

ITEM NO: 7a Supp

DATE OF MEETING: January 26, 2016

Revised January 21, 2016

# SUSTAINABLE AIRPORT MASTER PLAN (SAMP) UPDATE

January 26, 2016



## Briefing overview

- Background & planning process update
- Airport activity
- Airfield simulation modeling
- Major plan elements
- Evaluation of one and two terminal options
- Mid-term landside strategy
- Economic development
- Public outreach
- Next steps

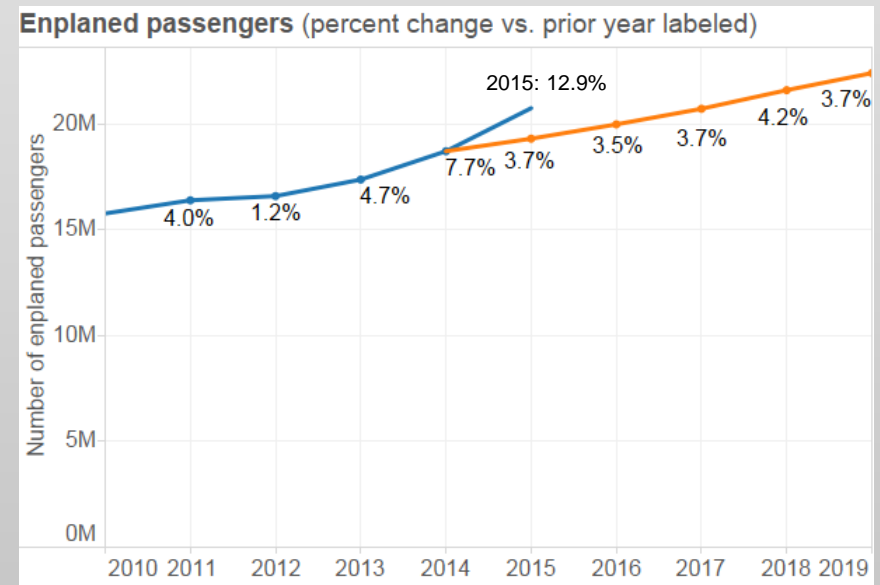
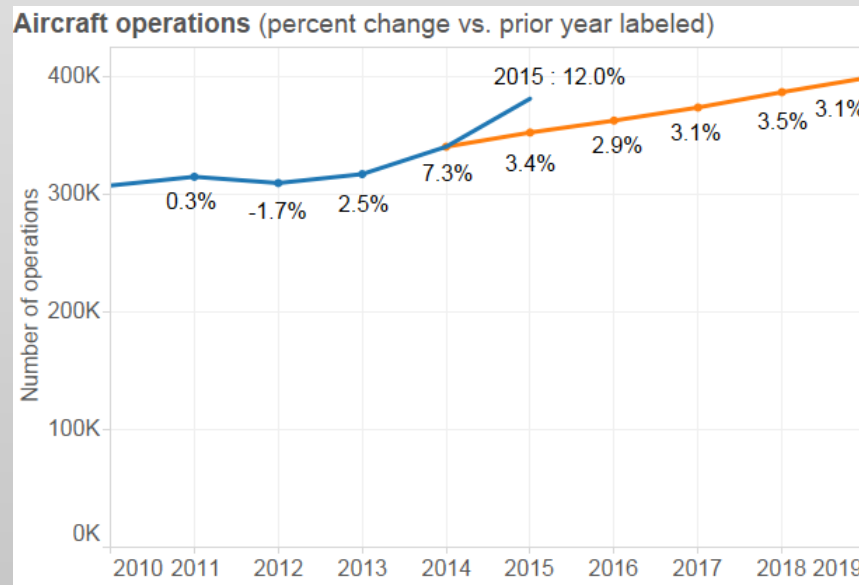
# Background

## Planning context

- ✓ Long-range plan (*e.g. SAMP*)
  - Campus wide, comprehensive planning
  - Facility requirements for airport activity in 5-year increments to 20-years
  - Alternatives analysis for major plan elements
  - Narrowing alternatives down to Preferred Alternative(s)
  - 20-year facilities development plan
    - Balance capacity in all key functional areas to fixed capacity of 3-runway airfield
    - Phasing plan to maintain adequate level of service and continuity of operations
  - Capital program / plan of finance
- ✗ Project definition (*e.g., concourse layouts for new gate piers*)
  - Program development for individual projects
  - Adequate detail required to transition projects to design
- ✗ Project design

# Airport activity

- Higher than previously forecasted growth in recent years
- Dramatic growth in 2015
  - **Operations:** 70% of SAMP 5-year forecasted growth anticipated in 2015
  - **Passengers:** 55% of SAMP 5-year forecasted growth anticipated in 2015



Higher than previously forecasted growth in recent years

# Where we are in the planning process

## Current work

- Airfield modeling
  - Assessed capacity of existing airfield at increased activity levels
  - Assessed capacity of airfield with improvements at increased activity levels
- Assessing impacts of runway/taxiway separation
- Developed options for major plan elements
- Evaluated one and two terminal options
- Developed mid-term landside strategy
  - Leverages operational measures and relatively low cost capital projects
  - Consistent with one or two terminal options (*minimal throwaway*)
- On-going work to explore phasing for gates, terminal and hardstands
- Beginning work to eliminate alternatives towards preferred alternative(s)

# Airside simulation modeling

## Approach & capacity

- Approach
  - Simulated average day of peak month at 5-year activity levels
  - North & south flow
  - Instrument & visual conditions
  - Assumed all anticipated FAA improvements to arrival/departure airspace procedures
  - Existing airfield with & without improvements
  - Annualize delay
- Airside capacity threshold is 20 minutes average annual delay per aircraft operation
  - Highest delay level experienced at any US airport
  - Recognized by FAA as maximum theoretical capacity
  - Analytic threshold, not a policy target

Capacity threshold of the airside is 20 minutes average annual delay

# Airside simulation modeling

## Potential airfield improvements

- Potential airfield improvements include
  - End-around taxiways
  - Centerfield taxiway
  - Dual taxiways A & B south of terminal



Suite of potential airfield improvements tested through modeling

# Airside simulation modeling

- Major elements
  - Airspace
  - Airfield
    - Runways
    - Taxiways
    - Runway crossings
    - Aircraft hold positions
  - Terminal gates
- Intersection of airfield and terminal complex identified as critical to efficiency resulting in need for aircraft hold positions
  - Approximately 35 required in 2029

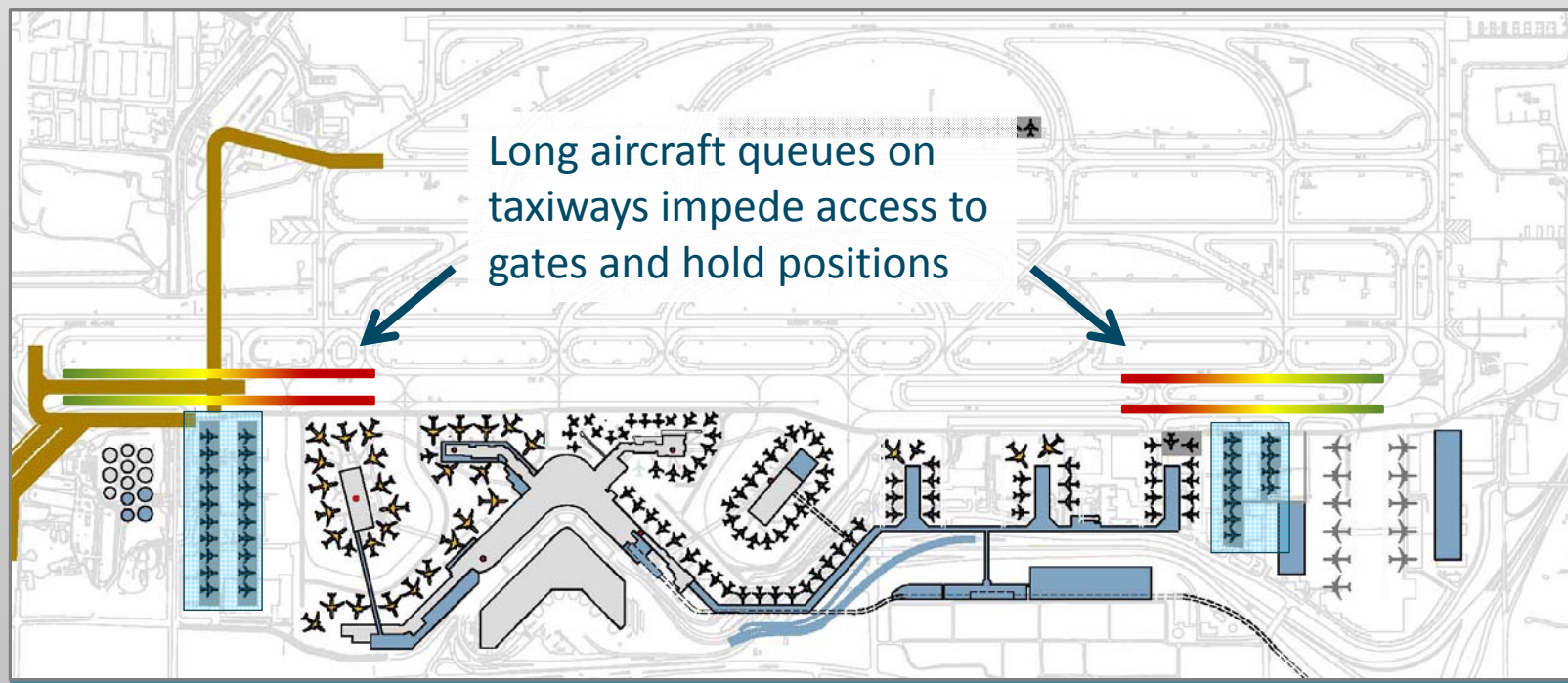
Aircraft hold positions are critical to airside efficiency



# Airside simulation modeling

## Why are aircraft hold positions so important?

- Delay compounded if gate access is blocked by taxiway queue
- Aircraft hold positions allow for:
  - Departing aircraft to move off a gate until a slot in the departure queue opens up (*frees-up gate for arrival of another aircraft*)
  - Arriving aircraft to be held off-gate until gate becomes available



Hold positions provide relief valve to airfield congestion

# Airside simulation modeling

## Conclusions & recommendations

- Airfield reaches critical delay between 2029 & 2034
- Significantly more aircraft holding positions required north & south
- South end-around taxiway provides the highest delay reduction benefit
- Continue to plan for 35 additional gates to provide operational flexibility

## Delay reduction benefit of potential improvements

### 2029 simulation results

	Average Annual Delay	Delay Reduction Benefit
Baseline	19.2	
Baseline + Taxiway A	18.8	0.4
Baseline + Centerfield Taxiway	18.7	0.5
Baseline + South End-around Taxiway	<b>17</b>	2.2
Baseline + North End-around Taxiway	<b>18.6</b>	0.6
Baseline + All Improvements	16.1	3.1

NOTE: Baseline model run includes required aircraft hold positions and anticipated airspace procedures.

