

MEMORANDUM

Date: January 15, 2016

To: MCI Leadership Committee

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J. Green – KCAD

D. Long – KCAD

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cc: KCI Airline Airport Affairs Committee

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Subject: Kansas City International Airport (KCI)
Review of Crawford Alternative Design

The Airline Technical Representative (ATR) has reviewed the Crawford Alternative Design (CAD) concept in conjunction with the airlines serving Kansas City International Airport (KCI) as requested by the Leadership Committee (LC). The airlines appreciate the opportunity to review this independent third-party input on a renovation design alternative. This paper summarizes the airlines' review of the CAD concept.

The CAD is similar in concept to one of the major renovation conceptual planning alternatives undertaken by the LC and presented to City Council last fall. More specifically, the CAD most closely resembles the Major Renovation Option A (MR-A) concept presented to City Council as one of four optimal concepts for terminal modernization at KCI.

The airlines realize that the CAD materials provided for ATR review are high-level conceptual documents. We further recognize that the Crawford design team did not have access to programming and technical information developed through the Exhibit K process with the LC and its consulting team during our joint 2+ year planning process. Consequently, we understand that the lack of programmatic requirements explains why the CAD concept fails to provide all the required facilities for the terminal modernization.

The CAD Report identifies some key problems with the existing terminal facility including inefficiencies in operational spaces, inadequate sizing of functional spaces, passenger congestion at peak periods, and the lack of amenities. In the development of the program, several other deficiencies and programmatic requirements (see appendix) were identified and addressed in the development of the concepts. These additional facility deficiencies were not addressed in the CAD concept or reflected in the concept's cost estimate.

One of the major program requirements is to functionally balance the terminal, airside, and landside related to passenger demand, capacity of the facility, and airport/airline operations. This balancing of all facility components is essential for the airport's flexibility to align new customer demands with capacity and to expand terminal facilities in a cost-effective and operationally efficient manner beyond the current design date. Because the Crawford team did not have the benefit of these requirements, the CAD concept does not provide the flexibility necessary to support this major program objective.

It should also be noted that the first phase of the CAD proposal is improving one of the existing terminals followed by additional terminals when required. Based on the program, at least two of the existing terminals are required at the outset in order to provide sufficient aircraft gates and equal facilities to all airlines.

In order to facilitate a comparison of the CAD to MR-A, the base budget for the CAD needs to be adjusted to include the facility requirements. This missing scope includes structural improvements, infrastructure replacement, airline/airport operational support areas, in-line baggage screening, international gates and federal inspection facilities, airside improvements, environmental compliance improvements, structured parking, utility upgrades, and all soft costs. Therefore, adjustments to the CAD estimate are necessary to more accurately reflect the required cost of achieving the program scope. In order to address the programmatic shortfalls, it is necessary to update the CAD budget estimate (in 2015 dollars). This has been depicted by functional area:

Functional Area	CAD Base Estimate Two Terminals	Adjustments to CAD Program Variances Appendix A &B	Revised CAD Estimate
Terminal	\$ 403.6	\$ 207.2	\$ 610.8
Airside	\$ 62.7	\$ 53.0	\$ 115.7
Landside	\$ 104.7	\$ 28.5	\$ 133.2
Utilities / MEP / Infrastructure / Baggage System	\$ 100.4	\$ 24.0	\$ 124.3
Total (Cost in 2015 \$ Millions)	\$ 671.4	\$ 312.7	\$ 984.1

Additional details on the requirements and issues by functional area is included in Appendix A. A summary of programmatic requirements is presented in Appendix B.

The normalized \$984.1M CAD cost estimate (in 2015 dollars) validates the LC findings, which shows that major renovation concepts are at least as expensive as new terminal development from a construction cost perspective. The new terminal concept is currently being estimated at approximately \$960M in 2015 dollars.

Conclusion

In conclusion, all major renovation concepts, including the CAD concept, have two fundamental problems that do not make renovating the existing terminals and infrastructure viable for the modernization program.

