U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

ORDER
6480.4A

Effective Date:
April 10, 2006

SUBJ: AIRPORT TRAFFIC CONTROL TOWER SITING PROCESS

Consistent with the Federal Aviation Administration's mission to foster a safe, secure, and efficient aviation system is the need for an effective and efficient process to accurately site our new and replacement Airport Traffic Control Towers (ATCT). Determining the optimum height and location of an ATCT is the result of balancing many requirements and considerations, both internal and external to the FAA.

This order defines the methods used to complete the ATCT siting process in a consistent manner, and establishes the criteria and procedures for evaluation and approval for the height and location of an ATCT to ensure safety within the National Airspace System (NAS). It prescribes policy, delegates authority and assigns responsibility to ensure that the ultimate goal of providing the shortest possible ATCT meeting all the siting criteria is achieved.

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CHAPTER 1. GENERAL

1. PURPOSE. This order establishes requirements for site location and cab height selection of Airport Traffic Control Towers (ATCT) to be established or replaced for use by the Federal Aviation Administration (FAA). The order applies to all ATCT's where federal funds are utilized including FAA operated Towers, FAA Contract Towers and Non-Federal Towers.

2. DISTRIBUTION. This order is distributed to the Chief Operating Officer for the Air Traffic Organization; Vice President level of the Air Traffic Services, Technical Operations, and Operations Planning; division level in the Flight Standards Services, and the Office of Airport Planning and Programming in Washington, DC; to the director level at the William J. Hughes Technical Center, to the division level at the Aeronautical Center; to all Regional Administrators; to the Director level of the Terminal Area Offices, and Field Services Offices; to the branch level in the regional Flight Standards, Logistics and Airports divisions; to all supervisory levels at all field offices; and to all Flight Procedures Offices in the regions.

3. CANCELLATION. Order 6480.4, Airport Traffic Control Tower Siting Criteria, dated, November 10, 1972, is canceled.

4. EXPLANATION OF CHANGES. This order establishes a new process for ATCT siting and defines a consistent method for reporting and approval. This order also mandates the use of the Airport Facilities Terminal Integration Laboratory (AFTIL) located at the William J. Hughes Technical Center for all ATCT sitings. Funding provided by the ATO-Terminal Facilities organization is not intended for use for contracting services resulting in a siting report as a deliverable.

5. IMPLEMENTATION. This order applies to all establish and replace projects for ATCT facilities whether they are built by FAA directly, or through other funding mechanisms. This includes FAA Contract Towers and Non-Federal Towers only where federal funds are utilized. This order applies to modernization efforts that involve raising an existing ATCT cab and/or overall height of the structure including all equipment and devices. These criteria are applicable to freestanding ATCT facilities as well as to tower cabs located on top of airport buildings (federally owned, leased or operated). Deviations from stated Siting Criteria (Chapter 2) shall be approved by the appropriate authority (Chapter 8) when controls are defined to mitigate associated safety and/or programmatic risks.

CHAPTER 2. SITING CRITERIA

200. GENERAL. The siting process shall take into consideration criteria relating to the safety of air traffic operations for each site. While all siting criteria shall be considered, the greatest emphasis is to be placed on the criteria included in Visibility Performance Requirements; instrument approach procedures with vertical guidance; impacts to communications, navigation and surveillance equipment; and cost. The optimum height and location is the result of balancing many requirements and considerations, based on the current approved Airport Layout Plan (ALP). The goal of this process is to provide the shortest possible ATCT that meets all siting criteria. The siting report shall document how this goal has been achieved.

201. VISIBILITY PERFORMANCE REQUIREMENTS.

a. General. A Visibility Siting Requirements Analysis shall be conducted to address the Unobstructed View, Object Discrimination, and Line of Sight (LOS) Angle of Incidence requirements.

b. Unobstructed View. Visibility from the ATCT Cab shall allow an unobstructed view of all controlled movement areas of an airport, including all runways, taxiways, and any other landing areas, and of air traffic in the vicinity of the airport. The simulation tool at AFTIL shall be used to do a dynamic visibility analysis including the evaluation of both moving and parked aircraft.

c. Object Discrimination. ATCT distance from critical airport locations and ATCT height shall support requirements for object visibility from the ATCT cab. An Object Discrimination Analysis shall be performed as described in Appendix 11, Section 11-0, to assess observers' probability of detection and recognition of an object on the airport surface according to the criteria below:

Observation Capability Requirements	Observation Description	Front View Probability Criteria[1] Minimum
Detection	Ability to notice the presence of an object on the airport surface without regard to the class, type, or model (e.g., an object such as an aircraft or vehicle). The observer knows something is present but may not recognize or identify the object.	95.5%
Recognition	Ability to discriminate a class of objects (e.g., a class of aircraft such as single engine general aviation aircraft).	11.5%

Notes [1] Front View Probability Criteria are calculated by the Airport Traffic Control Tower Visibility Analysis Tool (ATCTVAT) for the front view of a minivan. The ATCTVAT is available during siting visits to the Airport Facilities Terminal Integration Laboratory (AFTIL).

d. Line of Sight (LOS) Angle of Incidence. ATCT distance from critical airport locations and ATCT height shall support requirements for viewing objects on the airport movement areas, taxiways, and non-movement areas from the ATCT cab. A LOS Angle of Incidence Analysis shall be performed as described in Appendix 11, Section 11-1 to assess the angle at which the observers' view of a distant object intersects with the airport surface in accordance with the criterion below:

LOS Viewing Criteria	LOS Viewing Angle of Incidence
Minimum	Equal to or greater than 0.80 degrees

202. VISIBILITY PERFORMANCE CONSIDERATIONS.

a. Two-Point Lateral Discrimination. Consideration shall be given to the two-point lateral discrimination to ensure that ATCT location and height enhance visibility performance as much as possible. A Two-Point Lateral Discrimination Analysis may be performed as described in Appendix 11, Section 11-2 to ensure that operations at critical points of the airport surface provide the observer sufficient lateral discrimination. Consideration shall be given to laterally separating the observer's viewing angle between the two points by 0.13 degrees (8 minutes) or greater.

203. FEDERAL LAWS, REGULATIONS, ORDERS AND STANDARDS THAT PERTAIN TO THE SITING OF AN ATCT.

a. Terminal Instrument Procedures (TERPS). TERPS for the airport shall be studied to determine what impact a new ATCT would have on Instrument Terminal Procedures into and out of the airport. The ATCT shall be sited such that it does not degrade any current or planned terminal instrument procedures. Where any siting options would degrade these procedures, an assessment of impacts shall be coordinated with all stakeholders. Particular emphasis shall be made to protect for approaches with vertical guidance according to the current approved ALP. Non-precision approach and circling minimums may only be adjusted to accommodate a proposed ATCT, if the impacts of such adjustments are understood and agreed to by all stakeholders.

b. 14 CFR (Code of Federal Regulations) Part 77, Objects Affecting Navigable Airspace, and Advisory Circular 150-5300-13, Airport Design Standards, shall be reviewed and complied with as applicable. Airport surfaces of particular concern are the Runway Obstacle Free Zone including both the Precision Runway Obstacle Free Zone and the Approach Obstacle Free Zone, the Runway Object Free Area, Runway Protection Zone, Runway Safety Area, and Building Restriction Line. The Airport Layout Plan, as approved by FAA, shall be reviewed for conformance. A Non Rule Making Airport Study (NRA) shall be conducted in accordance with FAA Order 7400.2, Procedures for Handling Airspace Matters and Part 77 OE/AAA requirements.

c. Communications, Navigation and Surveillance Equipment: The ATCT shall be sited where it does not degrade or affect the performance of existing or planned facilities and/or equipment, unless deviations are necessary to meet other siting criteria and/or mitigation strategies are implemented.

d. Environmental: The recommended ATCT location shall be subject to an Environmental Due Diligence Audit (EDDA) review and to the National Environmental Protection Act (NEPA) process outlined in FAA Order 1050.1, Environmental Impacts: Policies and Procedures, to determine impacts.

204. OPERATIONAL REQUIREMENTS

a. General. For any given site, the ATCT shall be constructed at the minimum height required to satisfy all siting criteria.

b. ATCT Orientation. Consideration shall be given to the following; direct sun glare, indirect sun glare off natural and manmade surfaces, night-time lighting glare, external light sources, and thermal distortion in determining ATCT orientation. The ATCT shall be orientated where the primary operational view faces north or alternately east, or west, or finally south in that order of preference for an ATCT in the northern hemisphere. In areas where snow accumulates on the ground, or the ATCT site is surrounded by sand or a large body of water, a southern orientation should be avoided.

c. Weather. Using a 10-year weather history, consideration shall be given to local weather phenomena that impair visibility. Weather affecting the predominant flow of traffic should be considered in the siting process. Ceilings and visibility should be considered in determining ATCT height.

d. Look-down Angle. Consideration shall be given to impacts of lookdown angle due to the potential of a larger cab and/or taller ATCT. Visibility from the ATCT Cab shall consider the view of controlled movement areas around the base of the ATCT.

e. Look Across Line-of-Site (LOS). Consideration shall be given to visibility from operational positions in the ATCT cab and potential impacts to line-of-site due to an increase in cab size and/or ATCT height. The AFTIL should be used to assess potential line-of-site impacts due to the placement of operational positions in the ATCT cab.

f. Cab Orientation. Consideration shall be given to LOS impacts resulting from placement and configuration of mullions. The AFTIL shall be used to model the placement of mullions to minimize LOS impacts.

g. Look-up Angle for Missed Approaches. Consideration shall be given to look up angle for adverse impacts on air traffic operations. The AFTIL should be used to simulate view of missed approaches and assess potential impacts.

h. Construction. Consideration shall be given to LOS from the existing ATCT during construction of the new ATCT and impacts from the old ATCT when operating from the new ATCT.

i. Access. Access to the ATCT shall avoid crossing areas of aircraft operations.

j. Non-Movement Areas. Visibility of all airport surface areas for ground operations of aircraft and of airport ground vehicles on ramps, aprons and tie-down areas, and test areas shall be considered.

205. ECONOMIC CONSIDERATIONS

a. General. Consideration shall be given to economic factors when proposing ATCT sites.

b. Cost Estimates. Detailed cost estimates, to include at a minimum the following items, shall be documented for the preferred sites in the siting report.

(1). Height. Consideration shall be given to the height of a proposed ATCT as it is typically the largest contributing factor to the project cost.

(2). Land Use Planning. The ATCT plot shall have sufficient area to accommodate the initial building, parking, and future expansion. Environmental concerns shall be documented as part of the construction cost estimate.

(3). Utilities and Cabling. Consideration shall be given to the connectivity of existing FAA cabling and utilities to the preferred ATCT sites.

(4). Site Access. Consideration shall be given to any necessary new or redesigned site access roadways.

(5). Security. Consideration shall be given to the impacts of security compliance at the preferred ATCT sites.

CHAPTER 3. SAFETY RISK MANAGEMENT

300. GENERAL. The FAA Safety Management System (SMS) requires that safety assessments be performed on changes to the NAS that have significant safety impact. The Safety Risk Management (SRM) process ensures that safety-related changes are documented; hazards are identified; risks are assessed and analyzed; medium and high risks are tracked to resolution; high risks are mitigated to an acceptable level; medium risks are mitigated if possible; the effectiveness of the risk mitigation strategies are assessed and the performance of the change is monitored throughout its lifecycle. Each of the siting criteria shall be reviewed for potential hazards. The hazards identified for each preferred location shall be assessed and mitigated to an acceptable level of risk to satisfy SMS requirements. A partial list of potential hazards is contained in Appendix 1 along with a risk matrix from the SMS manual.

301. SITING SRM PROCESS.

a. Safety Assessments. The safety assessment for ATCT siting shall comply with the SMS Manual and at a minimum include the following:

(1) Descriptions of the preferred sites.

(2) Identification of hazards for each site.

(3) Analysis of each hazard including causes and potential outcomes.

(4) Risk assessment for each hazard considering the severity of consequence and likelihood of occurrence using the Risk Matrix in Appendix 1.