**Airfield reaches critical delay between 2029 & 2034**

# Major plan elements

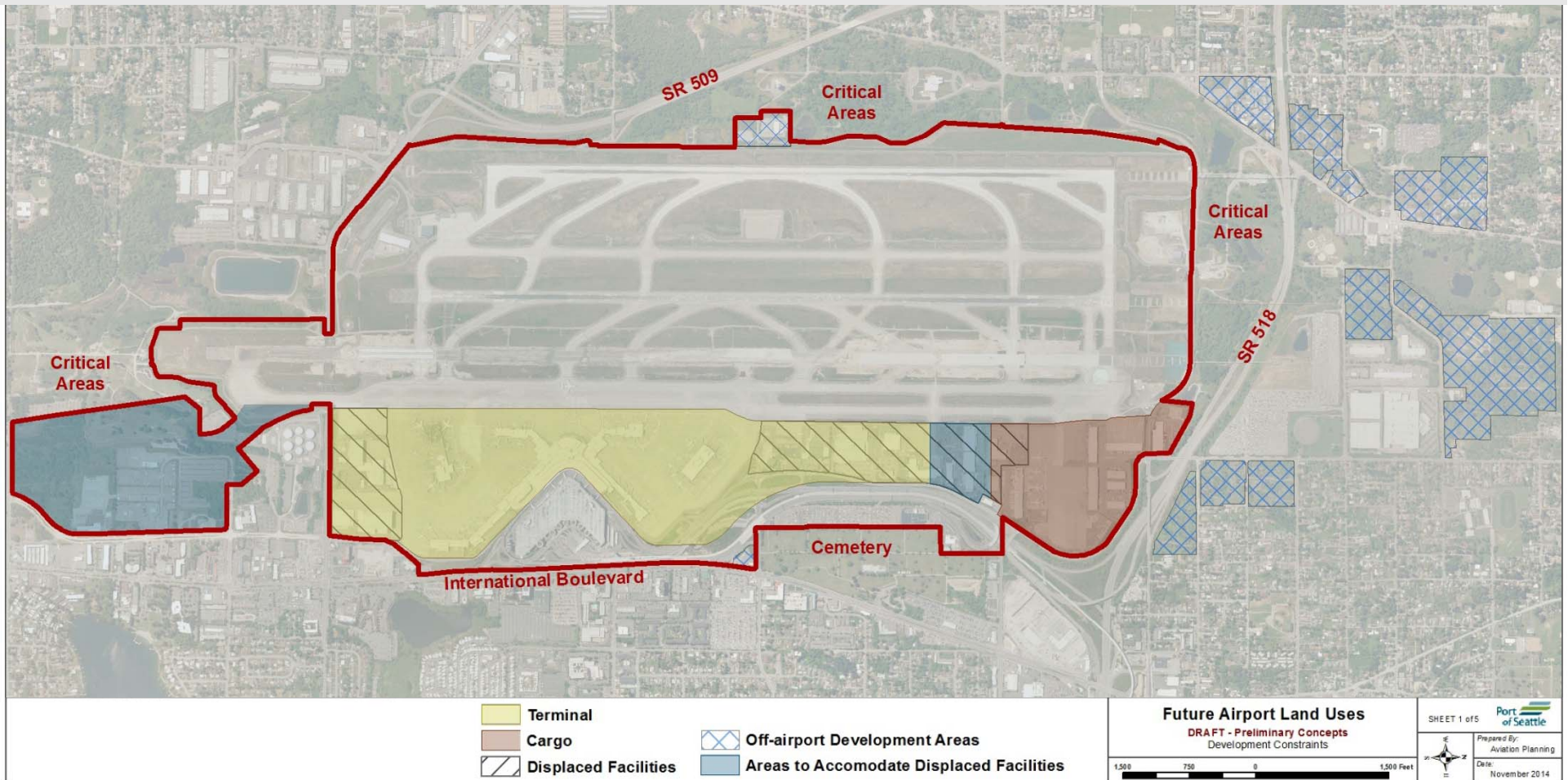
## Plan development (*iterative process*)

- Determine preferred gate expansion concept
- Assess airside capacity and required airfield & terminal facilities
  - Gates
  - Aircraft hold positions
  - Airfield improvements
- Allocate remaining land based on hierarchy
  - Terminal
  - Airfield
  - Landside
  - Cargo
  - Airline support
  - Airport support

Plan development is an iterative process

# Major plan elements

## Development constraints & key functional areas





# Major plan elements

## Concept 1

- Description
  - New widebody international gates on extension of Concourse A
  - Extension of Concourse D to two piers to the north
  - Aircraft hold positions provide to the north only
- Primary concerns/flaws
  - New south end gates in congested aircraft movement area
  - Does not provide aircraft hold positions on south end
  - Displaces aircraft maintenance



NOTE: Development concepts illustrate major plan elements independent of 1 vs 2 terminals

Concept 1 locates new widebody gates in a congested area

# Major plan elements

## Concept 2

- Description
  - New widebody international gates on Concourse B
  - Extension of Concourse D to three piers to the north
  - Less aircraft hold positions provided to the north
- Primary concerns/flaws
  - Does not provide aircraft hold positions on south end



NOTE: Development concepts illustrate major plan elements independent of 1 vs 2 terminals

Concept 2 does not provide aircraft hold positions on south end

# Major plan elements

## Concept 3

- Description
  - New widebody international gates on Concourse B
  - Extension of Concourse D to three piers to the north
  - Aircraft hold positions provided to the south and north
- Primary concerns/flaws
  - Displaces aircraft maintenance



NOTE: Development concepts illustrate major plan elements independent of 1 vs 2 terminals

Concept 3 displaces aircraft maintenance

# Major plan elements

## Concept 4

- Description
  - New widebody international gates on Concourse B
  - Extension of Concourse D to three piers to the north
  - Aircraft hold positions provided to the south and north
  - SASA accommodates displaced aircraft maintenance and cargo growth
- Primary advantages
  - Meets all program needs
  - Best operational layout



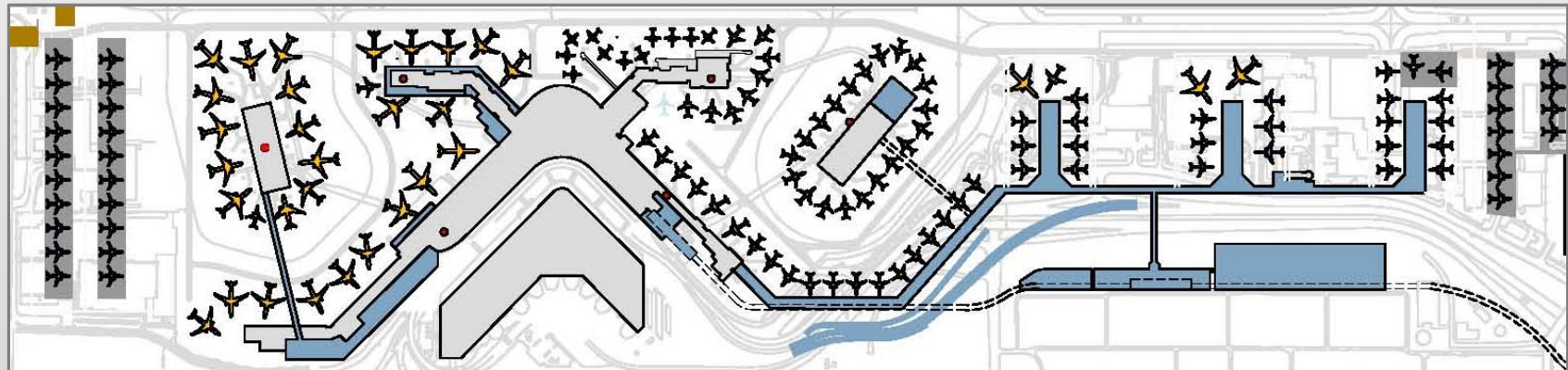
NOTE: Development concepts illustrate major plan elements independent of 1 vs 2 terminals

Concept 4 meets all program needs and provides best operational layout

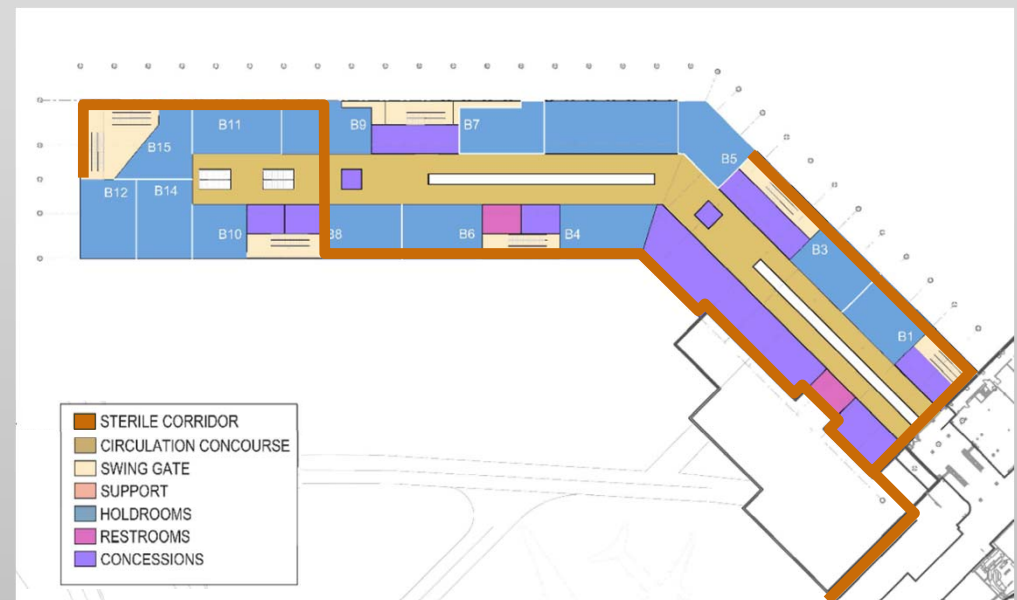


# Major plan elements

## Convert Concourse B to International widebody gates



- Gate expansion to the north on piers provides better distribution of aircraft activity
- Preserves area to the south for aircraft hold positions
- Shorter connection from new widebody gate to IAF
- Likely recommend new construction vs renovation



Locating widebody gates on Concourse B provides multiple advantages

# Major plan elements

## Airport support facilities

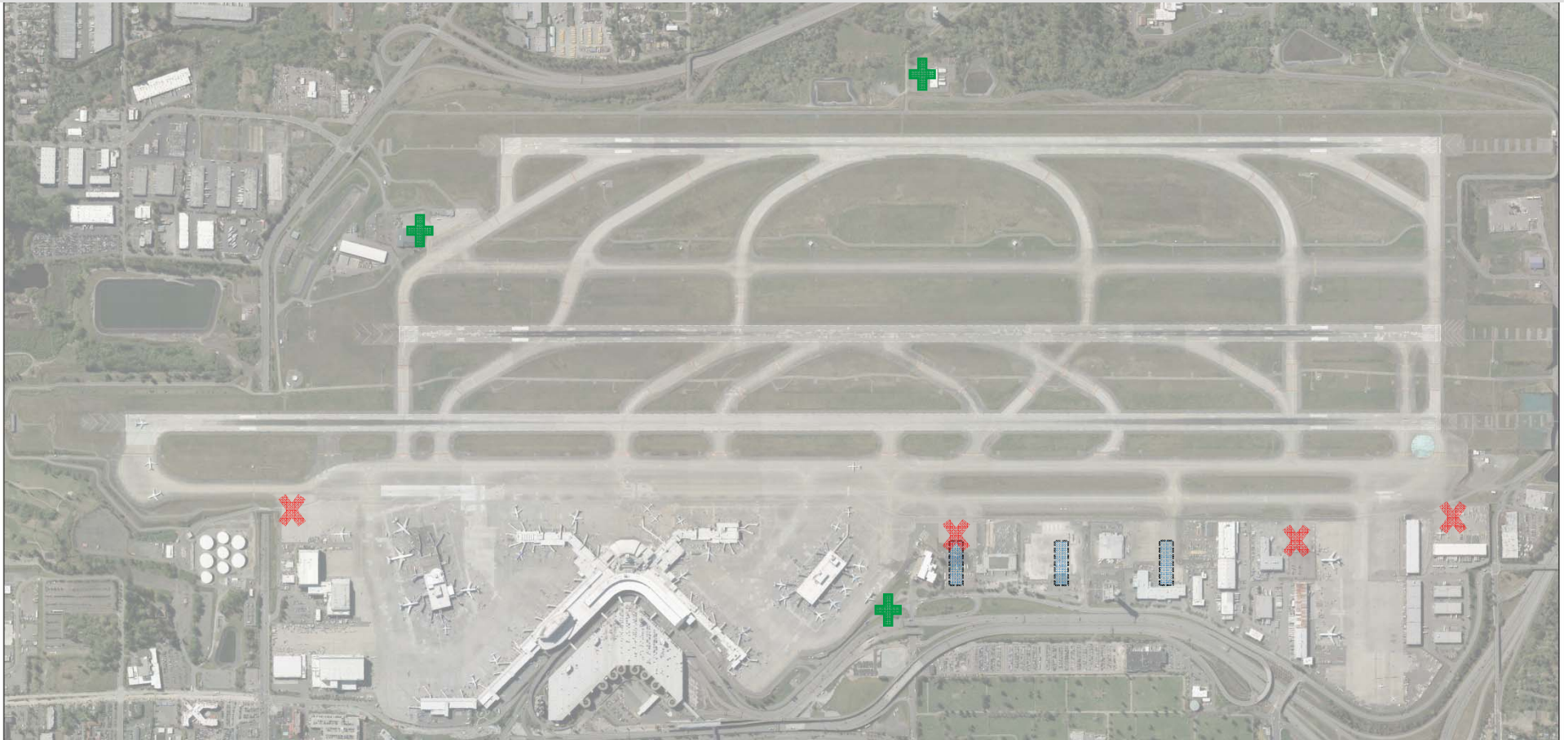
- Air Rescue & Firefighting facility (ARFF)
  - Two stations required to meet runway response times
    - ARFF located east of airfield
    - 2<sup>nd</sup> ARFF located on west side of airfield or general aviation area
  - Difficult to meet minimum response times today
    - Difficulty getting tower clearance and will be more challenging with growth
    - Best location for future ARFF located east of airfield presents greater challenge than existing location
- Airport Maintenance
  - Locate all functions on west side of airfield