First, major renovation concepts cannot adequately address many of the identified technical and operational issues because of the existing geometrics of the terminals, outdated infrastructure, inefficient baggage systems, and constrained landside configuration. The renovation concepts require a substantial amount of new area in the renovated terminal space to meet programmatic requirements resulting in larger overall terminal square footages when compared with new terminal concepts. These incremental terminal square footages result in increased long-term operating expenses that new terminal concepts do not experience. Additionally, the overall terminal infrastructure requirements including mechanical, electrical and plumbing systems need to be upgraded to current building codes, federal mandates, and environmental sustainability standards.

Second, major renovation concepts also face financial challenges. Although a major renovation may have a similar initial capital cost, it is not clear that revenue bonds issued for a major renovation can have the same 35-year term that new construction can achieve. This results in higher annual debt service payments for the airlines who will bear the cost of terminal modernization at KCI. Additionally, major renovation concepts will not likely be eligible for passenger facility charge (PFC) at the current \$4.50 per passenger maximum generally afforded to new construction. This requires additional revenue bonding resulting in further increases in annual airline costs.

The CAD concept validates the efforts of the LC and its consultants over the past 18-24 months to modernize terminal facilities at KCI. The LC carefully considered the costs and benefits of major renovation concepts and new terminal concepts. The LC took into consideration the technical, operational and financial challenges presented by major renovation concepts and comparing those with new terminal costs. Consequently, the LC determined a new terminal concept is more advantageous to the City as operator of KCI, users of the airport, the travelling public, the airlines serving KCI and the citizens of the Kansas City region.

Appendix A

Functional Area Review

The CAD Report identifies some key problems with the existing terminal facility including inefficiencies in operational spaces, inadequate sizing of functional spaces, passenger congestion at peak periods, and the lack of amenities. The program for KCI includes several other airport deficiencies and programmatic requirements identified by the airport and airlines that were to be studied.

The following narrative and cost comparisons highlight the potential deficiencies in the concept as proposed.

Terminal

The CAD terminal concept presented has some interesting perspectives on the renovation solution. However, the CAD terminal configuration has not addressed several important inefficiencies and inadequacies in the existing terminal(s), including:

Building Structure

- The existing terminal(s) and infrastructure will be 50 years old in 2022, the opening date of the renovation, requiring replacement or significant rehabilitation.
- The existing facility was designed for a different aircraft fleet with smaller aircraft, lower passenger volumes, and limited security requirements.
- The existing structure's age will require continued maintenance/repairs (increased O&M costs) and structural analysis may be needed for seismic improvements.
- Hydrant Fueling System and airside gravity waste water lines were installed with the original building and will require replacement.
- The curved narrow terminal building and existing column structure makes the existing facility inefficient for new functional spaces including the baggage handling system layouts. The CAD would require complex conveyor runs to the make-up devices, given a centralized checked baggage inspection system (CBIS) area.

Operations

- The CAD plan does not address the program requirements for international operations for gates, U.S. Customs & Border Protection (USCBP) requirements, international baggage claim, and meet/greeter area. Since the CAD alternative would result in at least two separate unit terminals, some airline customers may have flight connectivity difficulties upon departing the Federal Inspection Services (FIS) facilities.
- Airline operational spaces on the ramp level are inadequate and are insufficient for outbound baggage operations including Transportation Security Administration (TSA) checked baggage inspection screening (CBIS) equipment/functions, and baggage make-up areas. The CAD plan does not provide the required

functions/areas necessary to support the proposed consolidated passenger check-in lobbies.