(5) A comparison of the relative risk for the preferred sites.

(6) A hazard analysis for each preferred site, including a documented safety record that contains a definition of controls, mitigations, and/or procedures for each hazard.

b. Risk Treatment. Hazards that have a high initial risk shall be mitigated to an acceptable level (medium or low). Efforts by the Program Office or NAS change agent to further mitigate the (medium) hazard should continue. It is not a requirement to mitigate medium risk hazards, but strongly recommended in the interest of safety. Controls, mitigations, or procedures to reduce risk shall be stated as safety requirements and implemented to satisfy the intent of the mitigation strategy.

c. Risk Acceptance. Risk acceptance is sign-off certification by the management official in each affected Line of Business (LOB) that they understand the risk(s) associated with the change and accept the risk(s) into the NAS. High-risk hazards are unacceptable. Hazards with medium risk may be accepted by the appropriate management official.

d. Hazard Tracking and Risk Resolution. Medium risk hazards shall be tracked to closure, using a documented safety record. To close a hazard each safety requirement listed in the safety record shall be validated and verified, and the final risk will be accepted. Objective

evidence of validation and verification is presented to the risk acceptance authority to close a documented safety record.

e. Reporting. During the evaluation process a comparison of the relative risk for the preferred sites shall be documented in the Safety Risk Management Document (SRMD). The Siting Report coupled with the Comparative Safety Assessment (CSA) constitutes the SRMD. The results from the CSA shall be documented in the Final ATCT Siting Report meeting the SMS requirement for the SRMD.

CHAPTER 4. AIRPORT FACILITIES TERMINAL INTEGRATION LABORATORY (AFTIL)

400. GENERAL. The AFTIL develops a three-dimensional computerized terrain model of the airport and "real time" simulation of airport operations. The ATCT operations simulation tool provides an environment for the siting team to collectively evaluate a minimum of three preferred sites and then identify one recommended site.

401. REQUIREMENT TO USE. Use of the AFTIL is mandated for all ATCT replace projects whether they are built by FAA directly, or through other funding mechanisms, unless they qualify for the alternative siting process outlined in Chapter 9. This includes FAA Contract Towers (FCT) and Non-Federal Towers where FAA funds are utilized.

402. AFTIL DATA REQUIREMENTS. See Appendix 2, AFTIL DATA REQUIREMENTS.

CHAPTER 5. SITING PROCESS OVERVIEW

500. GENERAL. The ATCT siting process provides conformance to a standard procedure, which ensures uniformity in site selection and reporting. The Siting Process Flow Chart and Guidance Document (Appendix 3), shall be used when siting new and replacement ATCTs.

501. FUNDING RESTRICTIONS. Funding provided by the ATO-Terminal Facilities organization is not intended for use for contracting services resulting in a siting report as a deliverable.

502. AFTIL TRIP REQUIREMENTS. At least two trips to the AFTIL are required for each ATCT siting.

503. AFTIL TRIP #1. Trip #1 utilizes the AFTIL modeling and simulation capabilities for initial siting. At a minimum, three preferred sites shall be identified during this trip.

a. AFTIL Trip #1 Siting Team Members. This siting team shall consist of the following:

(1). ATO-Terminal Facilities National Coordinators

(2). ATCT Siting SMS Coordinator

and representatives from the following:

(3). Technical Operations Engineering Services (Terminal)

(4). Flight Standards Division AXX-200,

(5). Technical Operations Engineering Services (Operations)

(6). Terminal Area Office (Requirements and Operations)

(7). Local Airports District Office (ADO)

(8). XXX ATCT (local Air Traffic)

(9). Technical Operations Aviation System Standards

(10). Security and Hazardous Materials Division, and the Airport Sponsor.

(11). Airport Sponsor

504. AFTIL TRIP #2. Trip #2 is for cab size mock-up and equipment layout, mullion evaluation and site recommendation and validation.

a. AFTIL Trip #2 Siting Team Members. This siting team shall consist of the following:

(1). ATO-Terminal Facilities National Coordinators

(2). ATCT Siting SMS Coordinator

and representatives from the following:

(3). Technical Operations Engineering Services (Terminal)

(4). Terminal Area Office (Requirements)

(5). Flight Standards Division AXX-200

(6). XXX ATCT (local Air Traffic)

If the Airport Sponsor attends any of the Trips a representative from the Local Airports District Office (ADO) is required to attend. If no Local ADO representatives are available a representative from the Regional Airports Division may be substituted.

505. PRELIMINARY AFTIL TRIP. A Preliminary AFTIL Trip to discuss TERPS, SMS and Human Factors shall be attended by representatives of the Technical Operations Engineering Services (Terminal), and Terminal Area Office (Requirements) prior to conducting AFTIL Trip #1.

CHAPTER 6. SITING REPORT REQUIREMENTS

600. GENERAL. The intent of the siting report is to document and communicate the degree to which each siting criteria has been met. The siting report, coupled with the Comparative Safety Assessment (CSA), constitutes a Safety Risk Management Document (SRMD) in accordance with the FAA Safety Management System (SMS) Manual. This report shall be finalized, and then transmitted to the ATO Terminal Facilities National Coordinators within one month of completing AFTIL Trip #2. The final report shall be formatted within the FAA's branding requirements. These requirements can be found at http://employees.faa.gov/worktools/branding_guidelines/.

601. SAFETY RISK MANAGEMENT DOCUMENT APPROVAL. SRMD approval is the responsibility of the designated Safety Manager within each operations service unit of the ATO. Additionally the Aviation Safety (AVS) and Airports Organization (ARP) Safety Managers are responsible for the approval of the SRMD for issues impacting their LOB. A SRMD with a high initial safety risk shall be coordinated with ATO Terminal Safety and Operations and then sent for approval to the ATO-Safety Service Unit. Approving the SRMD means the approving party agrees that the analysis accurately reflects the safety risk associated with change, the underlying assumptions are correct, and the findings are complete and accurate and the planned remediation is acceptable.

602. APPROVED SRMD DISTRIBUTION. Copies of the approved report are maintained on record in the regional office Technical Operations Engineering Services (Engineering) group, including paper and electronic copies, throughout the lifecycle of the ATCT project. Copies shall also be distributed to ATO Terminal Facilities, ATO Terminal Safety and Operations, and the ATO Operations Planning Tower Integration Group (AFTIL).

603. SITING REPORT MINIMUM REQUIREMENTS. The siting report shall contain at a minimum those items contained in the Siting Report Table of Contents (Appendix 4). The hazard mitigations identified in the CSA, shall be incorporated into the lifecycle of the ATCT project.

CHAPTER 7. ROLES AND RESPONSIBILITIES

700. GENERAL. This order defines procedures to be followed and factors to be considered during the siting process.

701. FORMATION OF SITING TEAM. The Technical Operations Engineering Services (Terminal-formerly ANI-X40), the Terminal Area Office (formerly AXX-510), and the ATO-Terminal Facilities National Coordinators are responsible for the formation of a siting team.

702. SITING TEAM MEMEBERS. The siting team shall identify sites and recommend a location based on the requirements of this order along with participation by the Airport Sponsor. The siting team members shall include:

a. ATO-Terminal Facilities National Coordinators

b. ATCT Siting SMS Coordinator

and representatives from the following:

c. Technical Operations Engineering Services (Engineering-formerly ANI-X40)

d. Flight Standards Division AXX-200

e. Technical Operations Engineering Services (Operations-formerly AXX-400)

f. Terminal Area Office (formerly AXX-500)

g. Local Airports District Office (ADO)

h. XXX ATCT (Local Air Traffic)

i. Technical Operations Aviation System Standards (formerly AVN-XXX)

j. Security and Hazardous Materials Division AXX-700

k. Airport Sponsor.

703. RISK ACCEPTANCE. The hazards identified during the siting process have associated risks that shall be accepted prior to construction of the ATCT. Only those in a position to manage the risk can accept the risk into the NAS. In accordance with the SMS manual, changes with medium or low initial safety risks will be accepted at the Service Director/Manager Level within each ATO Service Unit and/or LOB (e.g. AVS, ARP) that is affected by the identified hazard prior to construction of the ATCT. Changes with high initial safety risks, which have been mitigated to medium, will be accepted by the Vice President for each ATO Service Unit and/or LOB (e.g. AVS, ARP) affected by the identified hazard prior to construction of the ATCT.

704. SITING TEAM MEMBER OBLIGATION. Each siting team member has an obligation to notify the assigned Technical Operations Engineering Services (Engineering) project engineer of

any current, proposed, planned, or envisioned projects that would be constructed on or adjacent to airport property that could possibly impact the LOS from the preferred ATCT sites.

705. ATO TERMINAL FACILITIES NATIONAL COORDINATORS. This is a Headquarters organizational element established to ensure strict compliance with the ATCT siting process. The coordinators are an ATCT/TRACON design engineer, and an Air Traffic Requirements Specialist who are responsible for scheduling and leading all ATCT siting efforts through the siting process.

706. TECHNICAL OPERATIONS ENGINEERING SERVICES (TERMINAL). This organization is responsible for all Technical Operations Engineering Services (Engineering) coordination and resolution. Responsibilities include coordination with all LOB's, facilitating siting activities at AFTIL, authoring the siting report and compiling the SRMD (siting report and CSA), and co-leading the LOB brief and sign off. This organization is also responsible for the implementation of, and adherence to, SMS policies and procedures within their span of control, including accepting the risk associated with NAS changes.

707. TERMINAL AREA OFFICE. This organization is responsible for all Air Traffic coordination and resolution. Responsibilities of the Requirements Branch include coordination with all LOBs, facilitating siting activities at AFTIL, and co-leading the LOB brief and sign off. Responsibilities of the Operations Branch include providing information relating to impacts on airport capacity and efficiency resulting from construction of an ATCT at each preferred site. This organization is also responsible for the implementation of and adherence to SMS policies and procedures within their span of control, including accepting the risk associated with NAS changes.

708. ATO OPERATIONS PLANNING TOWER INTEGRATION GROUP (AFTIL). This organization is responsible for developing the three-dimensional airport terrain model and real time simulation of air traffic operations. The Tower Integration Group maintains and operates the AFTIL. The AFTIL Manager is responsible for scheduling ATCT sitings and providing ATCT modeling and simulation support. This organization is also responsible for developing and constructing the full-scale mock-ups of the ATCT cab. An ATCT Siting SMS Coordinator is also part of this organization and is responsible for leading siting teams through the Comparative Safety Assessment (CSA), preparing the resulting reports for all ATCT sitings, and collecting and tracking all hazard information

709. XXX ATCT. This organization is responsible for participating in AFTIL Siting Trip #1 and #2. Responsibilities include identifying and evaluating proposed ATCT sites utilizing operational expertise and local area knowledge.

710. FLIGHT STANDARDS DIVISION (AXX-200). The Regional Flight Standards Division is responsible for evaluating the proposed ATCT site heights and locations based on ground- and/or flight-operations safety considerations, the analysis provided by Technical Operations Aviation System Standards, the analysis of Part 77 surfaces, and for providing other comments of a general nature, as appropriate. Impacts and comments shall be provided to the siting team in plain language. This organization is also responsible for the implementation of and adherence to SMS policies and procedures within their span of control, including accepting the risk associated with NAS changes.

711. TECHNICAL OPERATIONS AVIATION SYSTEM STANDARDS. This organization is responsible for applying the obstruction standards contained in FAA Orders, 8260 series, TERPS Instruction Letters (TIL), and Advisory Circulars to evaluate proposed ATCT locations to determine if these structures have an adverse impact to existing Instrument Approach Procedures and planned procedures on an approved ALP. This organization is also responsible for the implementation of and adherence to SMS policies and procedures within their span of control, including accepting the risk associated with NAS changes.

712. TECHNICAL OPERATIONS ENGINEERING SERVICES (OPERATIONS). This organization is responsible for all Technical Operations Engineering Services (Operations) coordination and resolution. This includes leading the NASWATCH program efforts and initiating AOS modeling if necessary, coordination within the LOB, coordination with Technical Operations Engineering Services representatives, and support for AFTIL related activities. This organization is also responsible for the implementation of and adherence to SMS policies and procedures within their span of control, including accepting the risk associated with NAS changes.