Preferred locations for ARFF and airport maintenance facilities identified

# Major plan elements

## Airport support facilities

- ARFF siting considerations
  - Airside & landside access
  - Adequate space for program needs
  - Compatibility w/ existing & future facilities
  - Runway response times



# Evaluation of one and two terminal options

## Evaluation criteria

- Cost (total cost of ownership)
  - Capital
  - Operation and maintenance
- Risk
  - Ability to accommodate faster growth than anticipated
  - Ability to accommodate higher level of activity than ultimately anticipated
- Flexibility
  - Operational: airline assignments, load balancing
  - Facilities: efficiency, sustainability, timing and scope
- Development
  - Phasing: ability to provide adequate capacity in a timely manner
  - Constructability: code issues, abatement
- Level of service
  - During construction
  - Post construction

# Evaluation of one and two terminal options

## Construction projects unique to one terminal option

- Remove interior ramps & remodel main terminal Level 1
- Remove upper level departure road
- Raise lower level roadway to align with arrivals floor level
- Remove pedestrian bridges from level 4 and relocate to level 5
- New garage level 5 entrance and exit lanes and roadway
- Remove western edge section of parking garage levels 6 to 8
- Expand departure level facade by 25' and remove interior ramps
- Remodel interior of main terminal Level 2
- System transfer OB/IB baggage between main terminal and north gates
- Relocate/replace/install elevator cores, escalators, vent stacks as required to move upper drive functions and rental car to level 5 of garage
- Expand ticketing & baggage claim at north end of terminal building
- New north of terminal garage for 3,750 Cars
- New automated people mover between main terminal and north gates

One terminal option includes substantial projects in multiple phases



# Evaluation of one and two terminal options

## Construction projects unique to two terminal option

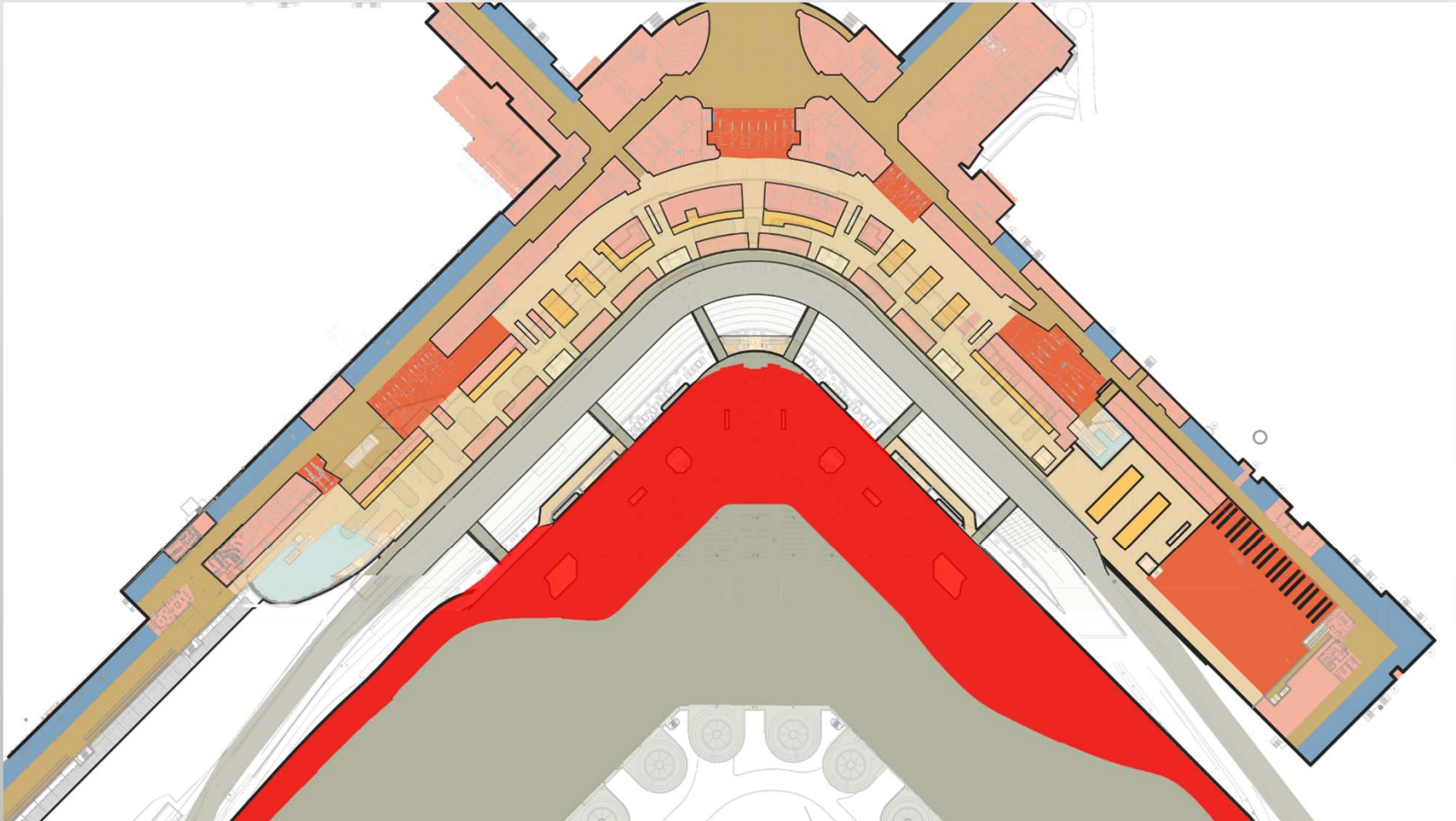
- Baggage system & tunnel between north terminal & airside corridor
- New north terminal roadway
- Pedestrian bridge between north terminal and airside concourse
- New utility plant for north terminal
- New north terminal garage for 5,000 Cars
- New north terminal
- Expand ticketing & baggage claim at north end of existing terminal building

Two terminal option has fewer construction projects

# Evaluation of one and two terminal options

## Project phasing for one terminal option

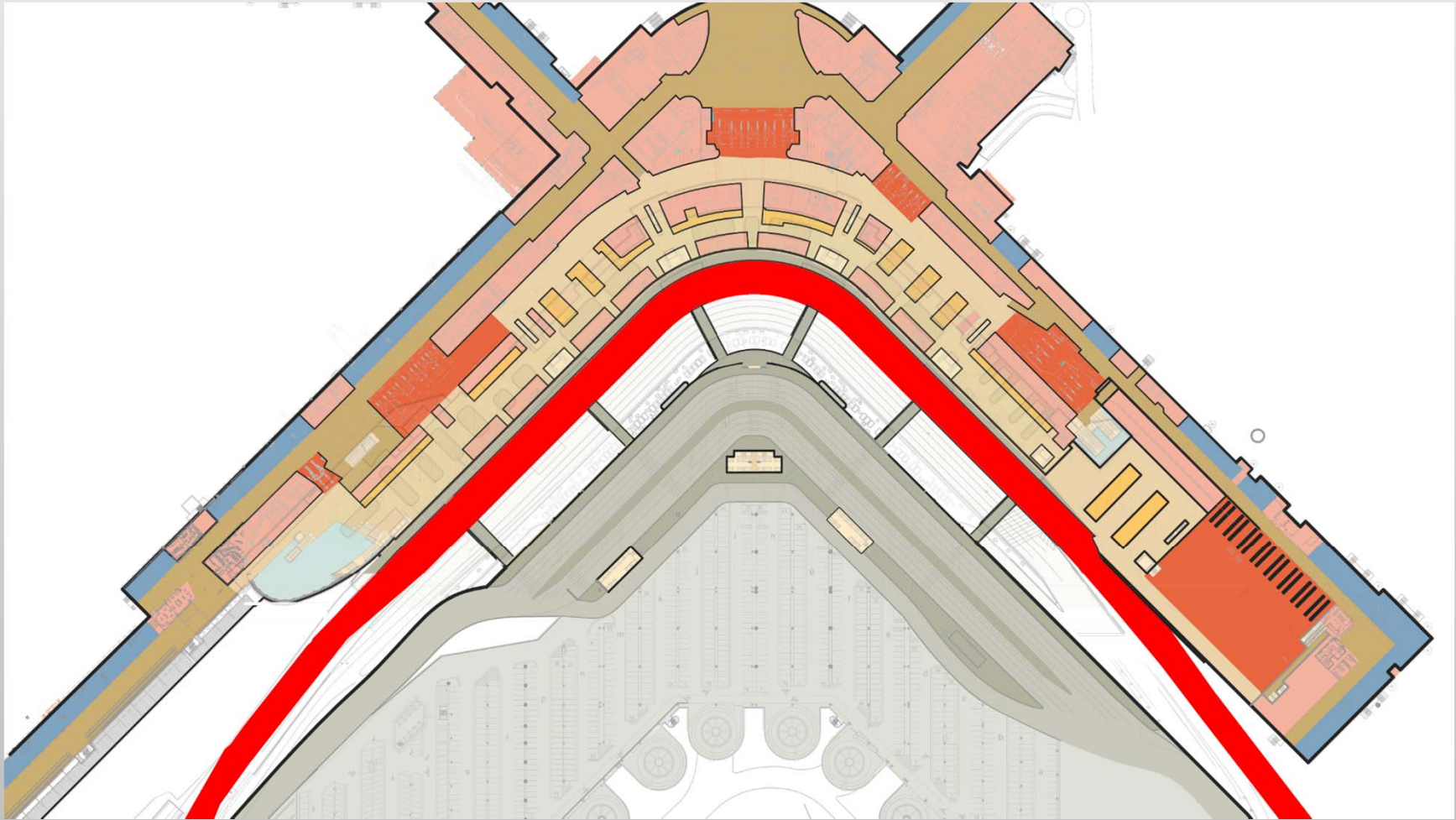
- Garage - demolition & roadway construction



