American Association of Port Authorities

MARINE TERMINAL MANAGEMENT TRAINING PROGRAM

TRENDS IN THE DESIGN AND OPERATION OF CRUISE TERMINALS

September 2015

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Bermello, Ajamil & Partners


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Design and operation process

1.0 Determine the market you serve and the growth

2.0 Establish facility demand

3.0 Determine your design vessel

4.0 Establish economic targets

5.0 Development strategy

6.0 Set performance standards

7.0 Terminal design

8.0 Transport design

9.0 Marine design

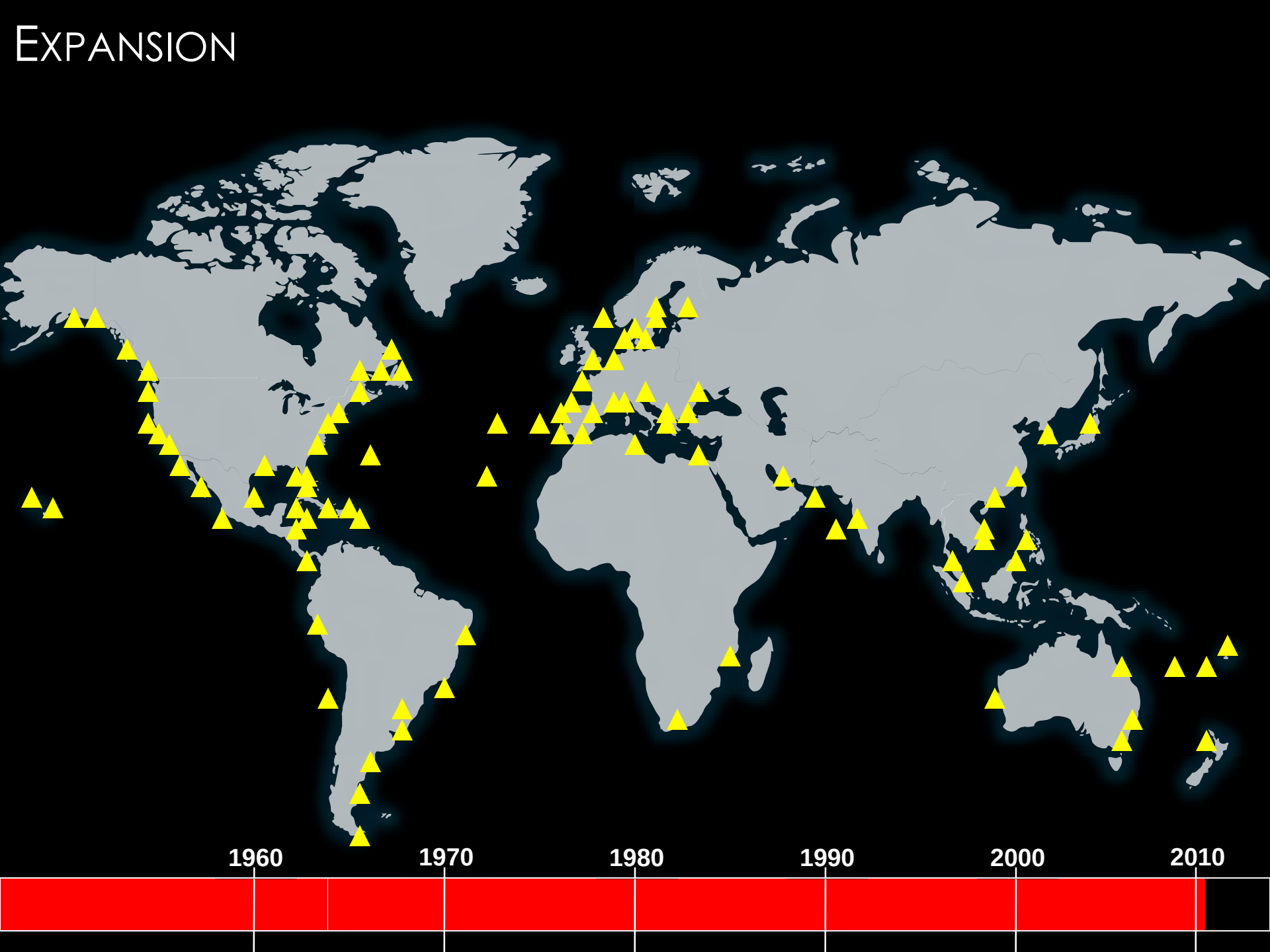
10.0 Waterfront integration

11.0 Operational options

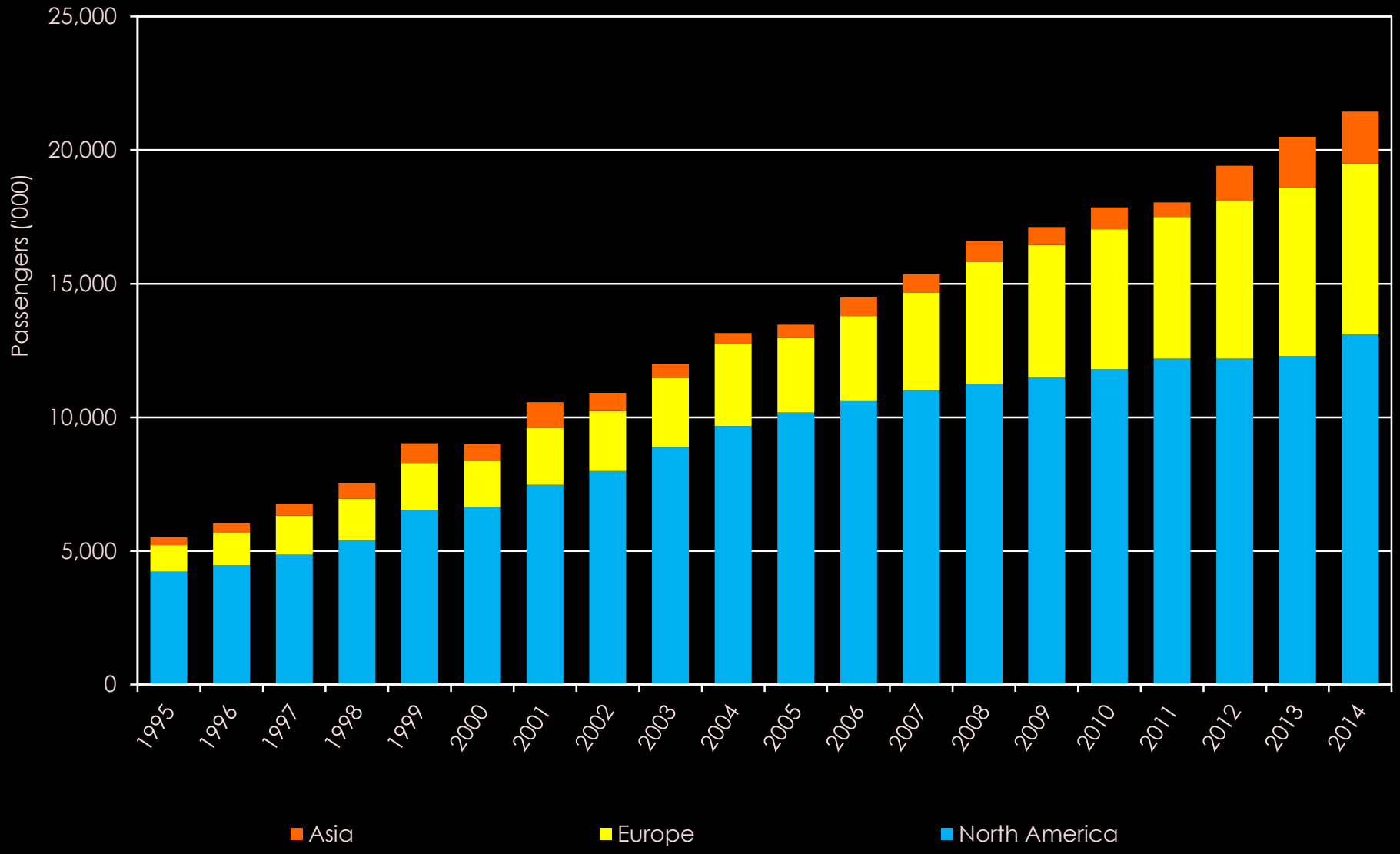
Potential

1