713. AIRPORTS DIVISION (AXX-600). This organization is responsible for all Airports Division coordination and resolution. Responsibilities include: knowledge of airport operations and development (Airport Layout Plans); coordinating with the Airport Sponsor regarding the availability of select tower locations to ensure that the tower siting plans do not conflict with airport development plans; known environmental issues; knowledge of local issues/concerns at airport that can impact ATCT siting team activities; knowledge of FAA planning and design policy/ procedures that can impact existing and/ or proposed airport development and surrounding airport environs; evaluating Part 77 surfaces, airport safety and design standards under varying development scenarios for proposed ATCT locations; ensuring the Airport Layout Plan is modified to indicate the proposed tower site. This organization is also responsible for the implementation of and adherence to SMS policies and procedures within their span of control, including accepting the risk associated with NAS changes.

714. AIR TRAFFIC SAFETY OVERSIGHT SERVICE (AOV). This organization is responsible for monitoring ATO compliance with the safety standards and the SMS. All controls used by the ATO to mitigate high initial risk hazards shall be approved by AOV.

715. ATO SAFETY SERVICE UNIT. This organization is responsible for approving all SRMDs with high initial risk.

716. ATO TERMINAL SAFETY AND OPERATIONS. This organization is responsible for participating in SMS activities at the AFTIL, providing signature on the Siting Report, and ensuring hazards have been identified, and associated mitigation strategies are tracked. They are the Safety Manager for ATO- Terminal.

717. ATO TERMINAL FACILITIES. This organization is responsible for managing the ATCT Replace Program, and providing signature on the Siting Report.

718. REGIONAL RUNWAY SAFETY OFFICE. This organization is responsible for evaluating the recommended ATCT sites for issues impacting runway safety. This evaluation shall include visibility of critical runway crossings, changes to the flow of airfield traffic, taxiway use changes, and any other pertinent factors.

719. SECURITY AND HAZARDOUS MATERIALS DIVISION (AXX-700). This organization is responsible for evaluating the preferred sites against FAA Order 1600.69, FAA Facility Security Management Program, particularly for requirements related to blast hardening and property. They shall provide initial facility requirements; participate in the FAA LOB meeting and AFTIL #1 and shall provide input to Technical Operations Engineering Services on the security pros/cons of each of the preferred sites.

CHAPTER 8. APPROVAL PROCESS

800. REGIONAL LINE OF BUSINESS APPROVAL. The Regional Siting Team shall brief the siting report to all Regional Lines of Business (LOB), as identified on the signature pages in Appendix 7, for their concurrence and signature. At the conclusion of the briefing, LOB signatures on the ATCT site recommendation page represent concurrence with the Siting Report. The LOB signatures on the final site approval page represent acceptance of the risk(s) identified in their area of responsibility.

801. REGIONAL LINE OF BUSINESS SINGATORIES. The Regional LOB signatories consist of:

a. Manager, Technical Operations Engineering Services (Terminal)

b. Manager, Logistics Division, AXX-50

c. Manager, Flight Standards Division, AXX-200

d. Manager, Technical Operations Engineering Services (Operations)

e. Manager Terminal Area Office

f. Manager, Airports Division, AXX-600

g. Manager, Security and Hazardous Materials Division, AXX-700

h. Manager, Technical Operations Aviation System Standards

802. REGIONAL ADMINISTRATOR APPROVAL. The Regional Administrator's signature on the siting report confirms that the appropriate regional coordination was accomplished and indicates approval of the siting report at the Regional level.

803. HEADQUARTERS APPROVAL. The completed siting report, coupled with the Comparative Safety Assessment (CSA), constitutes a Safety Risk Management Document (SRMD) in accordance with the FAA Safety Management System Manual. The SRMD is then transmitted to Headquarters for approval by the designated Safety Manager within each operations service unit of the ATO (Director of Safety and Operations). SRMD approval is the responsibility of the designated Safety Manager within each operations service unit of the ATO. Additionally AVS and ARP Safety Managers are responsible for the approval of the SRMD for issues impacting their LOB. A SRMD with a high initial safety risk shall be coordinated with ATO Terminal Safety and Operations and then sent for approval to the ATO Safety Service Unit. Approving the SRMD means the approving party agrees that the analysis accurately reflects the safety risk associated with the change, the underlying assumptions are correct, and the findings are complete and accurate and that the planned remediation is acceptable.

CHAPTER 9. ALTERNATIVE SITING PROCESS.

900. GENERAL. This process applies only to establish or replace Airport Traffic Control Tower (ATCT) projects, either sponsor built Federal Contract Towers (FCT) or ATCT's funded through Other Transaction Agreements (OTA's). Potential alternative process candidate sites shall provide the required documentation demonstrating adherence to the below criteria. Upon receipt of the documentation the FAA will review the submission for compliance with the acceptance criteria. Following this evaluation, if compliance to any of the criteria is not validated the candidate shall use the standard process and meet all of the requirements set forth in FAA Order 6480.A, including the use of the facilities at the Airport Facilities Terminal Integration Laboratory (AFTIL). Exceptions to the acceptance criteria can be granted only through written authorization from the Manager of ATO-Terminal Facilities. The use of an A/E firm for the application of this process is not prohibited.

901. ALTERNATIVE SITING PROCESS REQUIREMENTS. Each successful applicant to the alternative process shall provide a Safety Risk Management Document (SRMD) in accordance with the most recent version of the FAA Safety Management System (SMS) Manual. The SRMD shall consist of the siting report coupled with either a Functional Hazard Analysis (FHA) or a Comparative Safety Assessment (CSA).

902. SITING REPORT. The intent of the siting report is to document and communicate the degree to which each siting criteria has been met. It shall take into consideration the safety of air traffic operations from the proposed site(s).

903. SITING REPORT REQUIREMENTS.

a. The siting report shall adhere to FAA Order 6480.A, section 1, Siting Criteria, in its entirety.

b. The proposed ATCT location(s) shall be depicted on a copy of the latest approved Airport Layout Plan (ALP). If an ALP does not exist the proposed location shall be depicted on a copy of the latest Airport Master Plan.

c. The report shall contain all documentation required in Alternative Process Criteria below.

d. The report shall be compiled per appendix 4, Siting Report Table of Contents. Non-relevant sections or sub-sections may be deleted.

e. The report shall contain an Executive Summary per appendix 5, Executive Summary.

f. The report shall contain a site attribute chart per appendix 6, Sample Site Comparison Chart. At a minimum the chart shall be completed for the proposed site. The risk mitigation/ construction cost and airport arrival rate/ capacity impact information is not required.

g. The report shall contain a recommended site concurrence document. The completed siting report shall be coordinated with the Airport Facilities Terminal Integration Laboratory (AFTIL) National Coordinators to aid in the development of the required document signatories. Appendix 7, Sample ATCT Site Recommendation, can be used as a guide.

904. FHA/CSA. The FAA Safety Management System (SMS) requires that safety assessments be performed on changes to the NAS that have significant safety impact. FHA/CSA's are performed during the siting process on potential sites to comply with the Safety Risk Management (SRM) process outlined in the FAA SMS manual. The FHA is an analysis of the hazards that can impact aviation safety by execution of the project at the proposed evaluated location and height. A CSA is a comparison of the relative risks among multiple potential sites.

905. FHA/ CSA REQUIREMENTS.

a. The FHA or CSA shall adhere to Chapter 3, Safety Risk Management, in its entirety.

b. The FHA or CSA shall be completed in accordance with the most recent version of the FAA SMS manual.

c. Each potential location(s) shall have a completed Hazard Matrix per appendix 1, ATCT Siting Hazards.

d. At a minimum each FHA or CSA shall address all the items listed in Figure 4 Preliminary Hazard List, found in Appendix 1, ATCT Siting Hazards.

e. A final site approval signature document shall be prepared identifying each hazard, risk level and responsible lines of business. A sample document is found in Appendix 8, Sample Final Site Approval. The Airport Facilities Terminal Integration Laboratory (AFTIL) National Coordinators will aid in determining the appropriate lines of business for each identified hazard.

906. SRMD APPROVAL PROCESS. The completed SRMD shall be submitted to the appropriate ATO Planning Account Manager for distribution and concurrence among the appropriate FAA lines of business.

907. ALTERNATIVE PROCESS CRITERIA. Each of the following criteria shall be addressed in order to qualify for the alternative siting process.

a. Criteria 1- Visual Performance. Demonstrate there is an unobstructed view from any proposed ATCT site, at controller eye level, of all controlled movement areas on the airport, including all runways, taxiways, and any other landing areas, and of air traffic in the vicinity of the airport. Use the ATCTVAT (Airport Traffic Control Tower Visibility Analysis Tool) to perform both an Object Discrimination Analysis and Line of Sight Angle of Incidence Analysis. This tool can be found at www.hf.faa.gov/visibility. (ATCTVAT/Photographs/shadow studies)

Acceptance Criteria – Documentation showing data derived from ATCTVAT meets criteria established in Chapter 2, Siting Criteria. Provide a shadow study depicting shadows obscure no portion of any movement area. Provide 360° panoramic photographs from controller eye level using SLR 35mm camera.

b. Criteria 2 – TERPS. Document any TERPS impacts caused by any proposed ATCT site. Ensure no degradation to any current or planned terminal instrument procedures. (Airspace analysis 7460-1)

Acceptance Criteria – Final 7460-1 documenting no impacts to approaches with vertical guidance. Final 7460-1 documenting non-precision approaches are impacted shall be acknowledged by a letter from the airport authority stating user community concurrence with impacts to approaches.

c. Criteria 3 - Part 77. Document that Part 77, Objects Affecting Navigable Airspace, is reviewed and complied with. (Airspace analysis 7460-1)

Acceptance Criteria – Final 7460-1 evaluated as a Non Rule Making Action (NRA) in accordance with FAA Order 7400.2, Procedures for Handling Airspace Matters, documenting Part 77 surfaces are not impacted or if impacted can be properly mitigated.

d. Criteria 4 - Sunlight/Daylight. Document that sun glare off natural and manmade surfaces, thermal distortion, etc are no impact to the operation of the ATCT. (Photographs)

Acceptance Criteria – Panoramic photographs from proposed ATCT sites show no potential impacts. Provide statement demonstrating criteria consideration and outlining rationale utilized to determine sunlight/ daylight does not impact operations from proposed tower location(s).

e. Criteria 5 - Artificial Lighting. Identify any impacts to night-time ground and airborne operations caused by airport lighting/background clutter, municipal and industrial lighting. (Photographs)

Acceptance Criteria – Photographs, from a non-flash camera, showing airport lighting/background clutter, municipal and industrial lighting does not impact ground and airborne operations as viewed from the ATCT. If a potential impact is noted, provide documentation how these impacts are to be mitigated.

f. Criteria 6 - Atmospheric Conditions. Identify any naturally occurring atmospheric conditions that create site limitations from any proposed ATCT site.
(NOAA weather data, etc.)

Acceptance Criteria – Atmospheric conditions risk level shall be rated a low hazard based on appendix 1 hazard matrix and definitions. Submit a copy of past 10 years of airport weather data. Provide analysis of data showing number of hours per year visibility from proposed tower height and location is less than the greatest distance to a traffic pattern or movement area, including but not limited to, runway approach/ departure ends, taxiways, and controlled aprons; or the ceiling is less than the proposed overall tower height plus 100'.

g. Criteria 7 - Industrial Municipal Discharge. Identify any industrial/municipal discharges that create site limitations from any proposed ATCT site. (Photographs)

Acceptance Criteria – Photographs showing no industrial/municipal discharges impede proposed ATCT view of all runway final approaches.

h. Criteria 8 - Site Access. Document that access to any proposed ATCT site does not cross existing ground/air traffic patterns. (Site Plan)

Acceptance Criteria – Site plan depicting proposed ATCT site access does not cross existing ground/air traffic patterns.

i. Criteria 9 - Interior Physical Barriers. Identify any interior physical barriers of an ATCT (mullions/equipment etc.) that create sight limitations.
(Cab Drawings)

Acceptance Criteria – Cab drawings depicting console and mullion layout and how they are oriented in relation to runway configuration. Mullions and cab equipment cannot impact line of sight from the proposed ATCT to critical movement areas. These include, but are not limited to, runway approach and departure ends, runway/taxiway intersections, high speed turnoffs.