# Evaluation of one and two terminal options

## Project phasing for one terminal option

- Upper drive - demolition

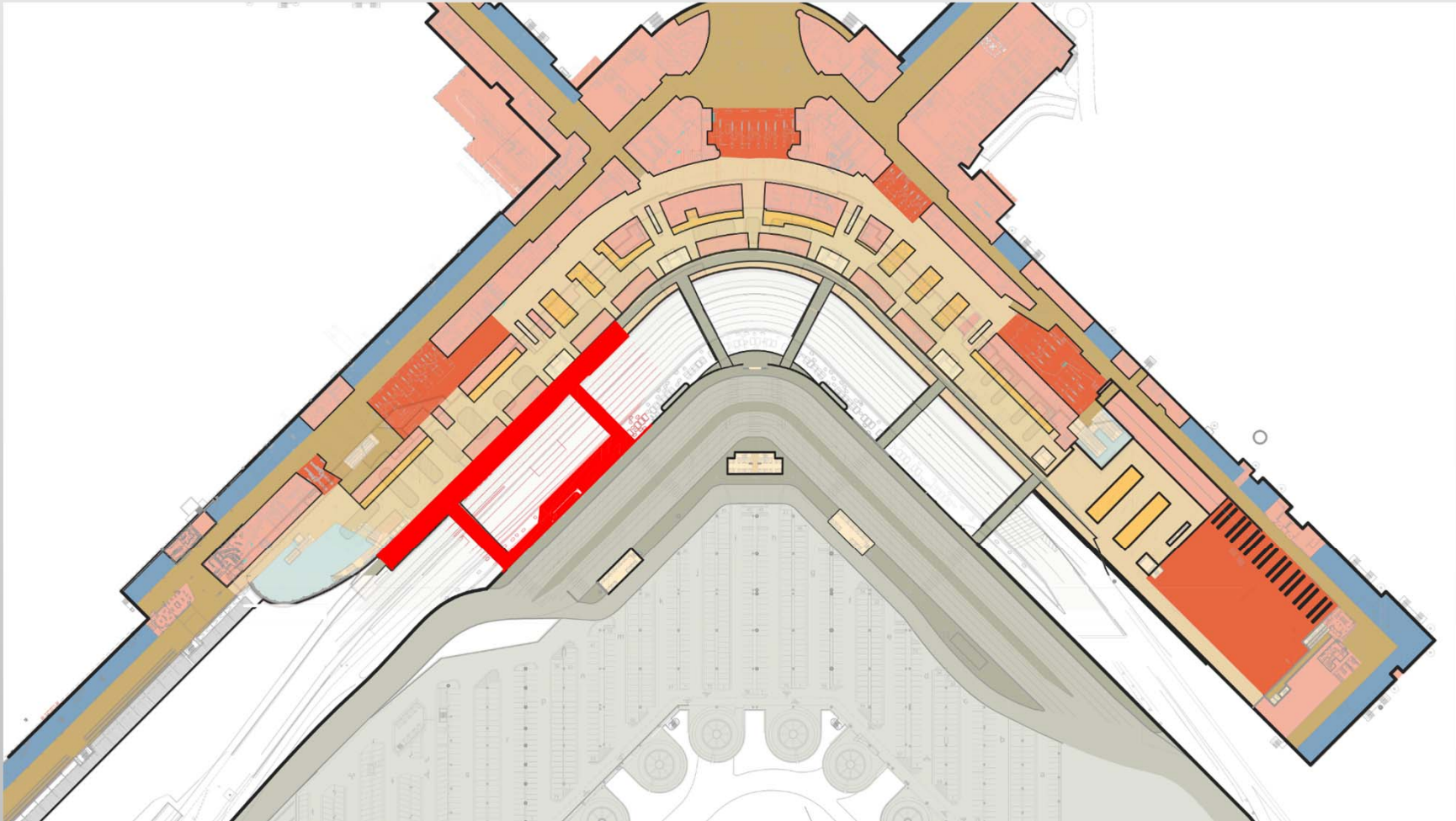




# Evaluation of one and two terminal options

## Project phasing for one terminal option

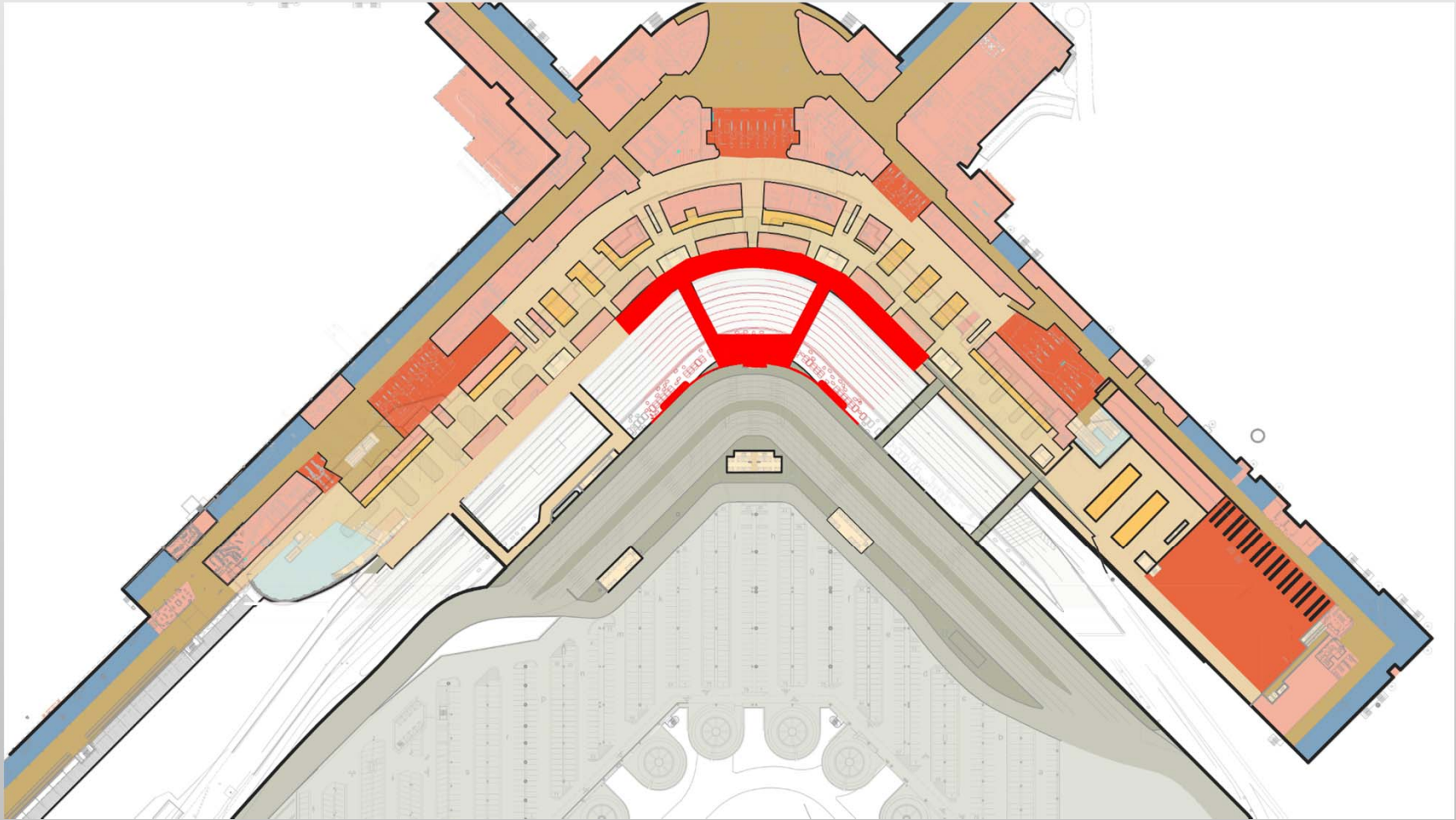
- Pedestrian circulation - renovation



# Evaluation of one and two terminal options

## Project phasing for one terminal option

- Pedestrian circulation - renovation

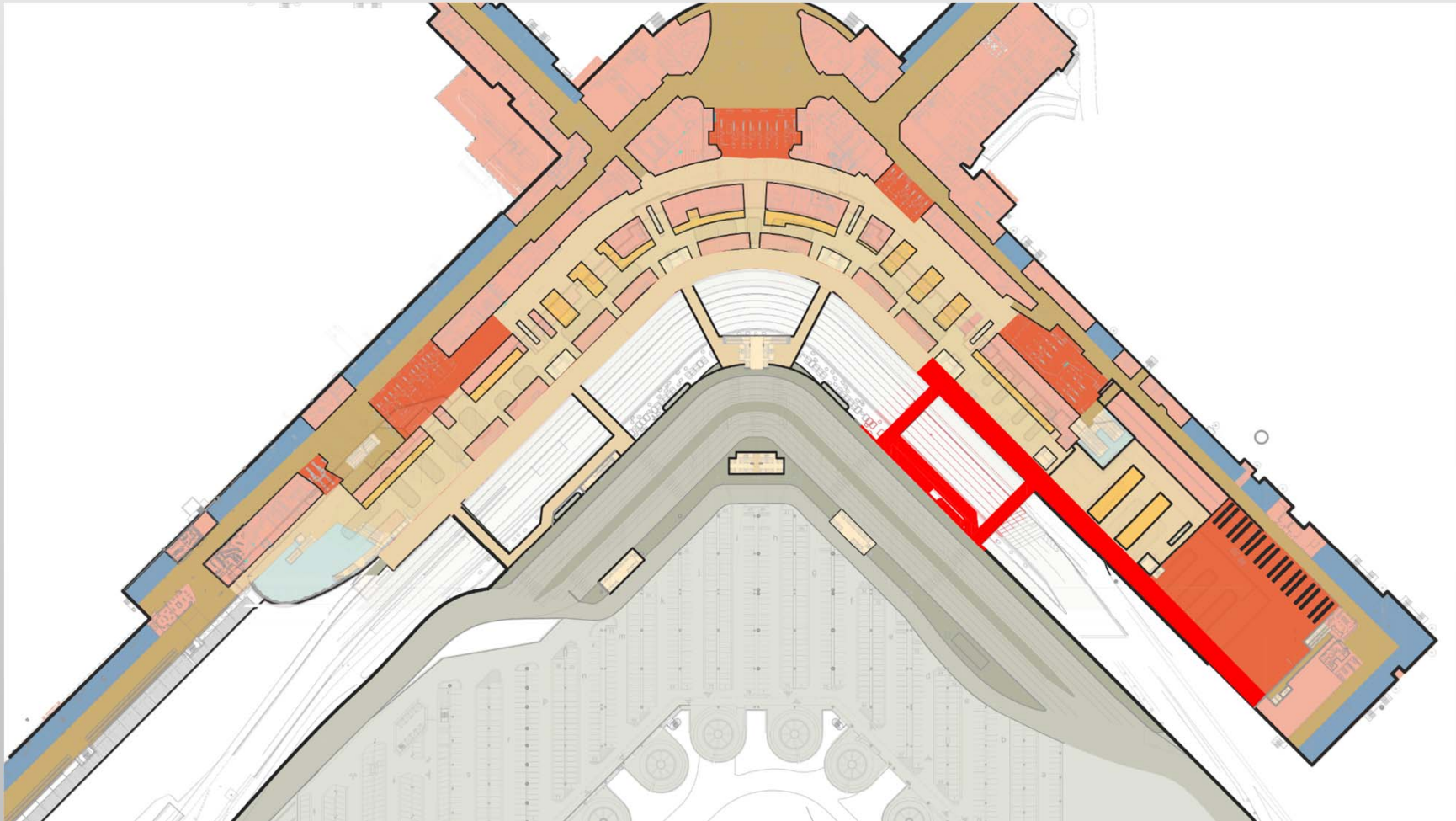




# Evaluation of one and two terminal options

## Project phasing for one terminal option

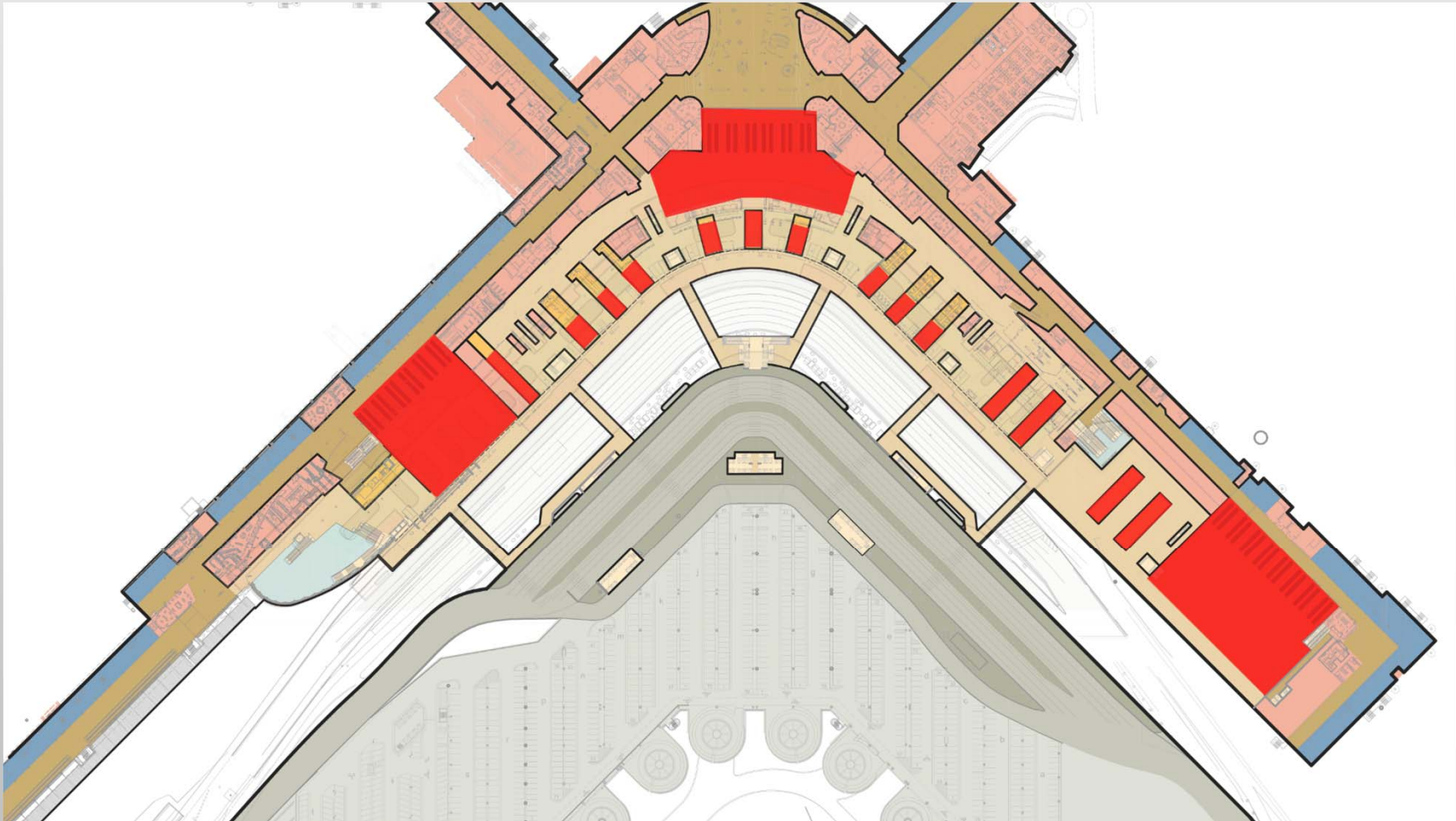
- Pedestrian circulation - renovation



# Evaluation of one and two terminal options

## Project phasing for one terminal option

- Ticketing - renovation





# Evaluation of one and two terminal options

## Project phasing for one terminal option

- Lower drive - reconstruction



# Evaluation of one and two terminal options

## Example of project replacing airport drives

- Atlanta Hartsfield-Jackson International – baggage screening project
  - Phased construction took roadway & curbside out of service