- Split Ticketing Lobby and Security Screening Checkpoint (SSCP) reduces passenger processing capacity as well as staffing flexibility
 - Split functions will result in redundancy for operational and support spaces
 - Split functions will also require additional program space to allow for growth potential and operational flexibility.
- With a split SSCP, there is an operational risk that TSA will close one of the checkpoints during off-peak periods causing longer walking distances to multiple gates.
- The CAD concept seems to limit the size of the SSCP. Since a clear diagram was not furnished, there is a concern that this area will not have the ability to adapt to future TSA procedures and equipment due to the lack of terminal depth in the expanded floor plan. Also, the area is constrained for pre- and post-security circulation. Historically, TSA is adding new equipment that is larger and requires changes to passenger flows, which this concept seems to limit the expansion capability without negatively impacting the overall terminal.
- Concessions
 - Two SSCPs split the passenger traffic which reduces the market penetration and passenger foot traffic for concession nodes.
 - Concession opportunities should also be located near gate holdrooms where passengers have the greatest dwell time. This plan appears to only allow for small kiosk type concessions along the gate holdrooms
- Airline operations and support functions are not addressed.
- Baggage tug circulation requires longer route times, reduces baggage delivery performance, and tug traffic in and around consolidated ticketing areas will impact the gate operations near the baggage make-up points.
- The CAD layout has three separate baggage claim areas, which may reduce walking distance for off-loading customers, but may cause difficulty for the passengers and meeters/greeters to unite, particularly if an airline has multiple locations. For example:
 - Airline baggage service support could only be one location.
 - Airline operations may only use one area and could overload that baggage system. All of the passengers going to this one claim area would also overload the terminal area and curbside at that one baggage claim area.
 - With multiple baggage claim areas, equipment redundancy is needed at each of the three locations.
- Flexibility in airline growth is problematic should an airline require to grow beyond its initial gate requirements. With the CAD plan's separate unit terminal approach, passenger connections between terminals will either require development of an airside connector with long walking distances or continuing the bus operation between terminals. This is in addition to customer confusion.

The CAD Report is carrying \$201.8M¹ (in 2015 dollars) for Terminal A improvements (\$403.6M for Terminals A & B). This estimate does not include the lower level of the terminal renovation and increased program areas for airline/airport building support functions and baggage operations. Based upon the knowledge gained through the Exhibit K process to date, the following adjustments to 2015 dollar estimates are appropriate to address the shortfalls:

Crawford Cost Summary <small>Costs reflect Terminal A & Terminal B Program Inclusive of Construction & Design Contingency (15%) & Design Fees (9%)</small>		Crawford Concept	Adjustment	Updated Crawford
Terminal		403.6M		610.8M
Renovation/repair existing ramp level <small>140,000 sqft @ \$305 per sqft</small>			107.0M	
New construction for FIS/Baggage <small>40,000 sqft @ \$1,000 per sqft</small>			100.2M	

Airfield

Since the airside for CAD was not indicated, this analysis used the similar Major Renovation Option A (MR-A) for the basis of this work. During the programming work for the MR-A, a detailed program for the airside was developed and following requirements identified:

- The program number of gates is 35.
- Dual taxilanes around the terminals for efficiencies in aircraft movement and pushback as much as possible.
- Taxilanes modified to allow for operations of larger aircraft types up to B747.
- 19 Remain Over Night (RON) aircraft parking positions.
- Elimination of the conflict of aircraft pushbacks at Terminal B into active Taxiway D and within the inter-terminal alleyways between Terminals A and B.
- Improvements to apron areas to handle new aircraft sizes and airline baggage operations.
- Relocation of aircraft hydrant fueling pits.
- New Passenger Boarding Bridges, pre-conditioned air, ground power, and other aircraft support systems.
- Improvements to deicing operations including glycol recovery and storage.
- Changes in airfield drainage to comply with current EPA requirements for glycol recovery and storage.
- Terminal area pavement replacement due to degradation of concrete as it reaches its useful life.

These program requirements were not addressed in the Crawford Report. The report is carrying \$31.3M² (in 2015 dollars) for airside improvements to Terminal A (\$62.7M for Terminals A & B). Based on the improvements outlined in the MR-A planning effort, the

¹ \$84M Renovated terminal, \$77M New terminal plus contingencies (15%) and design fees (9%)

² \$25M plus contingencies (15%) and design fees (9%)

estimated work is \$115.7M (in 2015 dollars) total program cost for Terminals A & B. This results in a \$53M (in 2015 dollars) adjustment for the total airfield program.

Crawford Cost Summary		
<small>Costs reflect Terminal A & Terminal B Program Inclusive of Construction & Design Contingency (15%) & Design Fees (9%)</small>		
	Crawford Concept	Updated Crawford
Airside	62.7M	115.7M
Airside Efficiency, Environmental, Deicing, Hydrant Fueling, New Loading Bridges		53.0M

It should be noted that the CAD report indicated that 18 aircraft can be accommodated at each terminal, but some of those gates will need to connect via a “gerbil tube” running behind concessions and baggage claim areas which causes improper holdroom sizing and passenger boarding/de-planing operations. It should also be noted that the absence of a CBIS and associated baggage make-up areas could negatively impact the flight line, depending upon its placement. Finally, the accommodation of the future aircraft mix may not be able to be accommodated in the available terminal frontage.