APPENDIX 1. ATCT SITING HAZARDS

FIGURE 1. HAZARD MATRIX

Severity / Likelihood	No Safety Effect 5	Minor 4	Major 3	Hazardous 2	Catastrophic 1
Frequent A					
Probable B					
Remote C					
Extremely Remote D					
Extremely Improbable E					

High Risk	
Medium Risk	
Low Risk	

Risk — Composite of predicted severity and likelihood of outcome or effect of the hazard in the worst credible system state.

Severity — Severity is determined by the worst credible potential outcome.

Likelihood — An expression of how often an event is expected to occur. Severity must be considered when determining likelihood.

APPENDIX 1. ATCT SITING HAZARDS

FIGURE 2. HAZARD MATRIX DEFINITIONS (SEVERITY)

SEVERITY				
Hazard Severity Classification				
No Safety Effect	Minor	Major	Hazardous	Catastrophic
	◆ Does not significantly reduce system safety	◆ Reduces capability to the extent that there would be a (see below):	◆ Reduces capability to the extent that there would be a (see below):	◆ Total loss of system control
◆ Slight increase in ATC workload	◆ Slight reduction in ATC capability or significant increase in ATC workload	◆Significant reduction in separation or significant reduction in ATC	◆ Total loss of ATC capability, reduction in separation defined by high severity ops error.	◆ Collision with other aircraft, obstacles, or terrain
◆ No effect on flight crew ◆ No effect on safety ◆ Inconvenience	◆ Slight increase in workload ◆ Slight reduction in safety margin ◆ Minor illness, environmental or system damage ◆ Some Physical discomfort to occupants	◆ Significant increase in flight crew workload ◆ Significant reduction in safety margin ◆ Major illness, injury, environmental or system damage ◆ Physical distress on occupants	◆ Large reduction in safety margin ◆ Serious or fatal injury to small number ◆ Physical distress/excessive workload on flight crew	◆ Outcome would result in full loss, multiple fatalities, or fatal injury

APPENDIX 1. ATCT SITING HAZARDS

FIGURE 3. HAZARD MATRIX DEFINITIONS (LIKELIHOOD)

	NAS Systems			Flight Procedures	ATC Operational	
	Quantitative	Qualitative				
		Individual Item / System	ATC Service / NAS Level System		Per Facility	NAS-wide
Frequent	Probability of occurrence per operation/ operational hour is equal to or greater than $1x10^{-3}$	Expected to occur about once every 3 months for an item	Continuously experienced in the system	Probability of occurrence per operation/ operational hour is equal to or greater than $1x10^{-5}$	Expected to occur more than once per week	Expected to occur more than every 1-2 days
Probable	Probability of occurrence per operation/ operational hour is less than $1x10^{-3}$, but equal to or greater than $1x10^{-5}$	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	Probability of occurrence per operation/ operational hour is less than or equal to $1x10^{-5}$ but equal to or greater than $1x10^{-7}$	Expected to occur several times in life cycle of an item	Expected to occur numerous times in system life cycle	Probability of occurrence per operation/ operational hour is less than or equal to $1x10^{-5}$ but equal to or greater than $1x10^{-7}$	Expected to occur about once every year	Expected to occur about once every few months
Extremely Remote	Probability of occurrence per operation/ operational hour is less than or equal to $1x10^{-7}$ but equal to or greater than $1x10^{-9}$	Unlikely to occur, but possible in an item's life cycle	Expected to occur several times in the system life cycle	Probability of occurrence per operation/ operational hour is less than or equal to $1x10^{-7}$ but equal to or greater than $1x10^{-9}$	Expected to occur about once every 10-100 years	Expected to occur about once every 3 years
Extremely Improbable	Probability of occurrence per operation/ operational hour is less than $1x10^{-9}$	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	Probability of occurrence per operation/ operational hour is less than $1x10^{-9}$	Expected to occur less than once every 100 years	Expected to occur less than once every 30 years

APPENDIX 1. ATCT SITING HAZARDS

FIGURE 4. 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
13 a. Dust
13 b. Ash
13 c. Smoke

APPENDIX 1. ATCT SITING HAZARDS

FIGURE 4. PRELIMINARY HAZARD LIST

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 2. AFTIL DATA REQUIREMENTS

2-0. GENERAL. The Airport Facilities Terminal Integration Laboratory (AFTIL) develops three-dimensional (3-D) airport models and simulations from a variety of input media. The final product is a simulation and 3-D computerized model of the airport surface containing models of all airport buildings including the present and proposed ATCT. The model allows all siting team members to visualize line-of-sight from any position on the airport while observing simulated aircraft movements. The accuracy of the simulation, model, and thus the depiction of shadows are dependent upon availability of accurate certified data. The data contained in the model is only valid through AFTIL Trip #2.

2-1. AIRPORT LAYOUT PLAN (ALP) DATA. ALP data in a format specified by the 3DAAP (Three Dimensional Airport Analysis Program) protocol and obtained using photogrammetry with a resolution of one (1) foot or better shall be used. Waivers to this data standard shall be submitted to ATO Terminal Facilities for approval.

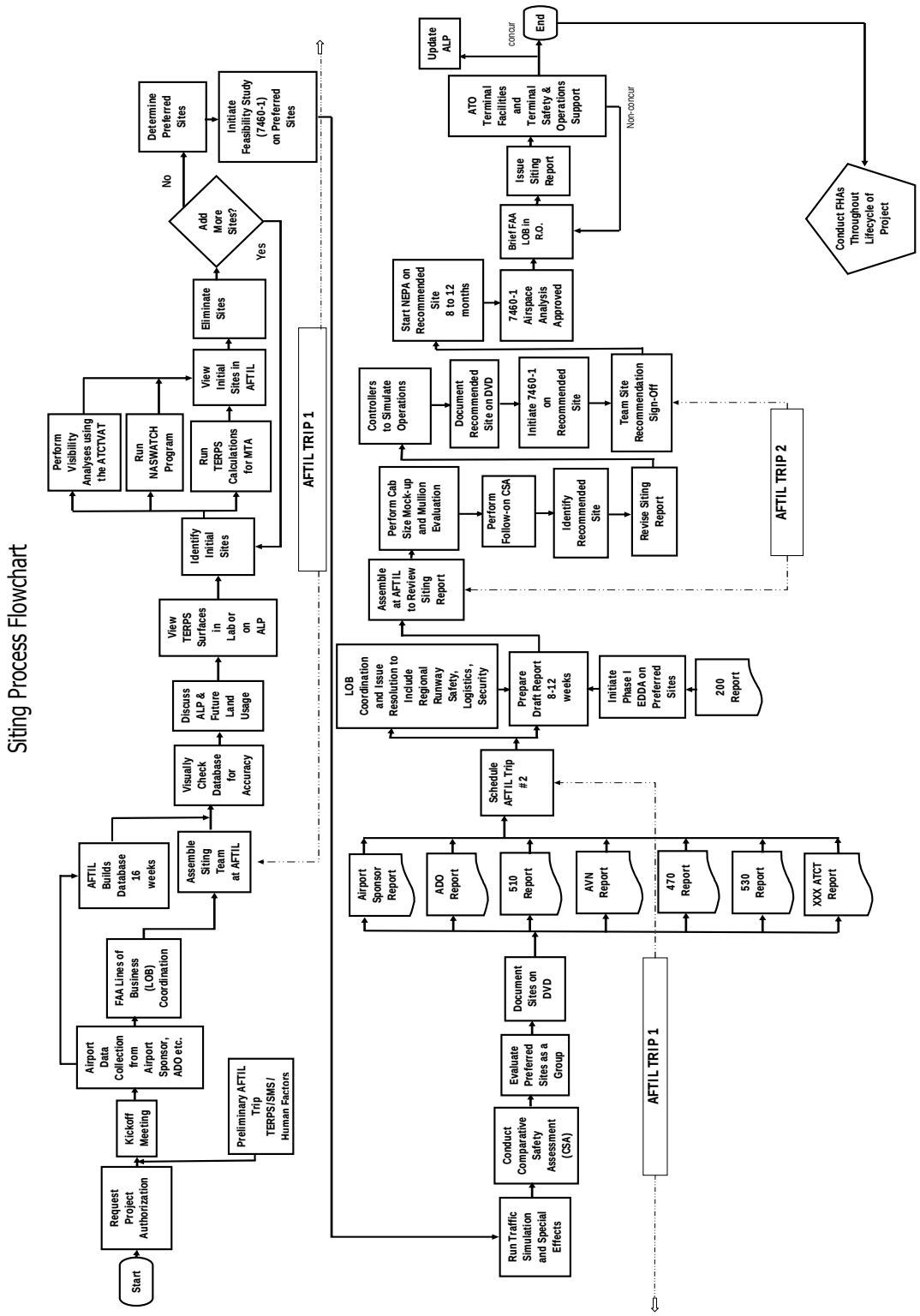
2-2. APPROVED AIRPORT CONSTRUCTION PROJECT DATA. Data of known and approved airport construction projects that could potentially affect the sighting from the proposed ATCT shall be provided using the 3DAAP data protocol. This includes, but is not limited to any new buildings, airport movement surfaces, navigational or surveillance equipment. Proposed buildings shall show all pertinent elevation data. The ADO should work with and fund a 3DAAP for airports that have planned or potential needs within 10 years of a future tower. This approach would assure current, consistent, and accurate data necessary for assimilation into AFTIL.

2-3. APPROVED ATCT CAB DRAWING DATA. ATCT cab drawings shall be provided in electronic format. This information shall show the Cab type and size; Console/Turret dimension; size and number of mullions; size and number of support columns.

2-4. ELECTRONIC DATA FORMAT. Electronic data for proposed construction projects and ATCT cab drawings are to be created with AutoCAD release 14 or higher whenever available. Preferred data format: ".dwg". Ground elevation contour and/or point data shown in 3D drawing (i.e., in the x,y,z dimensions) ALPs not created with AutoCAD provide ".dwg" and ".dxf" files.

APPENDIX 3. SITING PROCESS

FIGURE 1. SITING PROCESS FLOWCHART



APPENDIX 3. SITING PROCESS

FIGURE 2. SITING PROCESS FLOWCHART GUIDANCE DOCUMENT

Organization(s) in **Bold** is the Lead

3-0. PROJECT AUTHORIZATION (PA). Regions are responsible for requesting funding from ATO-Terminal Facilities to cover miscellaneous expenses and the environmental process to complete the Phase I siting effort. The majority of the Phase I funding resides with ATO Operations Planning Tower Integration Group (AFTIL) to cover AFTIL purchases and labor, and other expenses relating to siting efforts. ATO will fund travel for AFTIL Trip #1 and Trip #2 for siting team members who are FAA employees. Funding provided by the ATO-Terminal Facilities organization is not intended for use for contracting services resulting in a siting report as a deliverable.

Participants: **ATO Terminal Planning Account Manager, Technical Operations Engineering Services (Terminal), ATO Operations Planning Tower Integration Group (AFTIL), ATO Terminal Facilities National Coordinators**.

3-1. REGIONAL OFFICE LOB KICK-OFF BRIEFING. LOB meet to plan and coordinate future siting activities. Distribute current copy of 6480.A to all participants. Initiate contact with the AFTIL to schedule and begin the siting process.

Participants: **ATO Planning Account Manager, Technical Operations Engineering Services (Terminal), ATO Terminal Facilities National Coordinators,** Terminal Area Office (Requirements), Terminal Area Office (Operations), Technical Operations Engineering Services (Operations), Technical Operations Aviation System Standards, AXX-200, ADO, AXX-1R, AXX-700, AXX-50 and XXX ATCT (local Air Traffic), Airport Sponsor. If the Airport Sponsor attends, a representative from the Local Airports District Office (ADO) is required to attend. If no Local ADO representatives are available a representative from the Regional Airports Division can be substituted.