  - Time frame for roadways and curbside being out of service is variable
  - Construction in areas can be limited to provide higher passenger safety

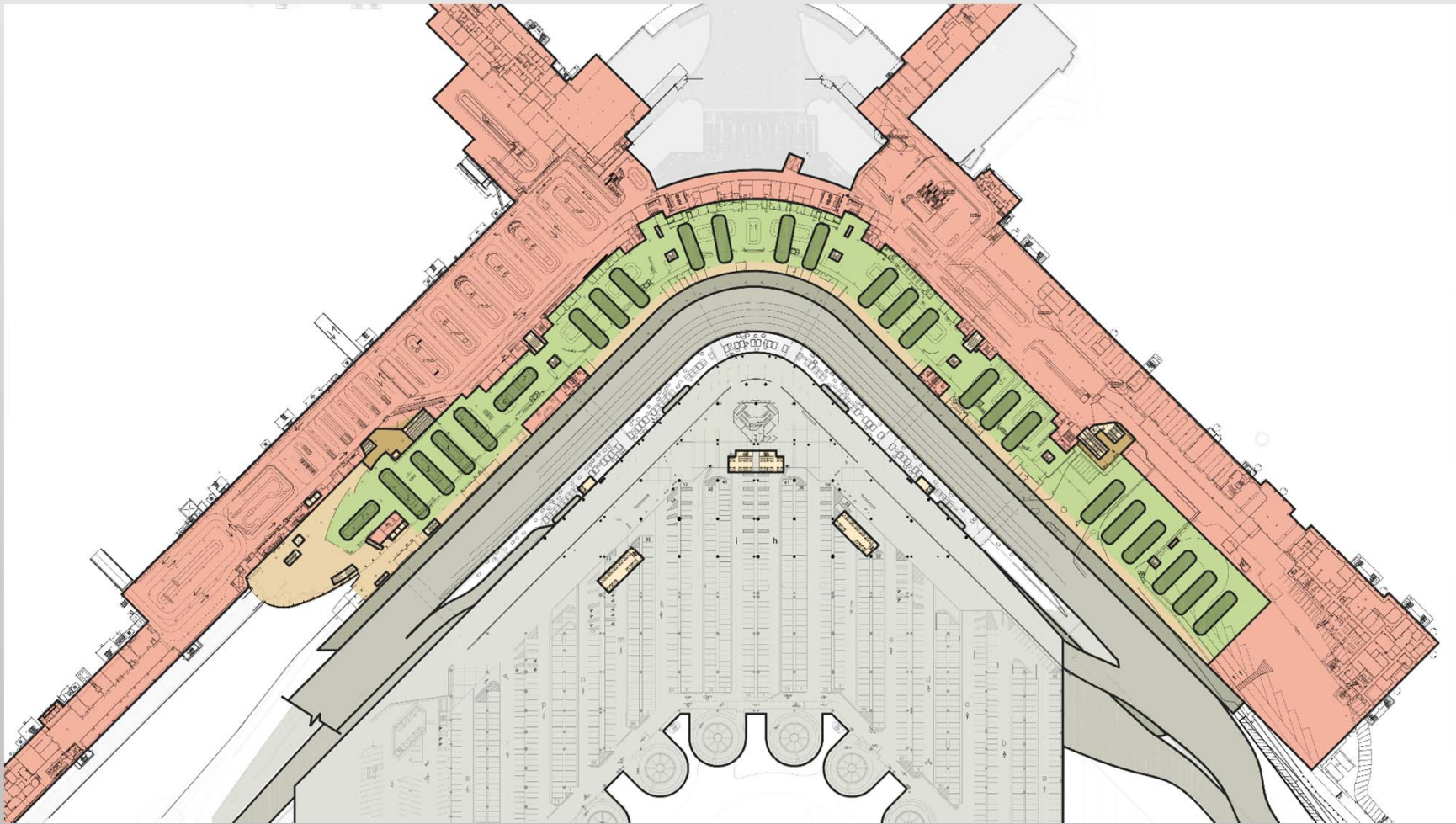




# Evaluation of one and two terminal options

## Project phasing for one terminal option

- Baggage claim - renovation



# Evaluation of one and two terminal options

Cost: *comparison of differentiating terminal and support projects only*

## One terminal

- Capital \$\$\$\$\$\$\$\$\$\$
- Operation & maintenance \$\$

Capital projects include:

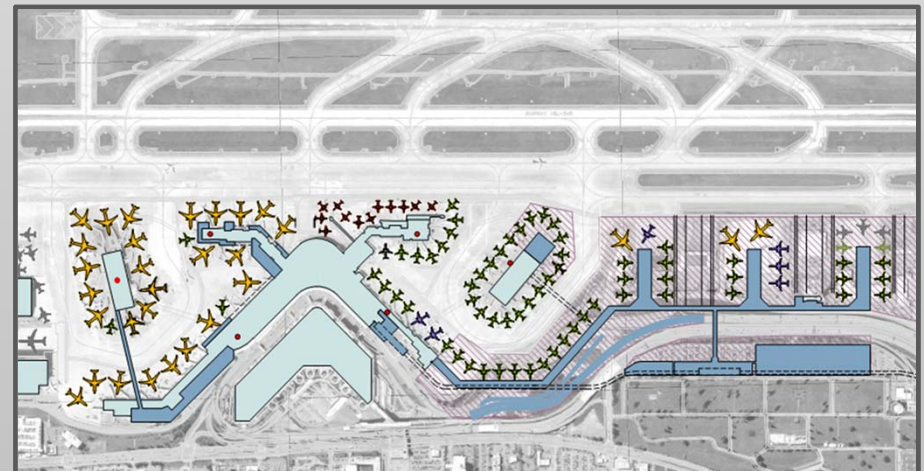
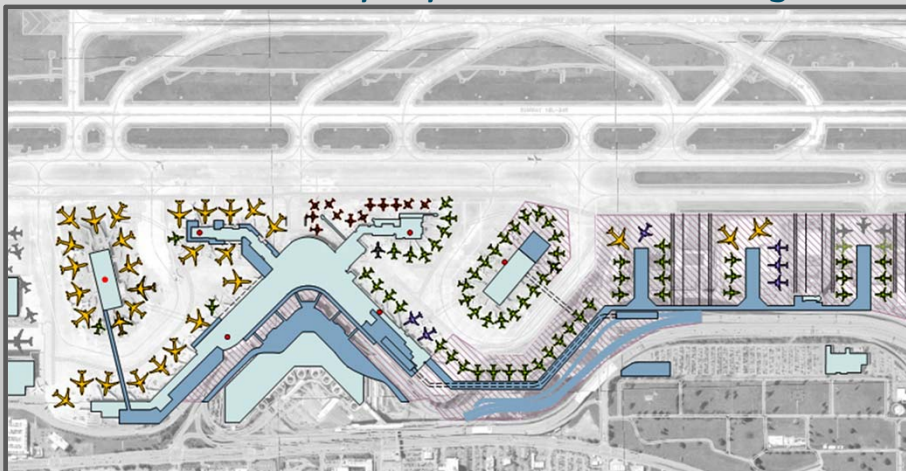
- Expand & renovate existing terminal
- Reconstruct & expand drives
- Automated people mover to north gates

## Two terminals

- Capital \$\$\$\$\$
- Operation & maintenance \$\$

Capital projects include:

- New north terminal & roadway connections
- North terminal to piers baggage & pedestrian connections



One terminal option is more expensive to construct



# Evaluation of one and two terminal options

Risk: *if growth is faster than anticipated*

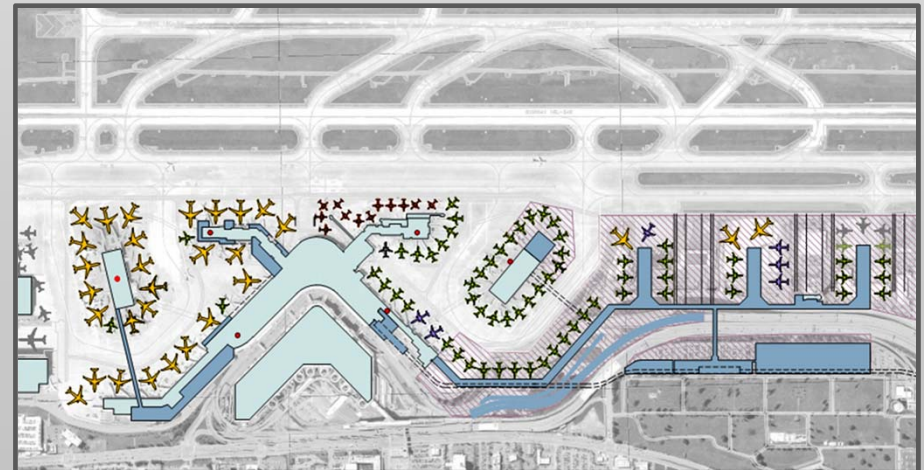
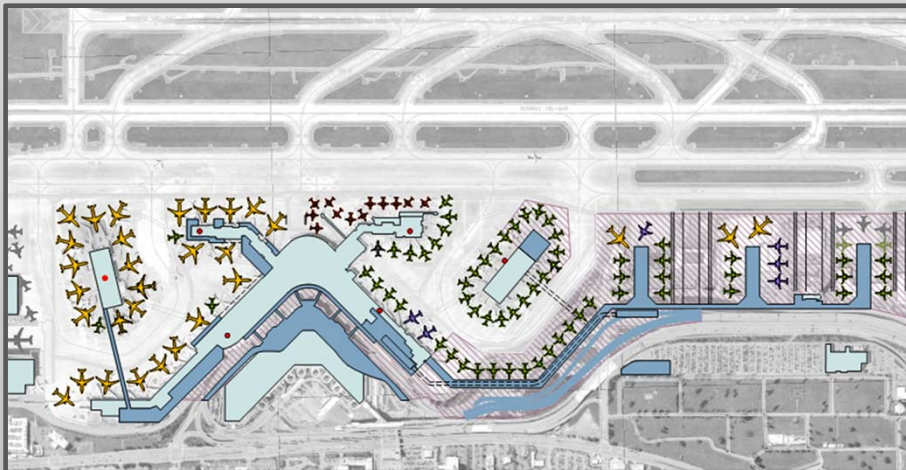
## One terminal

