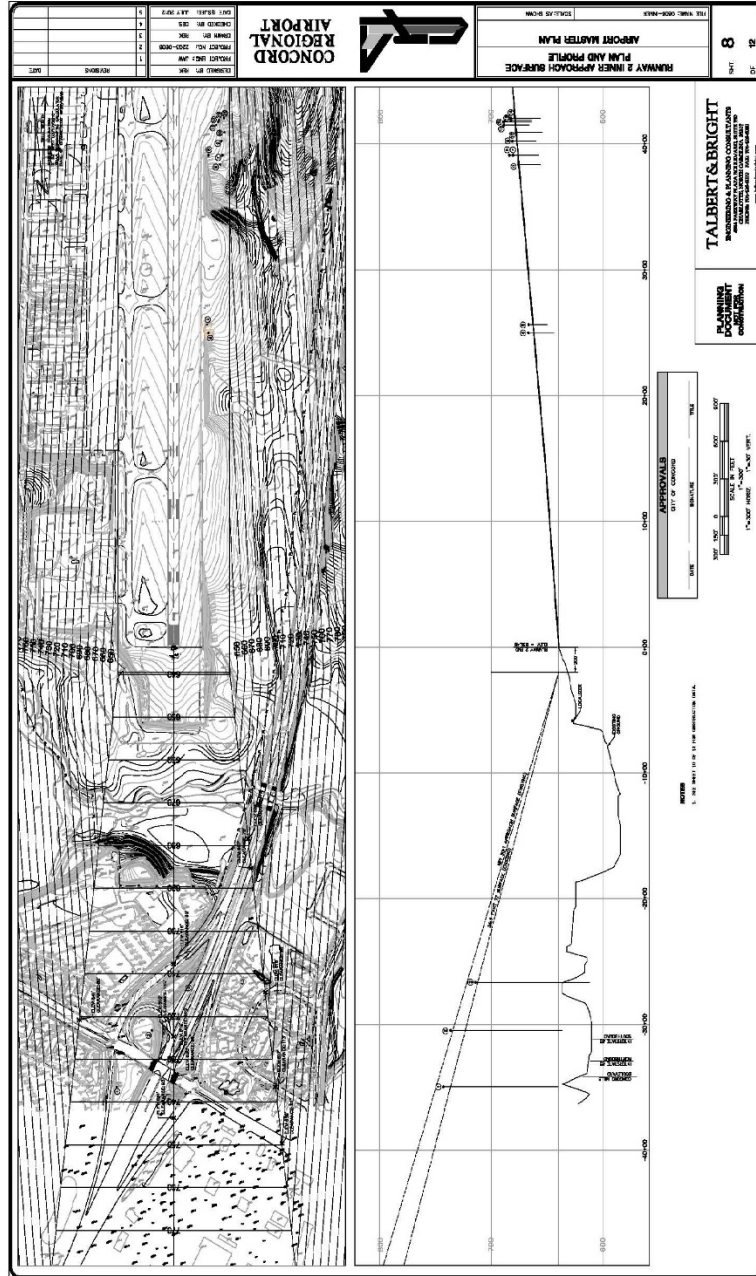


Concord Regional Airport
ATCT Site Selection Study

TALBERT & BRIGHT
M-4



APPENDIX M
DRAWINGS

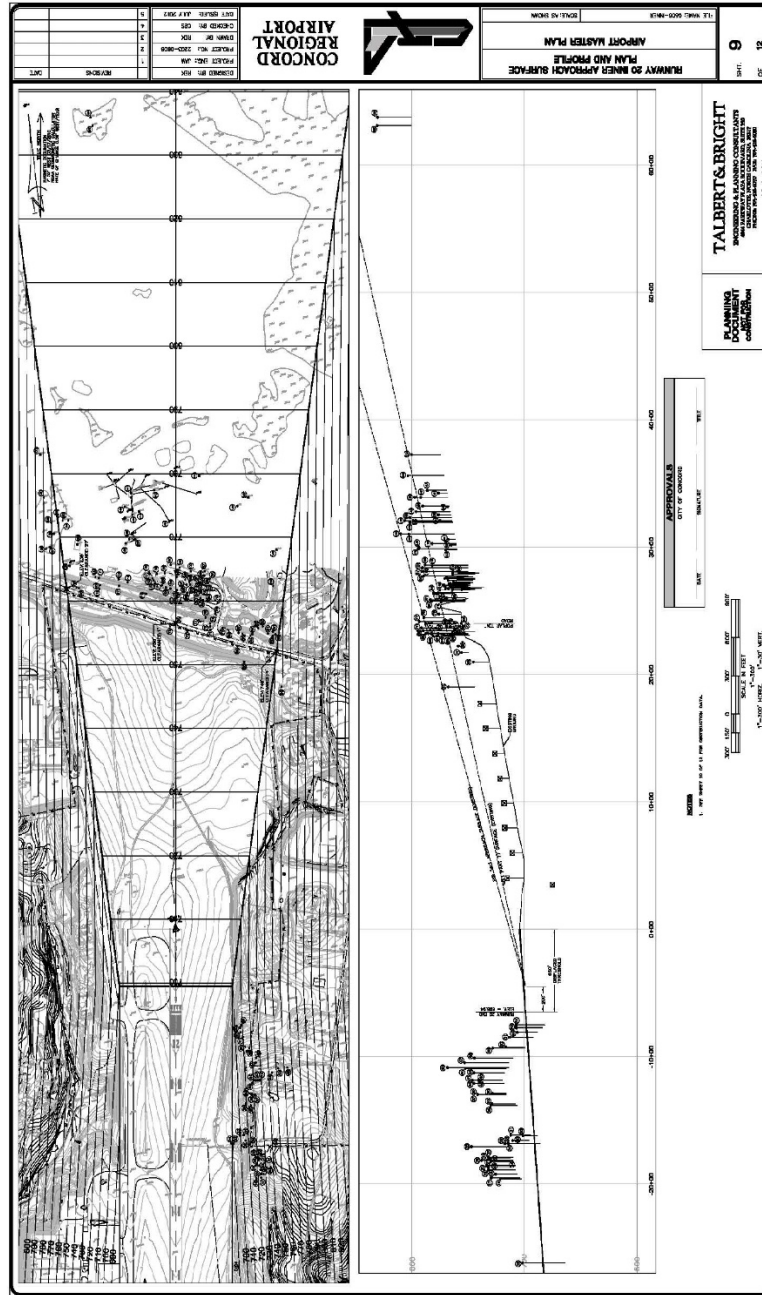


TALBERT & BRIGHT M-5

Concord Regional Airport
ATCT Site Selection Study



APPENDIX M
DRAWINGS



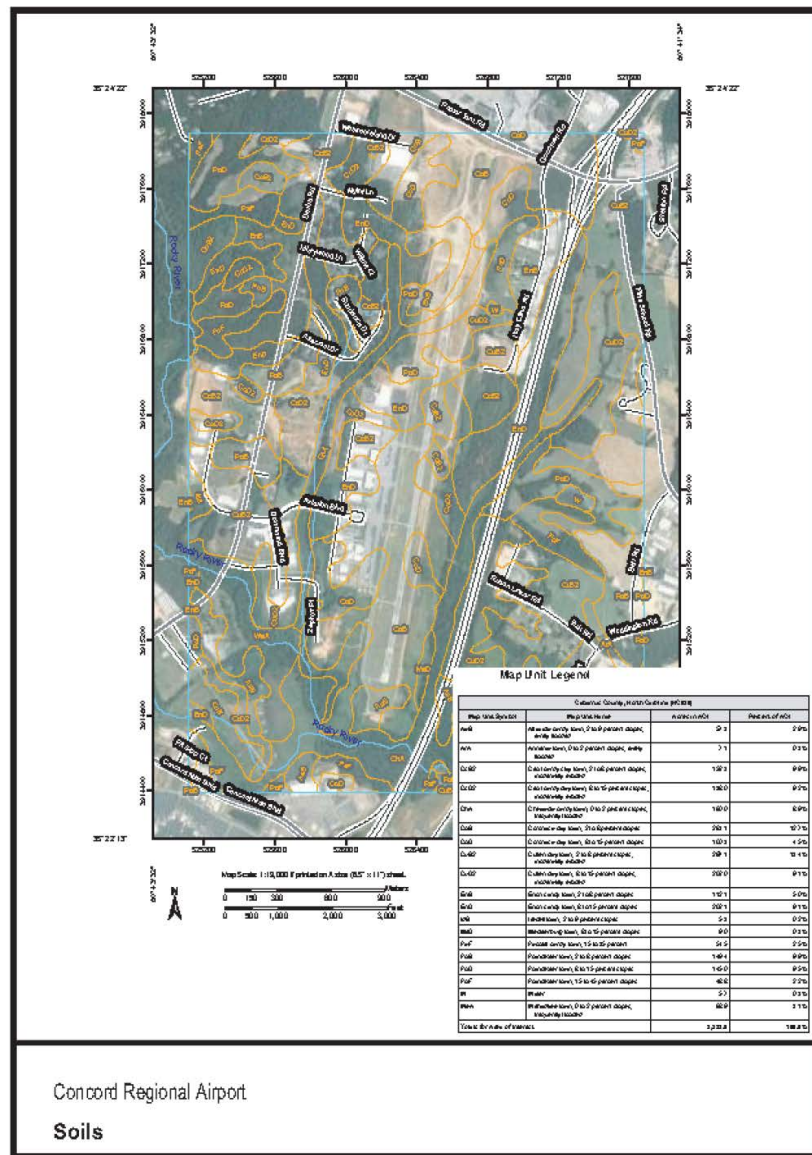
Concord Regional Airport
ATCT Site Selection Study

TALBERT & BRIGHT M-6

[illegible]

APPENDIX M

DRAWINGS



**Concord Regional Airport
ATCT Site Selection Study**

TALBERT&BRIGHT

M-8



TALBERT&BRIGHT

ENGINEERING & PLANNING CONSULTANTS
4944 PARKWAY PLAZA BOULEVARD, SUITE 350
CHARLOTTE, NORTH CAROLINA 28217
PHONE: 704-426-6070 FAX: 704-426-6080