3-2. PRELIMINARY AFTIL TRIP. Representative from Technical Operations Engineering Services (Terminal), and Terminal Area Office (Requirements), will be required to attend a four-day session at AFTIL to review TERPS/SMS/Human Factors prior to the start of the siting process.

Participants: **ATO-Terminal Facilities, ATO-Terminal Program Operations Safety, ATO Terminal Facilities National Coordinators**, **ATCT Siting SMS Coordinator,** Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements).

3-3. DATA COLLECTION. Provide the approved electronic files of the ALP data to the AFTIL in compliance with the data requirements in Appendix 2.

Participants: **Technical Operations Engineering Services (Terminal), ATO Terminal Facilities National Coordinators**, Airport Sponsor, and ATO Operations Planning Tower Integration Group (AFTIL).

3-4. FAA LOB MEETING. This meeting in the Regional Office outlines the roles and responsibilities of the siting team and establishes a schedule for the entire siting process.

Participants: **Technical Operations Engineering Services (Terminal), ATO Terminal Facilities National Coordinators**, ATCT Siting SMS Coordinator, Terminal Area Office (Requirements), Terminal Area Office (Operations), AXX-200, Technical Operations Aviation System Standards, Technical Operations Engineering Services (Operations), ADO, Airport Sponsor. If the Airport Sponsor attends, a representative from the Local Airports District Office (ADO) is required to attend. If no Local ADO representatives are available a representative from the Regional Airports Division can be substituted.

3-5. AFTIL BUILDS DATABASE. The AFTIL software modelers build and enhance the airport database.

Participants: **ATO Operations Planning Tower Integration Group (AFTIL)**, XXX ATCT (local Air Traffic), Airport Sponsor.

3-6. AFTIL TRIP #1.

a. The Siting Team assembles at the AFTIL to begin the siting process.

Participants: **Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements), ATO Terminal Facilities National Coordinators**, ATCT Siting SMS Coordinator, Terminal Area Office (Operations), Technical Operations Engineering Services (Operations), Technical Operations Aviation System Standards, AXX-200, AXX-700, ADO, XXX ATCT (local Air Traffic), Airport Sponsor. If the Airport Sponsor attends the trip a representative from the Local Airports District Office (ADO) is required to attend. If no Local ADO representatives are available a representative from the Regional Airports Division can be substituted.

b. Visual check. Check visual accuracy of the model from the existing ATCT and modify as necessary.

Participants: **ATO Operations Planning Tower Integration Group (AFTIL)**, Airport Sponsor, and XXX ATCT (local Air Traffic).

c. Discuss approved ALP. Discuss impacts of siting on future land usage, development, demolition of buildings, wetlands, contaminated soils, etc…

Participants: **ADO**, Airport Sponsor, Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements), and Technical Operations Engineering Services (Operations).

d. View TERPS, Part 77 and Airport Design Surfaces. The TERPS, Part 77 and Airport Design Surfaces can be depicted in the model or drawn on the approved ALP to identify working boundaries.

Participants: **Technical Operations Aviation System Standards**, **AXX-200,** Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements), Terminal

Area Office (Operations), AXX-200, Technical Operations Engineering Services (Operations), ATO Terminal Facilities National Coordinators, ADO, XXX ATCT (local Air Traffic), Airport Sponsor.

e. Identify initial sites. The group shall identify initial sites based on Part 77, TERPS surfaces and airport design standards. A pool of at least six initial sites shall be identified for the siting process.

Participants: **Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements), ATO Terminal Facilities National Coordinators, Terminal Area Office (Operations), Technical Operations Engineering Services (Operations), Technical Operations Aviation System Standards, AXX-200, AXX-700, ADO, XXX ATCT (local Air Traffic), Airport Sponsor.**

f. Run TERPS calculations. This identifies the maximum allowable height of the ATCT structure including all equipment and devices.

Participants: **Technical Operations Aviations System Standards, AXX-200,** Technical Operations Engineering Services (Operations), Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements), Terminal Area Office (Operations), ATO Terminal Facilities National Coordinators.

g. NASWATCH. The NASWATCH program will be run for each site. Initiate modeling by AOS if necessary.

Participants: **Technical Operations Engineering Services (Operations), Technical Operations Aviation System Standards**, ATO Terminal Facilities National Coordinators.

h. Visibility performance analysis. Team shall perform visibility analysis as outlined in Appendix 5 using the Airport Traffic Control Tower Visibility Analysis Tool (ATCTVAT-http://www.hf.faa.gov/visibility).

Participants: **Technical Operations Engineering Services (Terminal),** Terminal Area Office (Requirements), ATO Terminal Facilities National Coordinators.

i. View Initial Sites. Team shall evaluate all initial sites in lab.

Participants: **Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements), ATO Terminal Facilities National Coordinators, Terminal Area Office (Operations), Technical Operations Engineering Services (Operations), Technical Operations Aviation System Standards, AXX-200, AXX-700, ADO, XXX ATCT (local Air Traffic), Airport Sponsor.**

j. Eliminate sites. Based on the NASWATCH Program, ATCTVAT, or insufficient LOS, potential sites are eliminated. Additional sites shall be selected if required.

Participants: **Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements), ATO Terminal Facilities National Coordinators, Terminal Area Office (Operations), Technical Operations Engineering Services (Operations),**

Technical Operations Aviation System Standards, AXX-200, AXX-700, ADO, XXX ATCT (local Air Traffic), Airport Sponsor.

k. Determine preferred sites. At a minimum, three preferred sites shall be identified by the team. All items in Section 2, Siting Criteria, of 6480.A shall be discussed and impacts assessed and documented. Any of the three preferred sites would be acceptable as the recommended site.

Participants: **Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements), ATO Terminal Facilities National Coordinators, Terminal Area Office (Operations), Technical Operations Engineering Services (Operations), Technical Operations Aviation System Standards, AXX-200, AXX-700, ADO, XXX ATCT (local Air Traffic), Airport Sponsor.**

l. Initiate airspace feasibility studies. Feasibility studies (7460-1) shall be initiated on the preferred sites.

Participants: **Technical Operations Engineering Services (Terminal)**, Technical Operations Engineering Services (Operations), Technical Operations Aviation System Standards, AXX-200, ADO, ATO Terminal Facilities National Coordinators.

m.Traffic simulation/Run special effects. The AFTIL has the ability to show aircraft type and traffic patterns of the airport and to simulate fog, rain, snow, daylight, nighttime, and show sun angles. Operational impacts shall be evaluated.

Participants: **ATO Operations Planning Tower Integration Group (AFTIL)**, Terminal Area Office (Requirements), Terminal Area Office (Operations), XXX ATCT (local Air Traffic), ATO Terminal Facilities National Coordinators.

n. SMS. The team shall perform the Comparative Safety Assessment on the three preferred sites. Risks and resultant mitigations shall be identified.

Participants: **ATCT Siting SMS Coordinator, Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements), ATO Terminal Facilities National Coordinators, XXX ATCT (local Air Traffic),** Terminal Area Office (Operations), Technical Operations Engineering Services (Operations), Technical Operations Aviation System Standards, AXX-200, ADO, Airport Sponsor.

o. Evaluate sites. The team shall evaluate the preferred sites. All items in Section 2, Siting Criteria, of 6480.A shall be discussed and impacts assessed and documented.

Participants: **Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements), ATO Terminal Facilities National Coordinators, Terminal Area Office (Operations), Technical Operations Engineering Services (Operations), Technical Operations Aviation System Standards, AXX-200, AXX-700, ADO, XXX ATCT (local Air Traffic), Airport Sponsor.**

p. Document sites. All advantages and disadvantages of all initial sites will be documented on DVD.

Participants: **ATO Operations Planning Tower Integration Group (AFTIL), XXX ATCT (local Air Traffic), ATO Terminal Facilities National Coordinators,** Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements), Terminal Area Office (Operations), Technical Operations Engineering Services (Operations), Technical Operations Aviation System Standards, AXX-200, AXX-700, ADO.

q. Reports. Each LOB is to provide a report documenting their position relative to all initial sites.

Participants: **Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements), Terminal Area Office (Operations), Technical Operations Engineering Services (Operations), Technical Operations Aviation System Standards, AXX-200, AXX-700, ADO, (local Air Traffic), Airport Sponsor, ATO Terminal Facilities National Coordinators.**

r. Schedule next AFTIL visit. Prior to the conclusion of trip #1, the team shall schedule the site recommendation and validation trip (trip #2) to the AFTIL. It should be eight to twelve weeks from the conclusion of the first visit to allow for the Siting Report to be developed.

Participants: **ATO Terminal Facilities National Coordinators, ATCT Siting SMS Coordinator, Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements), XXX ATCT (local Air Traffic).**

3-7. LOB RESOLUTION BRIEFING. All LOBs are tasked to resolve issues identified at the AFTIL prior to AFTIL Trip #2.

Participants: **Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements), Terminal Area Office (Operations), Technical Operations Engineering Services (Operations), Technical Operations Aviation System Standards, AXX-200, ADO, AXX-1R, AXX-700, AXX-50, XXX ATCT (local Air Traffic), ATO Terminal Facilities National Coordinators.**

3-8. PHASE I EDDA. The Phase I EDDA should be started on all of the preferred sites.

Participants: **Technical Operations Engineering Services (Operations), Airport Sponsor, ADO, ATO Terminal Facilities National Coordinators.**

3-9. DRAFT SITING REPORT. All LOBs will be required to provide input and assistance in the development of the report. The draft report shall identify, at a minimum, three preferred sites. The siting report shall contain at a minimum those items contained in the Siting Report Table of Contents (Appendix 4). The Technical Operations Engineering Services Project Engineer will distribute a copy of the draft siting report to all LOBs at least two weeks prior to Trip #2.

Participants: **Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements), ATO Terminal Facilities National Coordinators,** ATCT Siting SMS Coordinator, Terminal Area Office (Operations), Technical Operations Engineering Services (Operations), Technical Operations Aviation System Standards, AXX-200, AXX-700, ADO, XXX ATCT (local Air Traffic), Airport Sponsor.

3-10. AFTIL TRIP #2.

a. The Siting Team assembles at the AFTIL to review the draft Siting Report.

Participants: **ATO Terminal Facilities National Coordinators, ATCT Siting SMS Coordinator, Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements), AXX-200, XXX ATCT (local Air Traffic).** If the Airport Sponsor attends the trip, a representative from the Local Airports District Office (ADO) is required to attend. If no Local ADO representatives are available a representative from the Regional Airports Division can be substituted.

b. Perform cab size mock-up and mullion evaluation. The proposed square footage of the tower cab shall be evaluated using a full-scale mock-up with equipment layout. Mullion placement and stair location, using the model, shall be assessed to minimize LOS impacts.

Participants: **ATO Operations Planning Tower Integration Group (AFTIL), Terminal Area Office (Requirements), XXX ATCT (local Air Traffic),** ATO Terminal Facilities National Coordinators.

c. SMS. The team shall perform a follow-on Comparative Safety Assessment on interior and exterior physical barriers.

Participants: **ATCT Siting SMS Coordinator, ATO Terminal Facilities National Coordinators, Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements), AXX-200, XXX ATCT (local Air Traffic).**

d. Identify recommended site. The Siting Team identifies and validates the recommended site.

Participants: **ATO Terminal Facilities National Coordinators, Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements), AXX-200, XXX ATCT (local Air Traffic).**

e. Revise Siting Report. The siting report shall be revised to incorporate identified changes.

Participants: **ATO Terminal Facilities National Coordinators, ATCT Siting SMS Coordinator, Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements), AXX-200, XXX ATCT (local Air Traffic).**

f. Simulation. The Airport Traffic Control Tower Specialist (ATCS) shall be given the opportunity to simulate operations.

Participants: **ATO Operations Planning Tower Integration Group (AFTIL), Terminal Area Office (Requirements), XXX ATCT (local Air Traffic),** ATO Terminal Facilities National Coordinators.

g. Final DVD. The advantages and disadvantages of all preferred sites will be documented on DVD.