- Multiple phases and lead time to deliver improvements means shortage of capacity for longer period of time
- Larger capacity deficit and lower level of service during construction

## Two terminals

- Shorter lead time to deliver additional capacity
- Construction on greenfield site does not impact capacity and level of service

❖ Slower growth would provide more time to implement projects with potentially less level of service impacts



Two terminal option can deliver additional capacity more quickly

# Evaluation of one and two terminal options

Risk: *if growth is ultimately greater than anticipated*

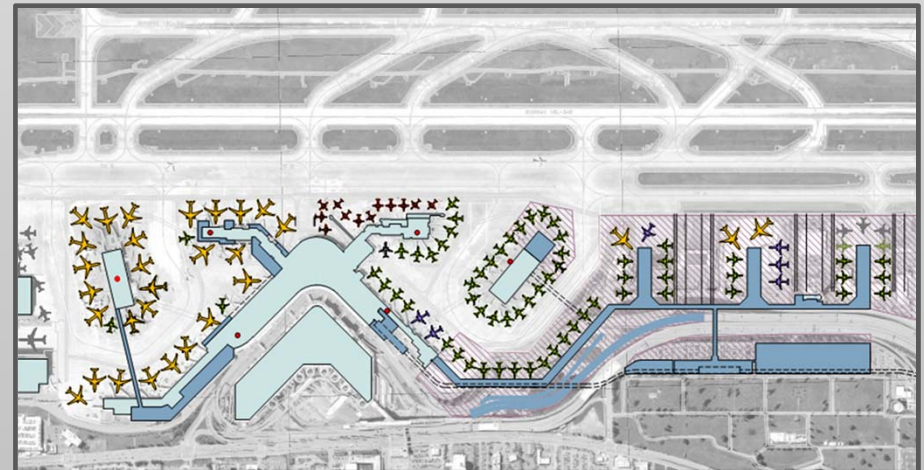
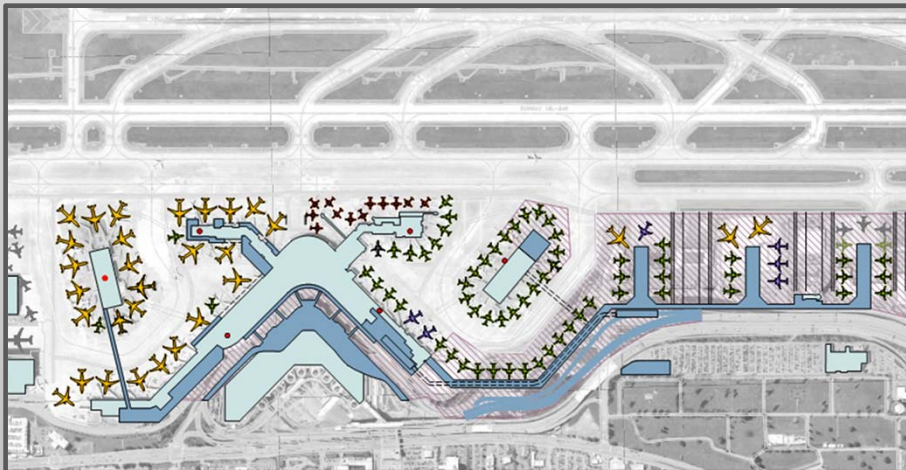
## One terminal

- Challenge of accommodating demand in existing terminal becomes more pronounced
- May lead to development of second terminal

## Two terminals

- Second terminal is already positioned to accommodate more demand
- All elements of single terminal solution still in place, but available on a categorical basis

❖ Less ultimate growth would potentially raise the level of service of the one terminal option



Two terminal option can accommodate a higher level of activity

# Evaluation of one and two terminal options

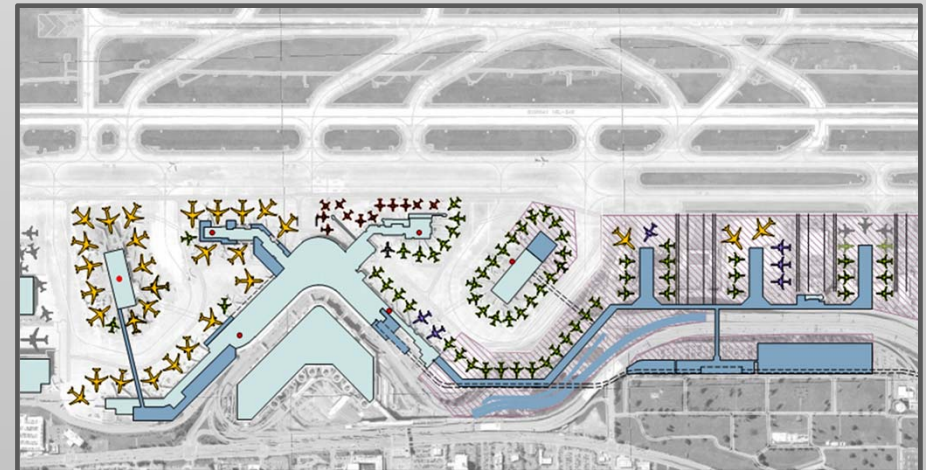
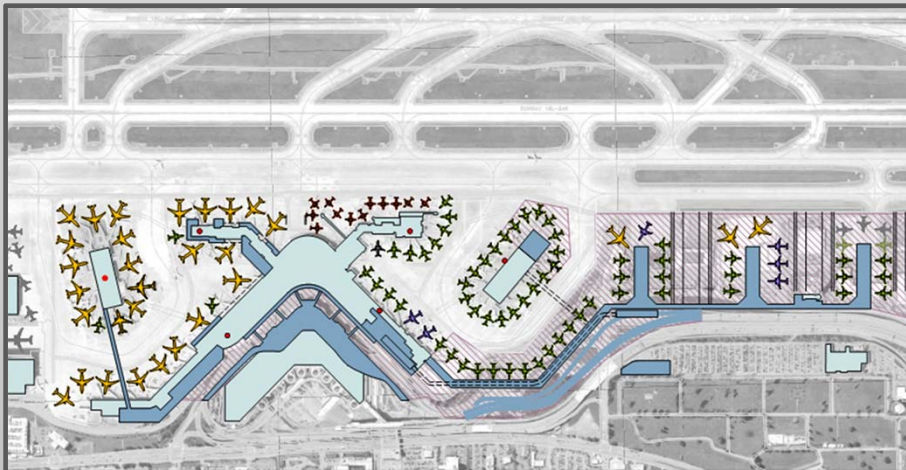
## Flexibility: *operational*

### One terminal

- Passenger activity disproportionately loaded to north end of single terminal
- Creates less desirable situation for carriers on north piers (longer distance from terminal to gates)

### Two terminals

- Better balance of passenger loads north and south between two terminals
- Greater flexibility to assign airlines to north and south gates



Two terminal option provides better balance of passenger loads



# Evaluation of one and two terminal options

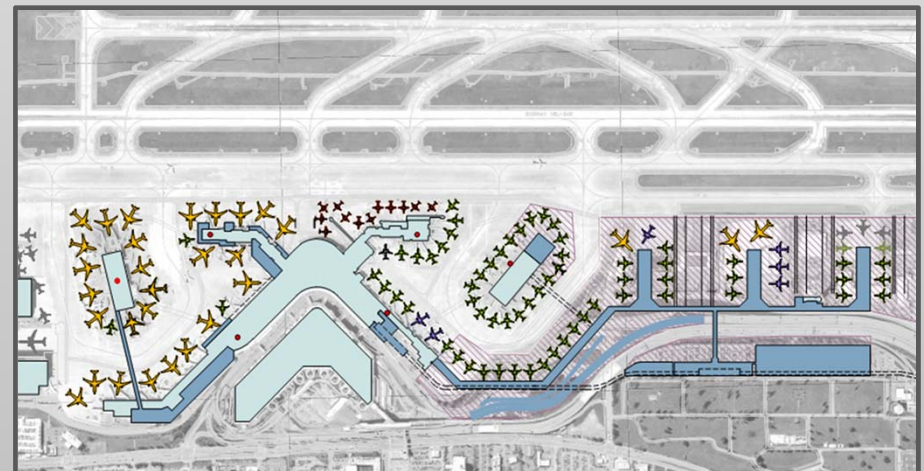
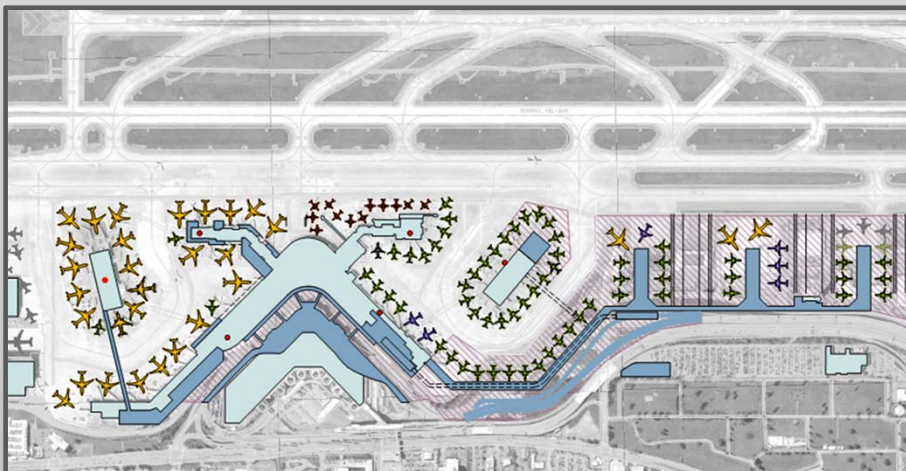
## Flexibility: *facilities*

### One terminal

- Redevelopment/retrofit within constraints of existing terminal results in less efficient facility
- More immediate need to provide APM connection to RCF

### Two terminals

- Purpose built second terminal provides better performing systems (baggage, passenger processing...) and greater opportunity for green building
- Greatly reduces/delays need for APM to replace RCF buses (relieves congestion in front of terminal)



2<sup>nd</sup> terminal provides opportunity for more efficient systems

# Evaluation of one and two terminal options

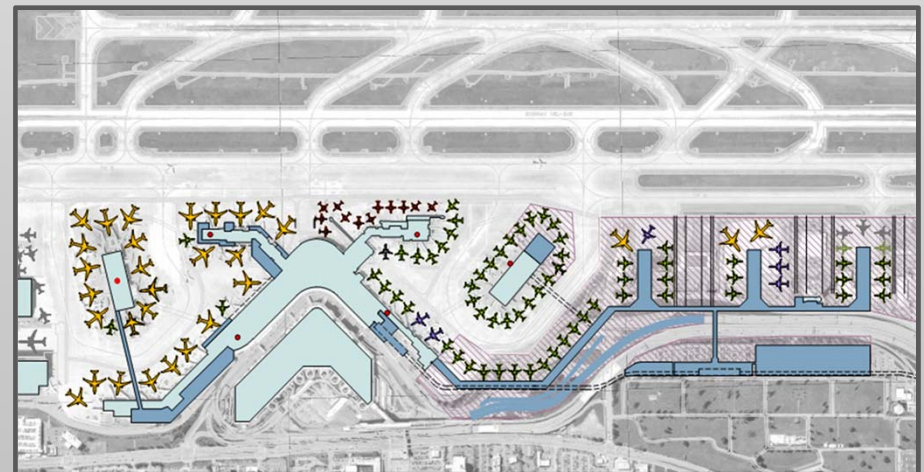
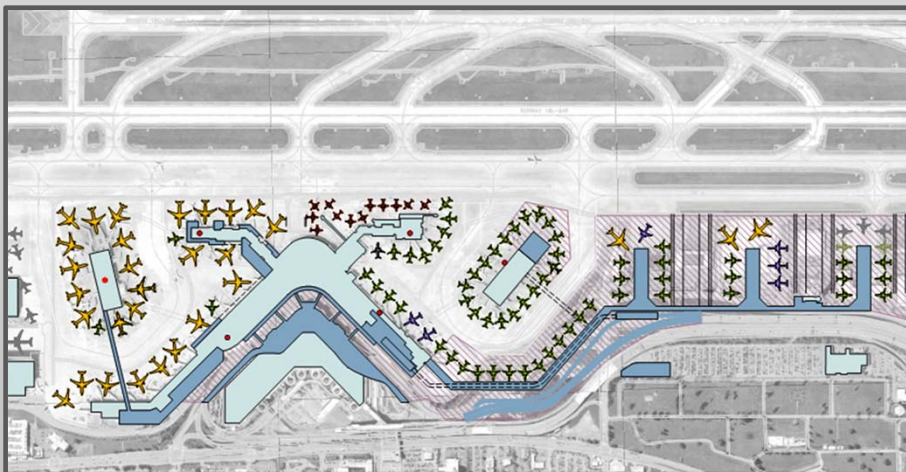
## Development: *phasing & constructability*