Landside

The CAD landside concept was developed without the benefit of the programming requirements. The parking structure has some interesting features, but it falls short in the program requirements for parking and terminal roadways. Several program requirements need to be addressed:

Parking Structure

- Parking Structure at Terminal A is 30 year old in 2017 and may need structural maintenance on top of the new construction being proposed
- 6,500 public garage spaces are required for the program (currently 4,246). The CAD only provides 5,200 when two terminals are improved.
- The post-tension construction of the existing parking structures cannot be modified as proposed by the CAD within the allotted budget.
- The original Terminal A Parking Structure has provisions for the addition of future floor levels; however, these provisions do not accommodate future levels across the entire footprint.
- The Commercial Vehicles (CV) will require separate structured access ramps would be required from the terminal access road to the parking structure to properly segregate commercial ground transportation vehicles (buses, shuttles, taxicabs) from private vehicles using the parking structure.
- The CVs will require a sizable portion of the garage floor plate for vehicular ramps needed to access the lower parking levels and also the upper two levels of parking. This does not appear to leave sufficient room remaining for the commercial vehicles to drop off and pick up passengers.
- The existing top level of the parking structure is not directly accessible to the terminal access road and would require new pedestrian walkways to accommodate persons seeking commercial ground transportation providers in the garage and appears excluded from the estimate.

- The top level of the existing garage is not designed to handle public assembly loading that would be required for the commercial vehicle passenger waiting areas. Modifications to the existing structure would be required.
- The split CV operation will increase the operator costs and the multiple locations may reduce customer service by increasing travel times.

Landside Operations

- Expansion to 1,940 (close-in) surface parking spaces are not indicated (current 1,722).
- The estimated budget to construct an entirely new terminal roadway for each terminal and modified parking garage does not appear to be sufficient.
- As proposed, the operations of single level terminal roadways appear to be a safety and traffic concern given roadway congestion and weave distances between departures and arrivals traffic. These vehicular weave points are in close proximity to the location for crosswalks to the parking garage and commercial vehicle parking.
- Additionally, the CAD terminal roadway concept eliminates an existing roadway lane, further reducing roadway capacity.

Roadway Improvements

- The CAD report shifts the outside curb of the existing roadway closer to the existing parking structure and will require the construction of retaining walls in order to maintain the open air definition of the parking structure and thus eliminates the sloped landscape areas.
- Constructing inside the horseshoe and shifting the roads from their present location will likely require the relocation of the existing utilities under the present roadway. These include domestic water, fire protection water and natural gas supplying the terminal and the terminal roof storm water collection system.
- Existing Roadway Bridges from International Circle replacement – These two 2-lane bridge structures are 44 plus years old and are a capacity restraints for the increasing vehicular traffic to/from the terminal curb front and parking structure.
- The present day sidewalk ramps rising from Bonn Circle and the surface parking lots up to the terminal curb front level need to be reconstructed as they are 43 years old and require re-engineering and realignment to comply with present day ADA regulations.

The CAD report is carrying \$52.3M³ (in 2015 dollars) for landside and parking improvements for Terminal A (\$104.7 for Terminals A & B). This estimate does not include the short-fall from the full program requirements for structured parking by 1,300 structured parking spaces. Assuming that the cost of the two terminals structures are shared equally, an additional cost (in 2015 dollars) to the Terminal A would be \$14.3M⁴ (\$28.5M for Terminals A & B). This cost adjustment does not include any costs risks associated with

³ \$9M Renovated Garage, \$22.7M New Garage, \$10M Roadways/Sidewalks/Curbs plus contingencies (15%) and design fees (9%)

⁴ \$11.4M for 650 spaces at \$17,500/space plus contingencies (15%) and design fees (9%)

parking garage structural modifications, roadway improvements, and revenue collection system.

Crawford Cost Summary <small>Costs reflect Terminal A & Terminal B Program Inclusive of Construction & Design Contingency (15%) & Design Fees (9%)</small>	Crawford Concept	Adjustment	Updated Crawford
Landside	\$104.7M		133.2M
Additional structured parking (1300 spaces)		28.5M	

Utilities/MEP/Infrastructure/Baggage System

The program will require the upgrade to the chillers in the Central Chilling Plant, enabling project, relocation of fuel pits, infrastructure replacements, and new inline baggage screening system.