Participants: **Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements), XXX ATCT (local Air Traffic), ATO Terminal Facilities National Coordinators**.

h. Airspace Study. Initiate 7460-1 on recommended site for Airspace Analysis.

Participants: **Technical Operations Engineering Services (Terminal).**

i. Team Sign-off. The Siting Team shall sign the site recommendation, which shall be incorporated into the final report.

Participants: **Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements), ATO Terminal Facilities National Coordinators, AXX-200, XXX ATCT (local Air Traffic)**

3-11. NEPA. The NEPA process shall be started on the recommended site.

Participants: **Technical Operations Engineering Services (Terminal and Operations),** Airport Sponsor, ADO.

3-12. SITING TEAM BRIEFING. Any members of the siting team that did not attend AFTIL Trip #2 shall sign the site recommendation, which shall be incorporated into the final report.

Participants: **Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements), ATO Terminal Facilities National Coordinators,** Terminal Area Office (Operations), Technical Operations Engineering Services (Operations), Technical Operations Aviation System Standards, AXX-200, AXX-700, ADO, XXX ATCT (local Air Traffic), Airport Sponsor.

3-13. AIRSPACE STUDY. Ensure approved 7460-1, Airspace Analysis, is received on Recommended Site and included in the final siting report.

Participants: **Technical Operations Engineering Services (Terminal).**

3-14. LOB BRIEFING. The Regional Siting Team will brief the siting report to all Regional Lines of Business (LOB), as identified on the signature pages in Appendix 4, for their concurrence and signature. At the conclusion of the briefing, LOB signatures on the ATCT site recommendation page represent concurrence with the Siting Report. The LOB signatures on the final site approval page represent acceptance of the risk(s) identified in their area of responsibility.

Participants: **Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements), ATO Terminal Facilities National Coordinators,** ATCT Siting SMS Coordinator, ATO Terminal Planning Account Manager, AXX-500, Terminal Area Office (Operations), Technical Operations Engineering Services (Operations), Technical Operations Aviation System Standards, AXX-200, AXX-600, ADO, AXX-700, AXX-1, AXX-1R, and AXX-50.

3-15. REGIONAL LOB SIGNATORIES. The Regional LOB signatories consist of:

a. Manager, Technical Operations Engineering Services (Terminal)

b. Manager, Logistics Division, AXX-50

c. Manager, Flight Standards Division, AXX-200

d. Manager, Technical Operations Engineering Services (Operations)

e. Manager Terminal Area Office

f. Manager, Airports Division, AXX-600
g. Manager, Security and Hazardous Materials Division, AXX-700

h. Manager, Technical Operations Aviation System Standards.

3-16. REGIONAL ADMINISTRATOR'S APPROVAL. The Regional Administrator's signature on the siting report confirms that the appropriate regional coordination was accomplished and indicates approval of the siting report at the Regional level.

3-17. HEADQUARTERS APPROVAL. The siting report, coupled with the Comparative Safety Assessment (CSA), constitutes a Safety Risk Management Document (SRMD) in accordance with the FAA Safety Management System Manual and is then transmitted to Headquarters for approval by the designated Safety Manager within each operations service unit of the ATO. SRMD approval is the responsibility of the designated Safety Manager within each operations service unit of the ATO. Additionally AVS and ARP Safety Managers are responsible for the approval of the SRMD for issues impacting their LOB. A SRMD with a high initial safety risk shall be coordinated with ATO Terminal Safety and Operations and then sent for approval to the ATO-Safety Service Unit. Approving the SRMD means the approving party agrees that the

analysis accurately reflects the safety risk associated with change, the underlying assumptions are correct, the findings are complete and accurate and the findings are complete and accurate, and the planned remediation is acceptable.

3-18. FINAL REPORT. The final siting report shall be submitted to ATO Terminal Facilities within one month of completing AFTIL Trip #2.

Participants: **Technical Operations Engineering Services (Terminal), Terminal Area Office (Requirements), ATO Terminal Facilities National Coordinators.**

3-19. ISSUE FINAL REPORT. After Headquarters approval of the SRMD, the appropriate signature pages will be added to the Final Siting Report for distribution in both paper and electronic copies to all LOB, ATO-Terminal Facilities, ATO Operations Planning Tower Integration Group (AFTIL) and ATO-Terminal Facilities National Coordinators.

Participants: **Technical Operations Engineering Services (Terminal), and Terminal Area Office (Requirements),** ATO-Terminal Facilities National Coordinators.

3-20. FUNCTIONAL HAZARD ANALYSIS (FHA). FHAs shall be conducted prior to the design phase, construction phase and facility commissioning. This is necessary due to the potential delays between ATCT siting and facility commissioning. FHAs are conducted to verify that the site has not been compromised and hazard mitigation strategies are in place.

Participants: **ATCT Siting SMS Coordinator, ATO Terminal Safety and Operations, Technical Operations Engineering Services (Terminal), and Terminal Area Office (Requirements), XXX ATCT (local Air Traffic), Airport Sponsor, ADO,** ATO-Terminal Facilities National Coordinators.

APPENDIX 4. SITING REPORT TABLE OF CONTENTS

APPENDIX 5. EXECUTIVE SUMMARY

FIGURE 1. EXECUTIVE SUMMARY GUIDELINES

5-0. BACKGROUND. Describe need for ATCT replacement, and any pertinent historical information.

5-1. PROPOSED ACTION. Type tower to be built, benefits of new facility, actions required to mitigate impacts.

5-2. THE RECOMMENDED SITE. Site location narrative, site coordinates, cab floor height, and overall ATCT height. Briefly outline how the shortest possible ATCT, which meets all siting criteria has been recommended.

5-3. IMPACTS. List all approach and departure procedures and annotate in plain language whether or not the proposed ATCT has an impact to each. Identify impacts to airport operations in plain language including but not limited to: TERPS, LOS, Part 77, future airport development, and local weather phenomena with the potential to impair visibility.

APPENDIX 5. EXECUTIVE SUMMARY

FIGURE 2. SAMPLE EXECUTIVE SUMMARY

Background

The existing Airport Traffic Control Tower (ATCT) is located on the top of the 2-story Terminal Building and was commissioned in 1961. The 400 square foot cab, which includes 4 ATCS positions, is open 17 hours daily and handles 138,000 operations per year. The present ATCT, located at the north end of the airport, cannot be expanded, raised nor improved. The cab floor elevation is a mere 36 feet above ground level (AGL). This is totally unacceptable for the amount of traffic, which needs to be controlled safely and effectively by this facility.

Proposed Action

Relocate and replace the existing ATCT with a Welton-Beckett style tower, which has the cab supported by four non-occupied shafts. The tower will have a 525 square foot cab and include 6 ATCS positions for present as well as future needs.

The Recommended Site

Site #3, which is the recommended location, is centrally located on the airfield. It is situated east of Runway 17-35 between runway 23's approach and runway 27's approach. The coordinates of the tower are Latitude: 42° 14' 17.238" and Longitude: 85° 32' 51.452". The proposed tower's cab floor elevation is 136 feet AGL with overall structure height of 166 feet AGL (1023 feet AMSL). Site #3 is the first choice by 5 of the 6 lines of business siting team members and is the preferred site in safety risk management assessments. This site is the shortest possible ATCT that meets all siting criteria and is deemed safe under SMS. The isolated site location provides ample space for security separation as well as possible future facility expansion. The proposed tower provides completely unobstructed views of all controlled airport surface areas along with maximum visibility of all airborne traffic.

Impacts

There are several known impacts from the proposed construction of this ATCT at Site #3. One potential impact is to the VOR. However, this impact can be completely mitigated with a proposed Doppler VOR. The other known impacts relate to a "TERPS" airspace study which required raising circling Minimum Decent Altitude (MDA) from 1320 feet to 1340 feet and raising the MDA of VOR Runway 35 from 1280 to 1300 feet. The AZO Airport Sponsor and airport users have agreed to the increased Minimum Descent Altitudes. This impact is completely mitigated when the Instrument Approach Procedures are revised.

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.

APPENDIX 6. SAMPLE SITE COMPARISON CHART

	Recommended		
Item	**Site X**	**Site Y**	**Site Z**
Line of Sight (LOS)	Airborne Traffic Patterns/Surface Areas - Unobstructed	Airborne Traffic Patterns/Surface Areas - Unobstructed	Airborne Traffic Patterns/Surface Areas - Unobstructed
ATCT Location on Airport (lat/long)	Northest Quadrant XX° XX' XX.XXX" XX° XX' XX.XXX"	Southest Quadrant XX° XX' XX.XXX" XX° XX' XX.XXX"	Northwest Quadrant XX° XX' XX.XXX" XX° XX' XX.XXX"
Access to ATCT Site	Unrestricted	Access road required (1/4 miles)	Restricted Access - Requires Crossing Taxiway
Maximum Distance (to farthest point on all runways and taxiways)	7000 ft	7800 ft	9800 ft
Controller Eye Height Tower Height	141 ft 166 ft	124 ft 149 ft	134 ft 159 ft
Environmental Issues	Wetland Close by	Possible Ground Water Contamination	None Known
ATCT Potential Impacts to Future & Existing Navaids	VOR LOC 35 ASR 1P ASR 2P ASR 3P	VOR ASR 2P ASR 3P	VOR ASR 1P Requires shielded glass (NEXRAD)
TERPS/Part 77 Impacts	Circling Min. - 1320 ft to 1340 ft Vertical guidance – No Non-Precision - No	Circling Min. – No Vertical guidance – No Non-Precision – No	Circling Min. – 1320 ft to 1340 ft Vertical guidance - Raises Cat II Min. 50 ft Non-Precision - No
Risk Mitigation Costs Total Construction Cost Estimates	$250,000 $12,064,000	$250, 000 $11,077,000	$250,000 $10,523,000
Safety Assessment	0 High 3 Medium 0 Low	1 High 1 Medium 13 Low	2 High 2 Medium 11 Low
Visibility Performance Analyses	Detection - .98 Recognition - .65 Angle of Incidence - 1.2	Detection - .95 Recognition - .23 Angle of Incidence - 0.7	Detection - .93 Recognition - .11 Angle of Incidence - 0.4
Airport Arrival Rate/Capacity Impacts			

APPENDIX 7. SAMPLE ATCT SITE RECOMMENDATION

ATCT Site Recommendation
XXX Airport Traffic Control Tower

This Agreement is made by and between Technical Operations Engineering Services (Terminal), Terminal Area Office, Technical Operations Engineering Services (Operations), Technical Operations Aviation Systems Standards, Flight Standards Division, XXX Airports District Office, XXX Air Traffic Management, and XXX Airport Sponsor, collectively known as the "Parties." The purpose of this agreement is to address the siting requirements for the new XXX ATCT planned for construction at XXX in XXX City, XXX State.

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

Article 1: The location of the ATCT, herein after referred to as Site #3

Latitude: N 42° 14' 17.238" (provide reference datum)
Longitude: W 85° 32' 51.452"

Article 2: The ATCS eye height used at the AFTIL Lab for the purposes of this agreement is 998 feet MSL or 141 feet AGL, assuming 857 feet MSL site elevation.