### One terminal

- Limited areas to expand existing terminal to provide additional capacity
- Long lead time and disruptive string of projects to expand terminal east
- More detailed investigation required to fully understand extent of retrofit

### Two terminals

- Adequate space to provide needed capacity, efficient systems and high level of service
- Greenfield site means quicker project delivery with minimal operational impacts



One terminal option difficult to phase in operational environment



# Evaluation of one and two terminal options

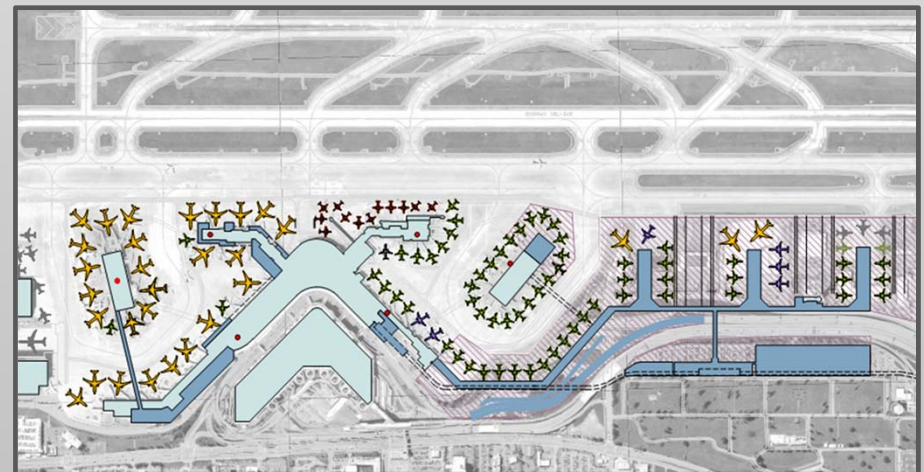
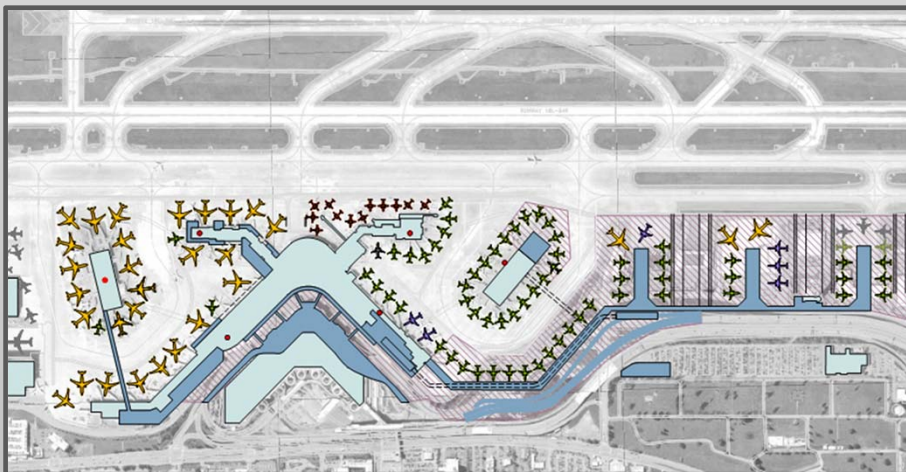
Level of service: *during & post construction*

## One terminal

- Project phasing to expand terminal east results in long period of disruptive construction
- Long distance to northern most gates
- Heavy vehicle and passenger congestion at north end of terminal

## Two terminals

- Terminal construction on greenfield site creates very little impact
- Direct connection to north piers from second terminal
- Vehicle and passenger loads balanced between two terminals



Two terminal option relieves congestion at Main Terminal

# Evaluation of one and two terminal options

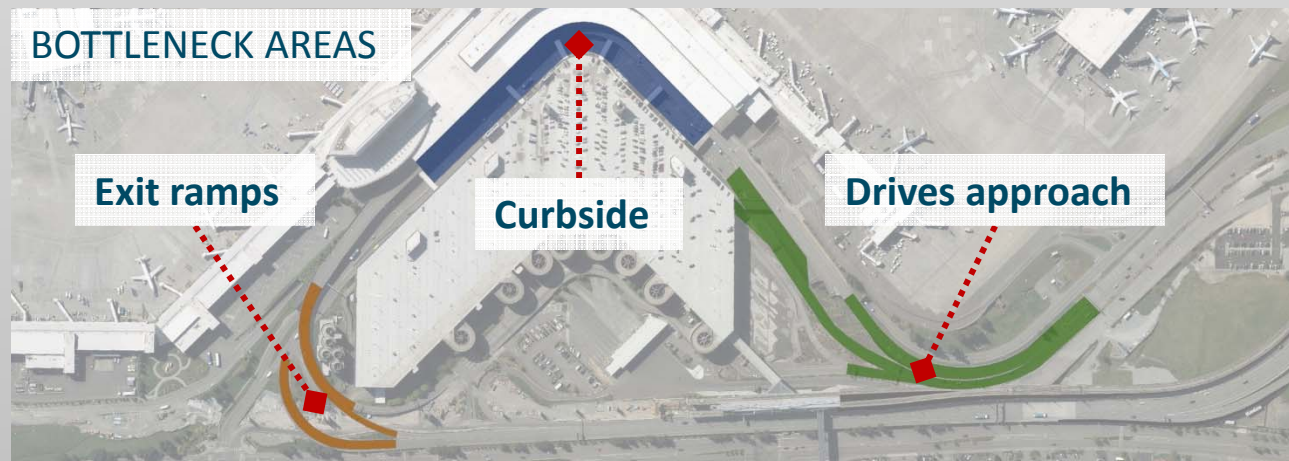
## Further study of one terminal option

- Potential for process & technology improvements to avoid or delay the need for 2<sup>nd</sup> terminal
  - Bag claim
  - Check-in
  - Security checkpoints
  - Passenger circulation
- Landside modeling to determine what improvements would be required/recommended if terminal expansion to the east can be avoided
  - Roadways
  - Curbs
  - Commercial ground transportation

# Mid-term landside strategy

## Overview

- Problem:
  - Existing terminal roadways and curb will need to accommodate increased demand in near- to mid-term
  - Three bottleneck areas may all need to be addressed or congestion will persist and Level of Service (LOS) will rapidly diminish further
- Goal:
  - Leverage operational strategies before phasing in capital projects
  - Minimize throwaway and maximize flexibility through relatively low cost capital projects that are no regrets under one or two terminal solutions



Combination of operational and relatively low cost solutions identified



## Mid-term landside strategy

### Curbside: *Key factors related to curbside congestion*

- Motorist behavior
  - Dwell times at SEA exceed industry norms
  - Reluctance to use inner lane
- High demand (*i.e. volume of vehicles loading/unloading*)
- Insufficient capacity
  - Insufficient curb length
  - Insufficient through / maneuvering lanes

Congestion on curbs caused by combination of factors

## Mid-term landside strategy

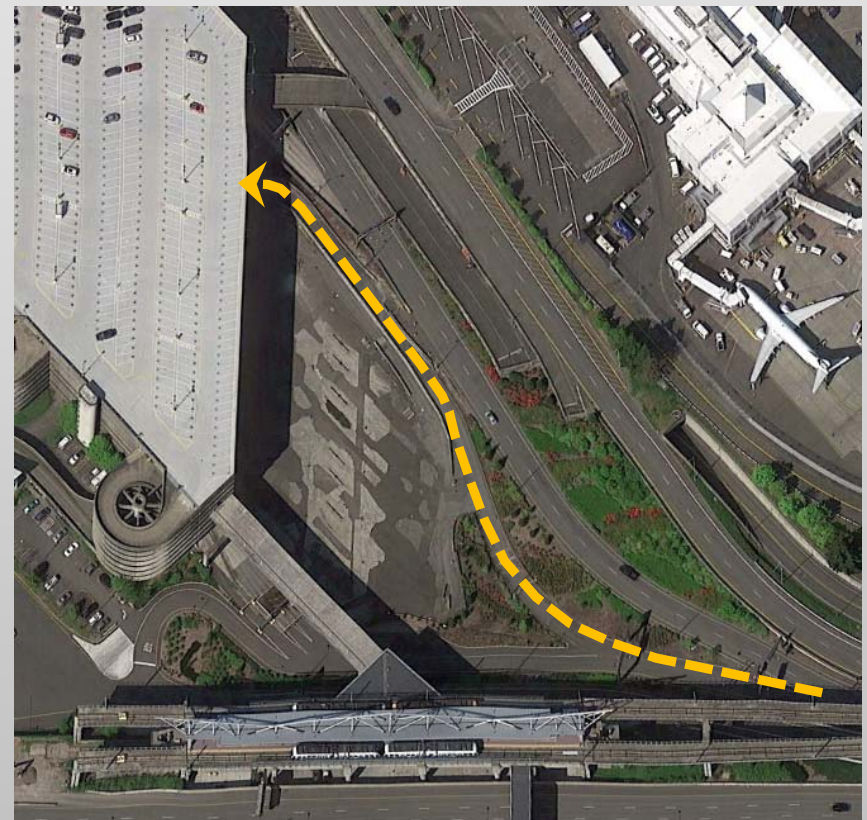
### Curbside: *Potential operational improvements / strategies*

- Dwell time enforcement
  - Active, consistent, visible enforcement of curbside rules
  - Use enforcement staff to assist drivers in entering and exiting inner-most lane
- Divert demand to alternate drive (*Upper or Lower depending on peak*)
  - Provide advance warning of curbside congestion (*i.e. continue using 160th Street bridge variable sign*)
  - Social media advisories, website notices
  - Signs in baggage claim suggesting use of alternate drive (*e.g. “Avoid being stuck in traffic. Consider using the Upper Drive the next time you pick-up passengers.”*)