The CAD Report is carrying \$50.2M⁵ (in 2015 dollars) for Services, Infrastructure, Utilities, and Baggage System improvements for Terminal A (\$100.4 for Terminals A & B). In rough-order-of-magnitude the current 2015 dollar estimates for the MR concepts are approximately \$124.3M (total program costs for Terminals A & B) for these functions which include a split baggage system and MEP (replacement chillers). There is a variance of \$24M.

Crawford Cost Summary <small>Costs reflect Terminal A & Terminal B Program Inclusive of Construction & Design Contingency (15%) & Design Fees (9%)</small>	Crawford Concept	Adjustment	Updated Crawford
Services/Infrastructure/ Utilities/Baggage Systems	100.4M		124.4M
Variance (MR-A) for split baggage system/ MEP replacement chillers		24.0M	

Phasing

The high-level phasing as depicted in the Crawford Report requires a two-phase development. A connection between Terminal A and Terminal B is not included in the initial build estimate and the proposed Phase 2 curved walkway will not allow for moving walkways to assist passenger going between terminals.

Soft Costs

The Airlines and KCI evaluated all the soft-costs related each of the functional areas of the program. These soft-costs are required for all project and are divided into three areas:

- Contractor Costs & Design Evolution costs includes project logistics, phasing, contractor's costs (general conditions, overhead & profit, insurances, bonds), design evolution, and LEED's requirements.
- Design & Project Management includes program management, design (architects/engineers), permits, testing, inspections, commissioning, and public art
- Owner's Construction Contingency, this includes funding to handle any unforeseen conditions during construction

⁵ \$40M plus contingencies (15%) and design fees (9%)

These soft-cost percentages vary depending on the work being performed, but the following table gives a high-level averages the various project components.

Program Soft-Costs Average % over the full range of projects	KCI Requirements	CAD Proposed	Variance
Contractor Costs & Design Evolution	27.1%	15%	20.1%
Owner's Construction Contingency	8.0%		
Design & Project Management	13.5%	9%	4.5%
	48.6%	24%	24.6%

The above analysis of the CAD concept does not take into account the additional program costs highlighted above which could potentially add an additional 25% to the overall CAD program costs.

Appendix B

Summarized Programmatic Requirements

The Crawford design effort was conducted without the benefit of terminal facility requirements that were developed through the Exhibit K process. These requirements were based on updated aviation demand forecasts and the resultant facility requirements. These requirements serve as the basis for terminal modernization programming. Passenger activity is forecast to grow at an average annual rate of 1.9% resulting in 6.9 million annual enplanements for the 2030 design year. The basic facility requirements for terminal modernization developed by the LC include:

- 31 airline-assigned gates (B737-900/A321 capable).
- Four city gates with the ability to handle two wide-body aircraft up to B747-400.
- Accommodate for 7 additional future aircraft gates.
- 19 Remain Overnight (RON) aircraft parking positions.
- Infrastructure to support defrosting at gates/taxilanes with deicing at pads.
- Ticket lobby capacity to support the design day flight schedule.
- Baggage claim with sufficient airline support area.
- International arrival capacity to include four international-capable gates, sterile corridor, USCBP area and international baggage claim.
- Building support spaces – airline operations, KCAD operations, mechanical, electrical and plumbing areas.
- 6,500 public garage parking spaces and 1,940 surface parking near the terminal.
- Separated terminal roadways for arrivals and departures to eliminate roadway congestion and safety for customer at vehicle interfaces points.
- Ability to expand gate capacity in a cost and operationally efficient manner.

The terminal space requirements yield the need for approximately 753,000 gross square feet of terminal space programmed as follows:

Functional Area	Sqft
Ticketing/Check-in	32,000
Security Checkpoint	18,640
Departure Lounges	81,600
Public Space/Departure Corridor	164,940
Airline Club / Common Use	2,500
International Arrivals	31,460
Concessions	70,660
Baggage Claim	45,710
Baggage Make-up	82,080
Airline Operations/ATO/BSO	56,720
Non-Public Spaces	49,450
Terminal Functions	117,200
Total Terminal Area	752,960