Article 3: The total ATCT height including antennae and all other obstructions will be approximately 1023 feet MSL or 166 feet AGL, assuming 25 feet from eye height level to top of structure and 857 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 preferred ATCT sites. The Airport Sponsor shall be held responsible for any impacts to the preferred 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 XXX Airport (XXX):

APPENDIX 7. SAMPLE ATCT SITE RECOMMENDATION

ATCT Site Recommendation
XXX Airport Traffic Control Tower

Engineering Services Terminal Platform date	Requirements Branch date
Air Traffic Manager, XXX ATCT date	Engineering Services Operations date
XXX Airport Director date	XXX Airports District Office date
Procedures Branch date	Manager, Engineering Services date
Manager, Airports Division, AXX-600 date Aviation System Standards	Manager, Technical Operations date
Manager, Logistics Division AXX-50 date	Manager, Runway Safety Office, AXX-1R date
Manager, Security Division, AXX-700 date XXX Service Area for Technical Operations	Director, date
Manager date Flight Standards Division, AXX-200	Director, XXX Terminal Area Office date
Regional Administrator date XXX Regional Office, AXX-1	

APPENDIX 8. SAMPLE FINAL SITE APPROVAL

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

The undersigned concur with the choice of Site #3 for the new Airport Traffic Control Tower at the XXX Airport (XXX). The Technical Operations Engineering Services signature on this document indicates they accept Hazard #1 that has been identified through the SMS process for this site as identified below. The Flight Standards, AXX-200 signature on this document indicates they accept Hazard #4 that has been identified through the SMS process for this site as identified below. The Terminal Area Office 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-T, Safety and Operations confirms the safety analysis was performed correctly.

Hazard #1 – Potential interference with navigation equipment, VHF Omni-Directional Range (VOR). Mitigation - Dopplerize the VOR. RISK – LOW Technical Operations Engineering Services
Hazard #2 - Potential interference with communication, navigation, or surveillance equipment, no potential impacts identified no safety effect. RISK – LOW

Hazard #3 – Potential Interference with existing and/or planned surveillance equipment, proposed ASR-11 sites 1, 2 and 3. A final ASR-11 site has not yet been selected.
RISK – LOW

Hazard #4 – TERPS impacts, circling minimum increases from 1320' to 1340'.
RISK – LOW (AXX-200)

Hazard #5 – Direction of visual field creates sight limitations; tower faces west, no safety impact. RISK – LOW

Hazard #6 – Line of Sight/Angle of view creates visual sight limitation, visibility to all aircraft movement areas, no safety impact. RISK – LOW

Hazard #7 – Distance of view creates visual sight limitations, potential loss of situational awareness. Mitigations – ATC use of 7110.65. RISK – MEDIUM Terminal Area Office

Hazard #8 - Sunlight/Daylight creates lighting atmospheric sight limitations, potential loss of situational awareness. Mitigations – DBRITE, sun shades. RISK – LOW Terminal Area Office

Hazard #9 – Artificial lighting creates sight limitations (ground), manufacturing plants to the south, potential loss of situational awareness. Mitigations - ATC use of 7110.65. RISK – MEDIUM Terminal Area Office

Hazard #9a – Artificial lighting create sight limitations (airborne), potential loss of situational awareness. Mitigations – ATC use of 7110.65 and DBRITE. RISK –LOW Terminal Area Office

Hazard #10 – Naturally occurring atmospheric conditions create site limitations, potential loss of situational awareness. Mitigations – Aircraft equipage, ATC use of 7110.65 and verification of aircraft/vehicle position. RISK – MEDIUM Terminal Area Office

Hazard #11 – Industrial/municipal discharges to the atmosphere create site limitations, no safety effect. RISK – LOW

Hazard #12 – Access to proposed site does not cross existing ground/air traffic patterns, no safety effect. RISK – LOW

Hazard #13 – Interior physical barriers create sight limitations, design not siting issue. RISK – LOW

Hazard #14 – Exterior physical barriers create sight limitations, extremely remote as current tower is not impacted by construction of the proposed ATCT.
RISK – LOW

_____ _____
Manager date Director date
Technical Operations Engineering Services XXX Terminal Area Office

_____ _____
Manager, date Manger date Flight
Standards Division, AXX-200 ATO-Terminal Facilities

_____ _____
Manager date Director date
ATO-Terminal Safety and Operations ATO-Terminal Program Operations

APPENDIX 9. SAMPLE AIRPORT SPONSOR LETTER OUTLINING POTENTIAL FUTURE IMPACTS TO TERPS AND RESULTING IMPACTS TO AIRPORT OPERATIONS

Mr. John Doe
Director
XXX Airport
123 Main Street
Any Town, USA
Re: Proposed ATCT/TRACON Development

Dear Mr. Doe:

As agreed to during our meeting last week concerning the Federal Aviation Administration's (FAA) plans to replace the Air Traffic Control Tower (ATCT) and Terminal Radar Approach Control (TRACON) facilities at XXX Airport (XXX), I am providing your office with the impacts to procedures for aircraft operating at XXX as a result of the proposed ATCT.

The FAA conducted an airspace review of the proposed structure on Date XX, 20XX (new XXX ATCT, 03-AXX-82-NR). The XXX Flight Procedures Office, AVN-XXX, determined that the proposed ATCT will raise "NON-PRECISION MINIMUMS" and "CIRCLING ALL CATEGORIES" non-precision instrument procedure at XXX as follows[1]:

a) Circling categories A, B, C, & D; 1300/1360' to1420' maximum to avoid adverse Instrument Flight Rules (IFR) effects, (MTA) 1000' – AMSL.
Due to the required height of the new ATCT, necessary to obtain a clear line of site for Air Traffic Control purposes, the circling categories will rise regardless of where the ATCT is located. This increase amounts to raising circling minima 120' above existing procedures.

b) XXX ILS RWY 24L (Current Threshold) Missed Approach DH 260' HAT to 342' HAT, MTA – 1016' AMSL.
This procedural impact would occur if the airport were not relocating the threshold of runway 6R/24L from intersecting with 10/28 under the current Airport Layout Plan (ALP). [Refer to Footnote #1.] This runway threshold relocation shall be completed prior to actual construction of the ATCT and thus this impact will not actually exist once the ATCT is constructed.

c) XXX RNAV (GPS) RWY 24L LPV; 1360' to1380', MTA – 1110' AMSL
This increase in the MTA amounts to a 20' change and is considered, by local ATC personnel, a minimal change with no significant impact relative to aircraft/historical use of this procedure.

d) XXX RNAV (GPS) RWY 24L VNAV 1180' to 1300', MTA – 1009' AMSL
This increase in the MTA amounts to a 120' change and is considered, by local ATC personnel, a minimal change with no significant impact relative to aircraft/ historical use of this procedure.

[1] THE NEW TOWER IS SURVEYED UNDER FAA SPECIFICATION 405; AIRSPACE CASE REVIEW REQUIRES THE EVALUATION OF EXISTING AIRFIELD CONDITIONS AND OPERATIONS.

e) XXX NDB RWY 06R; 1220' to 1240', MTA – 1107' AMSL.

At the request of XXX Airport, City of Any Town, the non-directional beacon (NDB) located on the airfield is to be decommissioned and removed from the airport, prior to the construction of the proposed ATCT, which will result in the decommissioning of the NDB procedure.

Current FAA policy requires a written confirmation from the XXX Airport owner/ operator stating they have advised the user community of the proposed new ATCT and the affects the above impacts would have on their operations at the airport. Following your coordination with the user community, please complete and return the attached form (Appendix 10) confirming the coordination with the users and their acceptance of the above proposed airspace procedural changes. Receipt of this completed form is necessary for us to continue beyond the design phase of this project.

To reiterate the need for expeditious completion of this process, the eventual use of the planned extension to runway 6R/24L is dependent upon the completion and commissioning of the new ATCT in order to meet air traffic control line of sight criteria.

If there are any remaining questions concerning these findings, please call me. I can be reached at (555) 555-5555.
Sincerely,

Terminal Account Manager
ATO Terminal Services
XXX Region
Attachment (2) LOA; ATCT Site Survey

cc: AXX-1
AXX-200
AXX-500
AXX-600
AXX-500
ANI-X00
AVN-XXX
ATO-T-Facilities
ATO-T- Planning
ATO-T-Safety & Operational Support

APPENDIX 10. SAMPLE 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 XXX Airport. The signed document will satisfy FAA national policy regarding written confirmation from the Airport owner/ operator stating they have advised the XXX 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
Lat. 041.24.37.853 (provide reference datum)
Long. 081.50.21.062
Item 2: The ATCT height is 1109.19 MSL (324' AGL).
Item 3. The ATCS eye height used is 1085 MSL (300' AGL).
Item 4: The exact location of the ATCT is subject to moving no more than 80 ft. within the boundaries of the site to efficiently accommodate the base building. This may impact the ATCT height no more than 5 ft.
Item 5: The exact ATCT height is subject to Official Air Space Approval per FAA Form 7460-1.
Item 6: The existing ASDE-3 shall remain on the existing ATCT. The line of sight from the proposed ATCT over the existing ATCT does not shadow any movement area.
Item 7: 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.

Item 1: The XXX Flight Procedures Office, AVN-XXX conducted an airspace review of the proposed structure (new XXX ATCT, 03-AXX-XX-NR). Their findings determined the proposed ATCT will raise "NON-PRECISION MINIMUMS" and "CIRCLING ALL CATEGORIES" non-precision instrument procedure at XXX as follows[2]:

a) Circling categories A, B, C, &D 1300/1360' to 1420' max to avoid adverse IFR Effects (MTA) 1000 – AMSL.
The circling categories will rise regardless of where the ATCT is located. This is due to the required height of the new ATCT facility, which is necessary to obtain a clear line of sight for Air Traffic Control (ATC) purposes. This increase amounts to raising circling minima 120' above existing procedures.

b) XXX ILS RWY 24L (CURRENT THRESHOLD) MISSED APPROACH DH 260' HAT TO 342' HAT, MTA–1016' AMSL.

This procedural impact would occur if the airport were not relocating the threshold of runway 6R/24L from intersecting with 10/28 under the current Airport Layout Plan (ALP). [Refer to

[2] THE NEW TOWER IS SURVEYED UNDER FAA SPECIFICATION 405; AIRSPACE CASE REVIEW REQUIRES THE EVALUATION OF EXISTING AIRFIELD CONDITIONS AND OPERATIONS.

Footnote #1.] This runway threshold relocation shall be completed prior to actual construction of the ATCT and the impact will not exist once the ATCT is constructed.

c) XXX RNAV (GPS) RWY 24L LPV; 1360 TO1380', MTA – 1110' AMSL
This increase in the MTA amounts to a 20' change and is considered a minimal change with no significant impact by local ATC personnel relative to aircraft/historical use of this procedure.

d) XXX RNAV (GPS) RWY 24L VNAV 1180 TO 1300', MTA–1009'
This increase in the MTA amounts to a 120' change and is considered a minimal change with no significant impact by local ATC personnel relative to aircraft/historical use of this procedure.

e) XXX NDB RWY 06R 1220 TO 1240', MTA–1107'. At the request of the Airport Sponsor, City of Any Town, the non-directional beacon (NDB) located on the airfield is to be decommissioned and removed from the airport. This equipment removal also decommissions the NDB procedure. This shall also occur prior to the construction of the proposed ATCT.

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 therein 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 (NEPA), the Council on Environmental Quality (CEQ) regulations implementing NEPA (Title 40 of the Untied States Code of Federal Regulations [CFR], Parts 1500-1517, and other statues, orders, directives, or policy concerning environmental assessment and alternatives.

Section 4. Airport Submission

For the Airport Sponsor
City of Any Town, USA

_____		_____	
Name	(date)	Name	(date)
_____		_____	
Title		Title	

APPENDIX 11. VISIBILITY PERFORMANCE ANALYSES

11-0. OBJECT DISCRIMINATION ANALYSIS.

a. Purpose. Conduct a quantitative Object Discrimination Analysis to assess an observers' probability of detection and recognition of an object on the airport surface as a function of observation range, tower height, and atmospheric and surface conditions. This is done using the Airport Traffic Control Tower Visibility Analysis Tool (ATCTVAT) available at the Federal Aviation Administration's AFTIL, W.J. Hughes Technical Center or at the Human Factors Research and Engineering Division, Washington, D.C. and online at http://www.hf.faa.gov/visibility.

b. Question Answered by the Analysis: What improvement in detecting or recognizing a distant object can be gained by increasing tower height or decreasing tower distance from the object?

c. Analysis Assumptions: The following assumptions are inherent in this analysis:

(1) Detection is defined as the ability to notice the presence of an object on the airport surface without regard to the class, type, or model (e.g., an object such as an aircraft or vehicle). The observer knows something is present but can not recognize or identify the object.