## Mid-term landside strategy

### Curbside: *Potential improvements / strategies*

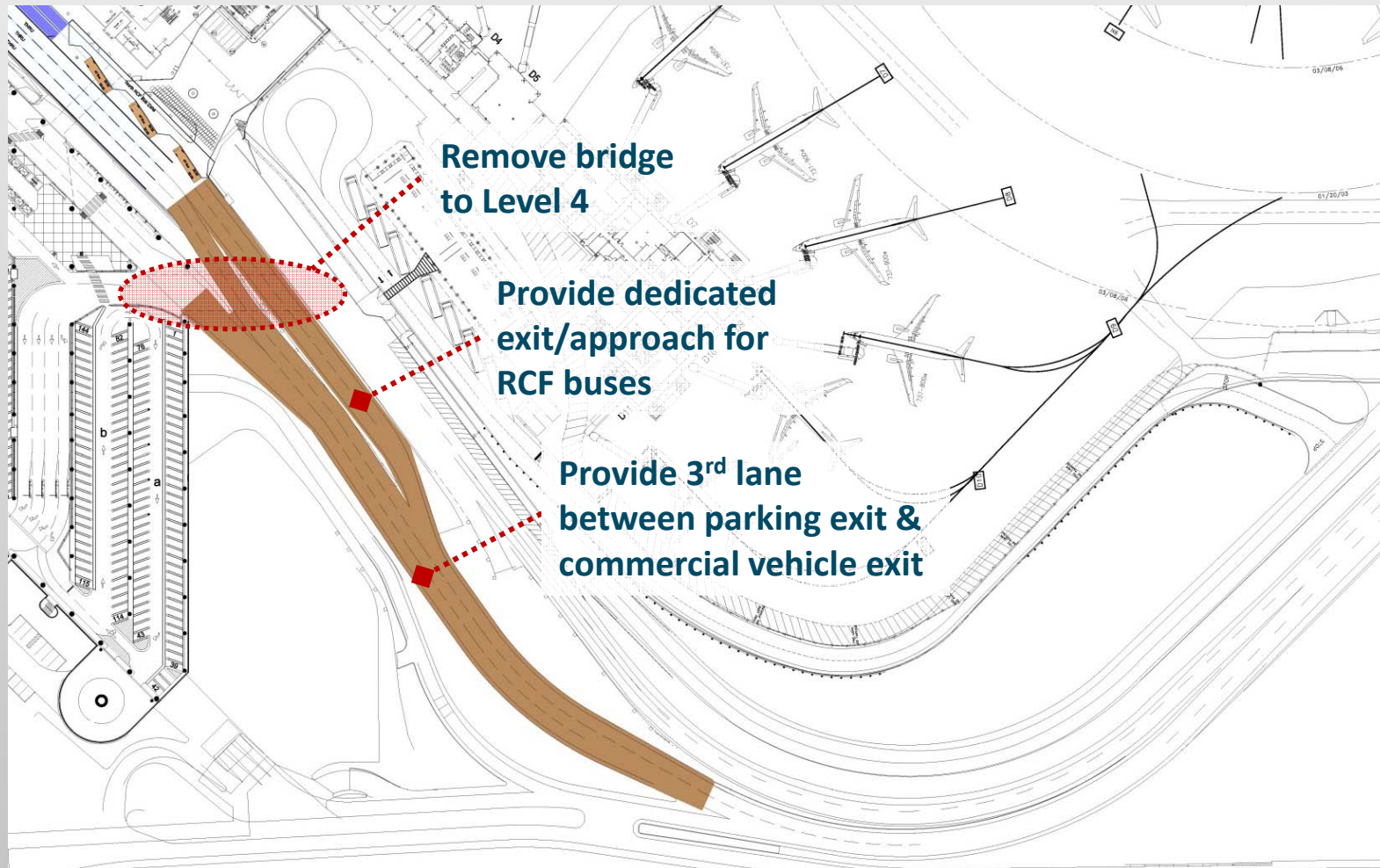
- Divert demand to Main Garage
  - Use existing ramp from Lower Drive approach to access 2<sup>nd</sup> floor
    - Outside of existing revenue controls allows for variable pricing
  - Create attractive, ‘nested’ parking area close to elevators
  - Limit parking duration to ensure high turnover and reliability (*i.e., 2 hours*)



Create attractive, reliable parking to divert demand to garage

# Mid-term landside strategy

## Drives approach: *Potential improvements*

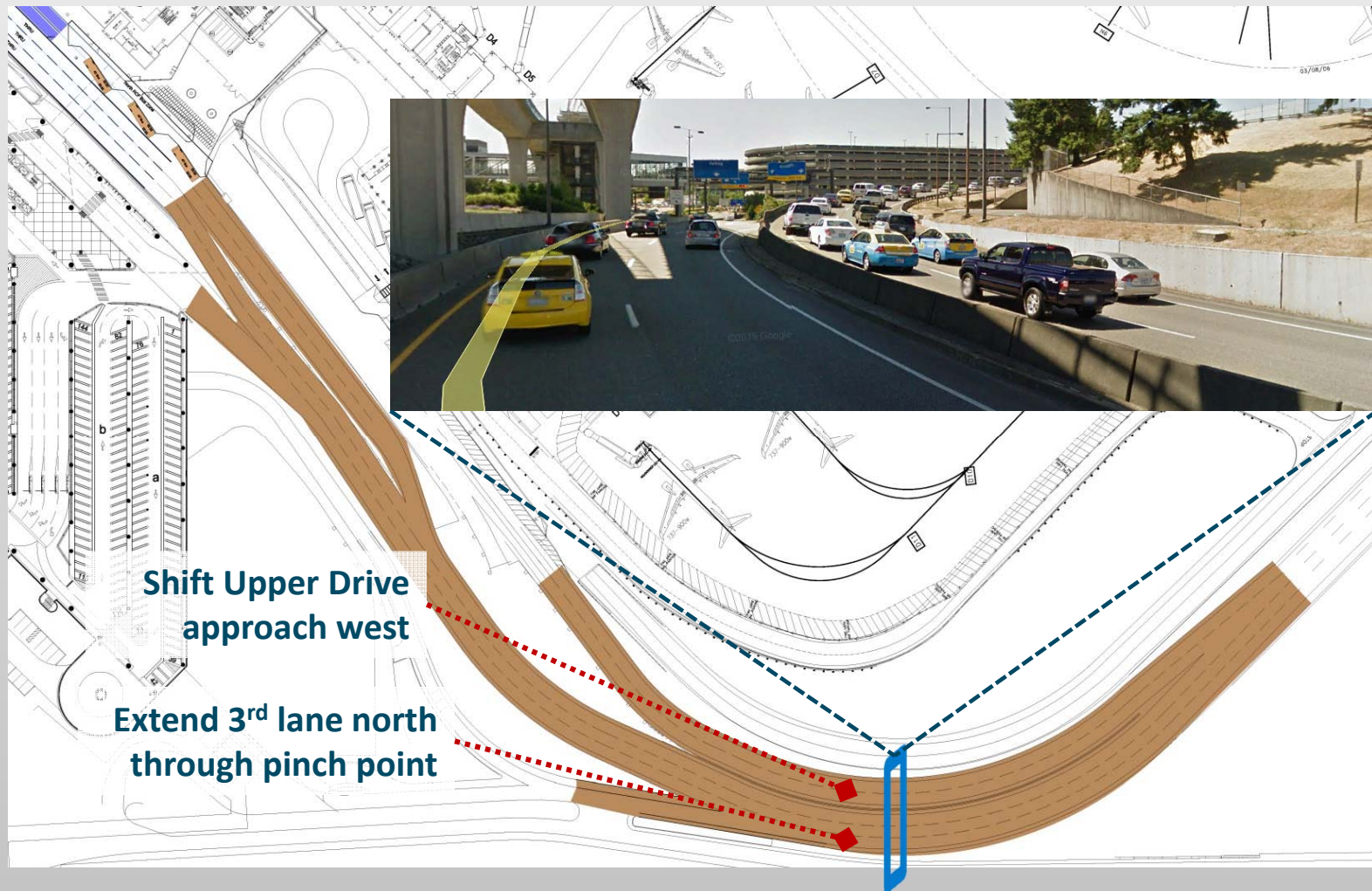


Relatively low cost capital improvements to increase LOS



# Mid-term landside strategy

## Drives approach: *Potential improvements*

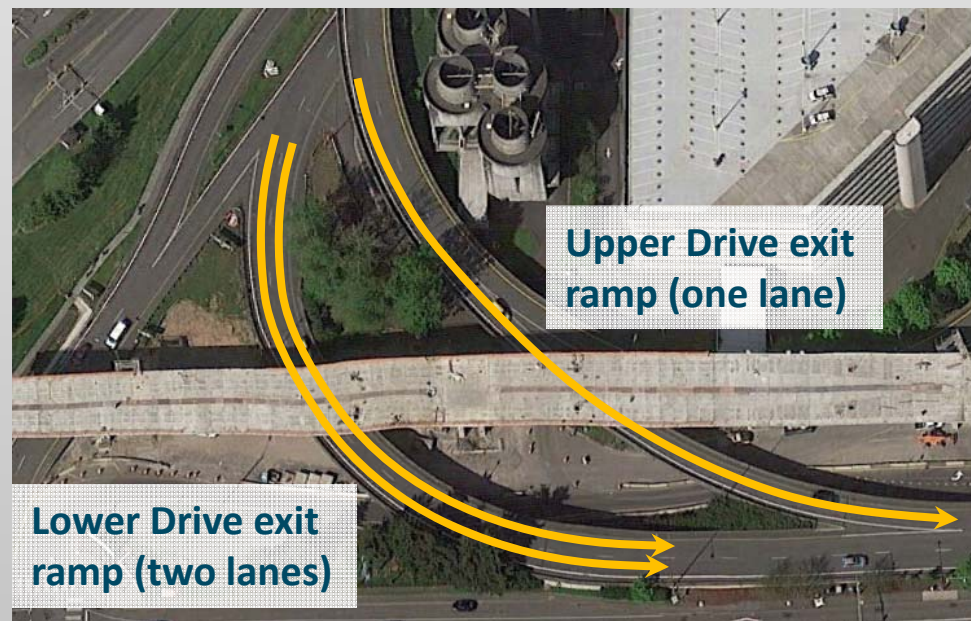


Relatively low cost capital improvements to increase LOS

## Mid-term landside strategy

### Exit ramps: *Potential improvements*

- Upper Drive exit ramp with only one lane may present persistent bottleneck that will need to be addressed in the mid-term
- Adding lanes to either exit ramp would require reconstruction of elevated structures



Upper Drive exit ramp may need to be widened to two lanes

# Economic Development

- Airport growth provides economic development opportunities
- SAMP helps define airport operation needs for off-airport properties
- Thus far we have hosted business roundtable meetings with each airport city:
  - Gives businesses and civic leadership chance to provide input towards economic development initiatives and aspirations
  - Specific plans and strategies can be coordinated with SAMP
  - Development can occur even when not specific to SAMP

# Real Estate Development Opportunities

- Airport-area real estate development and business incubator projects happening now
  - Des Moines Creek Business Park
  - NERA properties in Burien, both Port and City-owned
  - Other airport properties in Seatac
  - business incubator opportunities on Port-owned properties in SeaTac

Airport properties can support middle class job creation



# SAMP & Economic Development

- Master plan effort provides opportunity to incorporate Port and partner City economic development aspirations:
  - Tourism
  - Downtown Development
  - Small Business Development
  - Business Recruitment
  - Real Estate Development

SAMP = Economic Development Opportunity

# Public Outreach

## Engaging the General Public

- Community open houses
  - Identical meeting and materials in three locations: airport-area, Seattle, Eastside
    - 1st Series: SAMP process, goals, forecast (March 2015)
    - 2nd Series: Major Plan Elements (February 2016)
    - 3rd Series: Preferred Development Alternative (Q3 2016)
- King County survey Q1 2016
- Formal Environmental Review begins mid-2016

# Public Outreach

## Reaching Targeted Audiences

- Forums and focus groups to reach specialized audiences
  - Local & regional planners
  - Stakeholders in economic and environmental sustainability, social responsibility
  - Airport-area business roundtables
- Commission-hosted roundtable discussions
- Regional and local community groups and associations
- Federal, state, regional & local government briefings
- Ongoing engagement with tenants, operators, FAA, & TSA

Engaging all stakeholder interests

# Public Outreach

## Complete or in Process

- ✓ Round One Open Houses (Des Moines, Seattle, Bellevue)
- ✓ Air Mail newsletter (ongoing)
- ✓ Interjurisdictional Transportation Advisory Group
- ✓ Airport Communities Business and Economic Development Roundtables
- ✓ Environmental community outreach
- ✓ SAMP brochure
- ✓ Social Justice outreach
- ✓ County-wide research

## Upcoming

- Round Two Open Houses (SeaTac, Seattle, Bellevue)
- Translated documents
- Economic development follow-up
- Website update
- Video
- Social media emphasis
- Media outreach
- Focus groups
- SAMP notebook for Commissioners
- Environmental Review process
- Round Three Open Houses (Burien, Seattle, Eastside)



## Next steps

- Airfield
  - Continue assessing impacts of runway/taxiway separation
  - Assess constructability and estimate cost of south end-around taxiway
- Gates
  - Refine gate layouts & phasing plan
- Terminal
  - Continued analysis of one vs two terminal concepts
- Landside
  - On going capacity analysis through modeling
  - Develop roadway layouts and assess challenges
  - Support Airport Operations to further develop mid-term strategy and spin-off projects
- Support facilities
  - Incorporate support facilities into overall development plan
  - Determine land uses for South Aviation Support Area & timing of development
- Continued robust community engagement