(2) Recognition is defined as the ability to discriminate a class of objects (e.g., a class of aircraft such as single engine general aviation aircraft).

(3) The object (aircraft or vehicle) size is taken to be the square root of the frontal or side cross-sectional area of the object (e.g., wing span x height).

(4) Modified Johnson's criteria is used for the number of optical cycles required for a 50% probability of success in object discrimination (N50).

(5) All observations are made with the unaided eye. Observers have normal vision.

(6) The observer is assumed to be at the specified tower height while all objects (e.g., aircraft, vehicles) are taken to be at the ~ 3 ft (1 m) height.

(7) To account for the impact of atmospheric (optical) turbulence on the downward-slanting optical path, an average/effective refractive-index-structure-parameter *scaling factor* was calculated. This *scaling factor* was derived by taking the line integral of the Tatarski height scaling equation over the downward-slanting optical path.

d. Analysis Procedure: The Object Discrimination Analysis may be conducted using standard procedures for evaluation of an observers' probability of detection and recognition of a specified object at a given distance/range under specified surface and atmospheric conditions. Standard procedures are incorporated into the Airport Traffic Control Tower Visibility Analysis Tool (ATCTVAT), which generates probability-of-discrimination curves, by drawing from four well-developed and empirically validated functions and models:

(1) U.S. Army Night Vision Laboratory's Standard Object Transfer Probability Function (using modified Johnson's discrimination criteria)

(2) Barton's model for the human eye's Contrast Transfer Function

(3) Kopeika's atmospheric (optical) turbulence modulation transfer function

(4) Tatarski's atmospheric-index-structure-parameter height-scaling model

The siting team representatives may use standard default values or manipulate the ATCTVAT's input parameters (e.g., tower height, tower distance to object, object characteristics, surface properties, atmospheric conditions, contrast ratios, and ground turbulence) to determine what improvement in visibility can be gained by increasing or decreasing tower height or increasing or decreasing the distance to key points on the airport surface. Under control of the user, the ATCTVAT performs the steps identified below:

(1) Select object and relevant object dimensions.

(2) Specify tower height and key point distance.

(3) Use human contrast threshold function for discrimination.

(4) Scale the atmospheric index for the specified location.

(5) Determine turbulence ranges.

(6) Determine visibility function.

(7) Calculate the probability of detection and recognition (probability of identification is also available but less important).

(8) Evaluate the object discrimination probabilities (e.g., compared with the minimum).

e. Criterion. Object Discrimination Analysis probabilities provide a baseline measure from a sample of ATCTs and offer values that enable the tower siting team to assess the impact of the height and location of the tower relative to that sample. Based on the analysis of the test object (i.e., front view of a Dodge Caravan minivan, unless another object or object orientation is selected), parametric derivations of the sample provide recommended baseline values, where the minimum is approximately 1 ½ standard deviations below the sample mean (i.e., better than 6.7% of the sample).

f. Analysis Considerations. The distance from key airport locations and the ATCT height shall support requirements for object visibility from the ATCT cab. In addition to the ATCTVAT parameters, other operational considerations that can affect the probability of discrimination, but not calculated in the model, include:

(1) Types of airport operations and movement patterns.

(2) Various types of aircraft and vehicles that may need to be detected for the selected airport (unless otherwise specified in the model).

(3)Textual dimensions of the airport movement and surrounding areas including the degree of contrast between pavements and non-pavement areas.

(4) Some attributes of the objects to be detected or recognized for the specified airport (e.g., shape, color).

(5) Cognitive cues and situational awareness of the ATCS that can enhance or detract from discrimination performance.

11-1. LINE OF SIGHT (LOS) ANGLE OF INCIDENCE ANALYSIS

a. Purpose. Conduct a Line of Sight (LOS) Angle of Incidence analysis to assess an observer's viewing perspective of the airport surface key points. This is done using the Airport Traffic Control Tower Visibility Analysis Tool (ATCTVAT) available at the Federal Aviation Administration's AFTIL, W.J. Hughes Technical Center or at the Human Factors Research and Engineering Division, Washington, D.C. and online at http://www.hf.faa.gov/visibility.

b. Question Answered by the Analysis. What improvement in the ATCS viewing perspective can be gained by increasing the observer's line of sight angle of incidence to the airport surface at key distance points?

c. Analysis Assumptions. The following assumptions are inherent in this analysis:

(1) All observations are made with the unaided eye. Observers have normal vision.

(2) LOS viewing performance criteria are established using a 50% probability of achieving designated ATCS assessment ratings.

(3) Distant key points (e.g., furthermost runway threshold) and elevation difference (i.e., between mean sea level of the tower base and mean sea level of the designated key point) have been identified accurately.

(4) Runway slope is insignificant or calculations adjusted to account for any significant slope.

d. Analysis Procedure. The analysis uses the results of a study in which observers performed common ATCS visual tasks at different tower heights while positioned in a tower cab simulation. The observer's task was to visually scan a designated distant "key point" on an airport surface and rate (using the scales below) the observer's ability to: (Q1) distinguish boundaries of the movement areas, and (Q2) identify the position of an object at the airport's key point, when various settings were used for tower height.

(1) Q1: How well can you distinguish boundaries of the movement areas?

1	2	3	4	5

Can see object area. Cannot discriminate boundaries of runways or taxiways.	Can discriminate boundaries of most of runways and taxiways; but provides no distance information.	Can discriminate boundaries of all runways and taxiways, but unable to estimate distances between movement areas.	Can discriminate boundaries of runways and taxiways, and provides some information about distances between movement areas.	Can discriminate boundaries of runways and taxiways, and can readily estimate distances between movement areas.

(2) Q2: How well can you identify the position of an object at the airport's key point?

1	2	3	4	5
Can see object. Unable to determine any information about the object position relative to key point or movement areas.	Able to determine the general object position relative to key point, but unable to determine if object is on or off movement area.	Able to determine that object position is in general vicinity of key point, but unable to estimate distances of object within movement area.	Able to determine that object position is near key point, and provides some information about distances of object within movement area.	Able to determine the exact object position relative to key point. Able to readily estimate distances of object within movement area.

The analysis entails the following steps:

(1) Determine the most distant key point (e.g., runway threshold) on the airports surface movement area.

(2) Calculate the height of the observer in the tower according to the formula: $H_O = H_C - (P_E - T_E)$ where, H_O is height of observer; H_C is ATCS eye height above the ground at the tower; P_E is ground elevation of key point Above Mean Sea Level; T_E is ground elevation of tower Above Mean Sea Level. ATCS eye height is defined as five feet above cab floor height.

(3) Compute the Line of Sight angle at which the observer's view intersects with the airport surface at the key point.
Line of Sight angle = Arc Tan (height of observer/distance between key point and tower)

(4) Compare the calculated LOS angle of incidence with rated values to determine the observer's perspective for the resultant LOS viewing criteria (e.g., minimum).

d. Criterion. LOS Viewing Angles of Incidence were derived from an ATCS study of sample ATCTs and offer values that enable the tower siting team to assess the impact of the height and location of the tower relative to that sample. Parametric derivations of ATCS ratings on that sample provide recommended baseline values, where the minimum is established at 50% probability that ATCS assessments indicated: Q1: "Can discriminate boundaries of most of the runways and taxiways; but provides no distance information" (i.e., receiving a rating of 2 or better), and Q2: "Able to determine that object position is in general vicinity of key point, but unable to estimate distances of object within movement area." (i.e., receiving a rating of 3 or better).

LOS Viewing Criteria	LOS Viewing Angle of Incidence
Q1: Minimum	Equal to or greater than 0.481 degrees
Q2: Minimum	Equal to or greater than 0.799 degrees

Note - Minimum LOS Viewing Criteria is set at the higher of the two values for Q1 and Q2.

e. Analysis Considerations. ATCT distance from critical airport locations and ATCT height shall support requirements for viewing objects on the airport movement areas, taxiways, and non-movement areas from the ATCT cab. The tower distance and height requirements reflect the observer's perspective of the airport surface as represented by the ATCT line of sight (LOS) angle of incidence to designated key points on the airport surface. Other operational considerations that relate to the observer's perspective or the LOS Angle of Incidence analysis include:

(1) Airport operations, airport layout, texture of areas surrounding the airport movement areas (e.g., runways/taxiways) can enhance or detract from the observer's perspective without regard to the LOS angle of incidence.

(2) Furthermost distant key points represent a "worst case" angle of incidence for the purpose of tower siting and viewing perspective; they may not necessarily represent the most operationally significant points on the airport surface to be observed.

(3) The study and analyses upon which the LOS angle of incidence requirements were based eliminated the influence of object discrimination. Thus, the LOS angle of incidence is independent of the probability to detect or recognize an object.

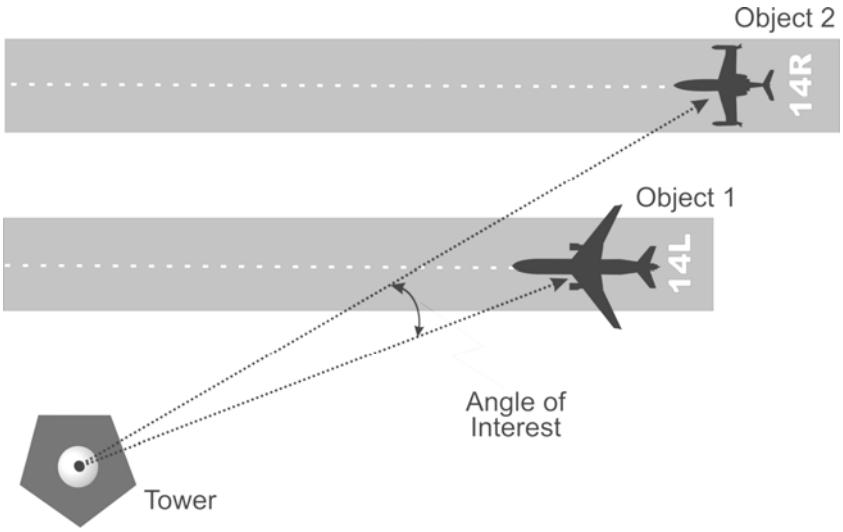
11-2. VISIBILITY PERFORMANCE CONSIDERATIONS- TWO-POINT LATERAL DISCRIMINATION ANALYSIS

a. Purpose. Quantify the impact of tower height on the ability to laterally separate two critical points of the airport surface operations.

b. Question Answered by the Analysis. What improvement in discriminating between two critical points of the airport surface operations can be gained by changing the tower location?

c. Analysis Procedure. Determine the amount of lateral separation between two points by measuring the angle between the line of sight from the tower to the object at key point 1 (Object 1 on Runway 14L) and the line of sight from the tower to the object at key point #2 (Object 2 on Runway 14R). Using this procedure ensures that there is sufficient lateral separation between two key points on the movement areas, especially at distant points on the airport surface.

d. Criterion. Ensure that two objects of distant key locations provide the observer sufficient lateral discrimination to be separated by 0.13 degrees (8 minutes) or greater.



APPENDIX 12. REFERENCE DOCUMENTS

12-0. REFERENCE DOCUMENTS

a. FAA Order 6480.7 - ATCT/TRACON Design Guidelines

b. FAA Order 8040.4 – Safety Risk Management, Latest Revision

c. Safety Management Systems Manual (SMS), Latest Revision

d. System Safety Management Program, Latest revision

e. System Safety Handbook, Volume 2, Tools and Techniques, Latest Revision

f. FAA Order 8260.XX TERPS Documents

g. TERPS Instruction Letters (TIL)

h. FAA Order 1600.69 – FAA Facility Management Program (FSMP)

i. FAA Order 7400.2 – Procedures for Handling Airspace Matters

j. Advisory Circular 150/5300-13 Airport Design Standards

k. FAA Order 1050.1 – Policies and Procedures for Considering Environmental Impacts

l. FAA Order 1050.19 – Environmental Due Diligence Audits in the Conduct of FAA Real Property Transactions

m. FAA Order 5050.4 – Airport Environmental Handbook

n. 14 CFR Part 77 - Objects that Effect Navigable Airspace