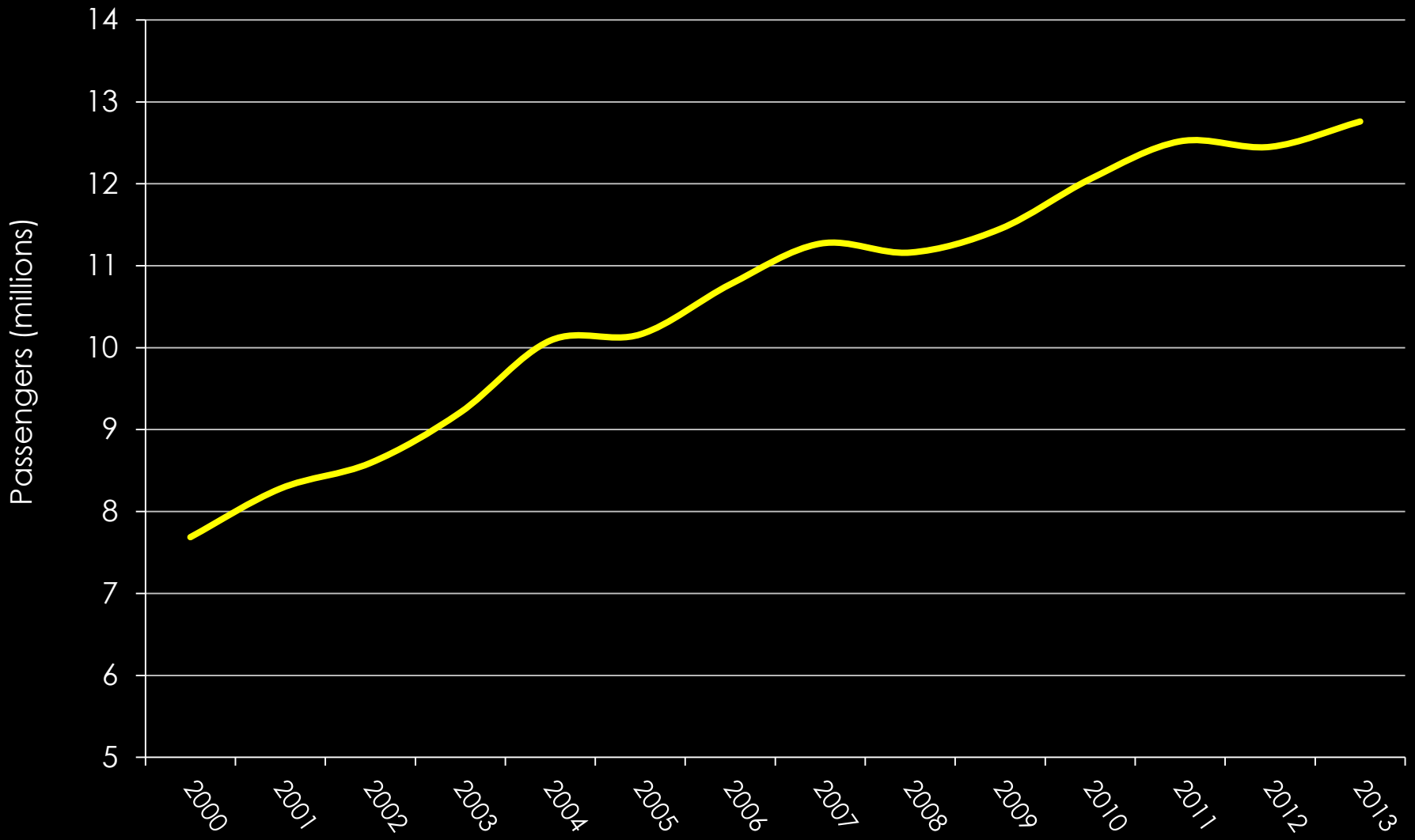
Expansion



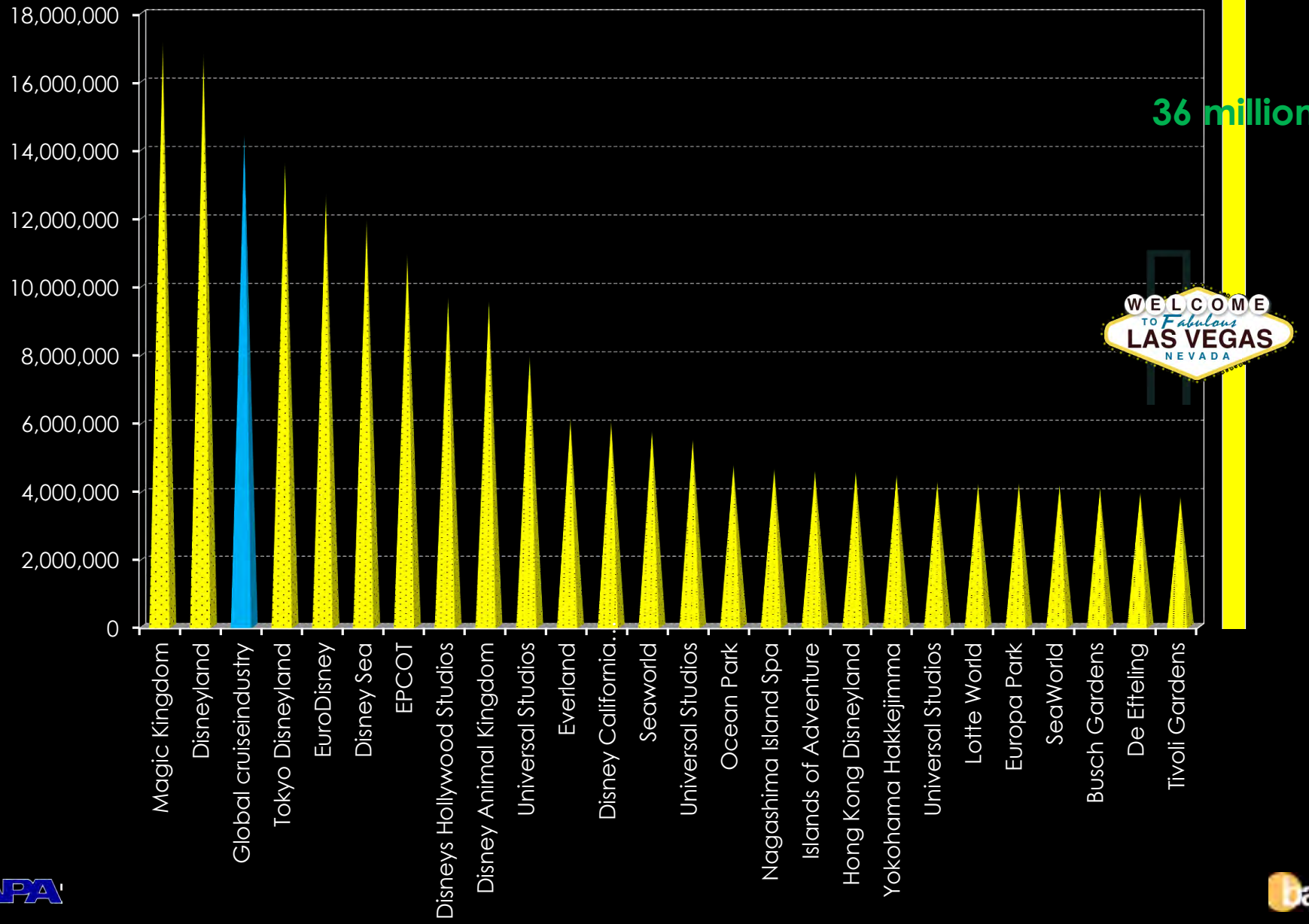
Cruise passenger growth



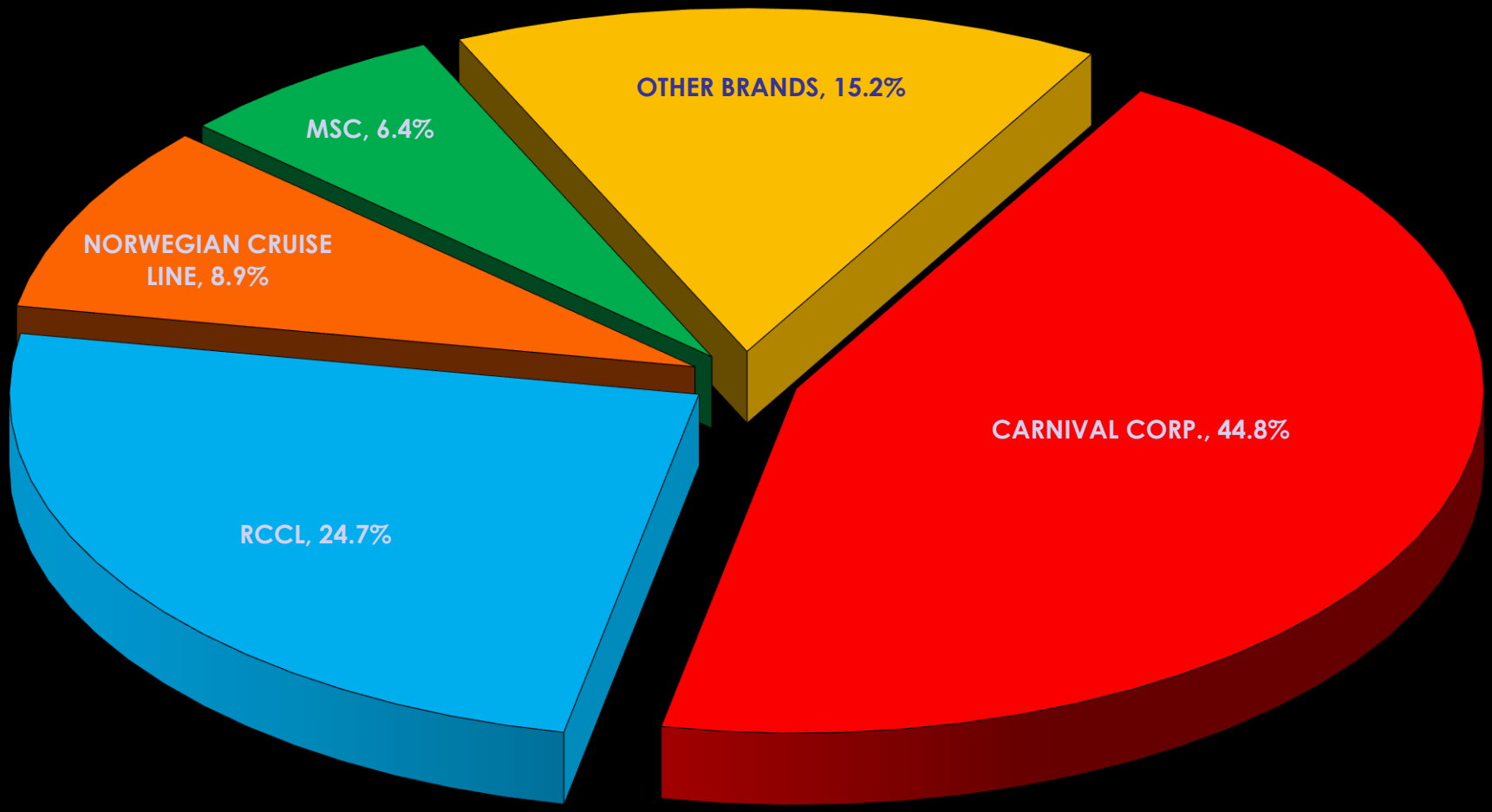
North America cruise traffic



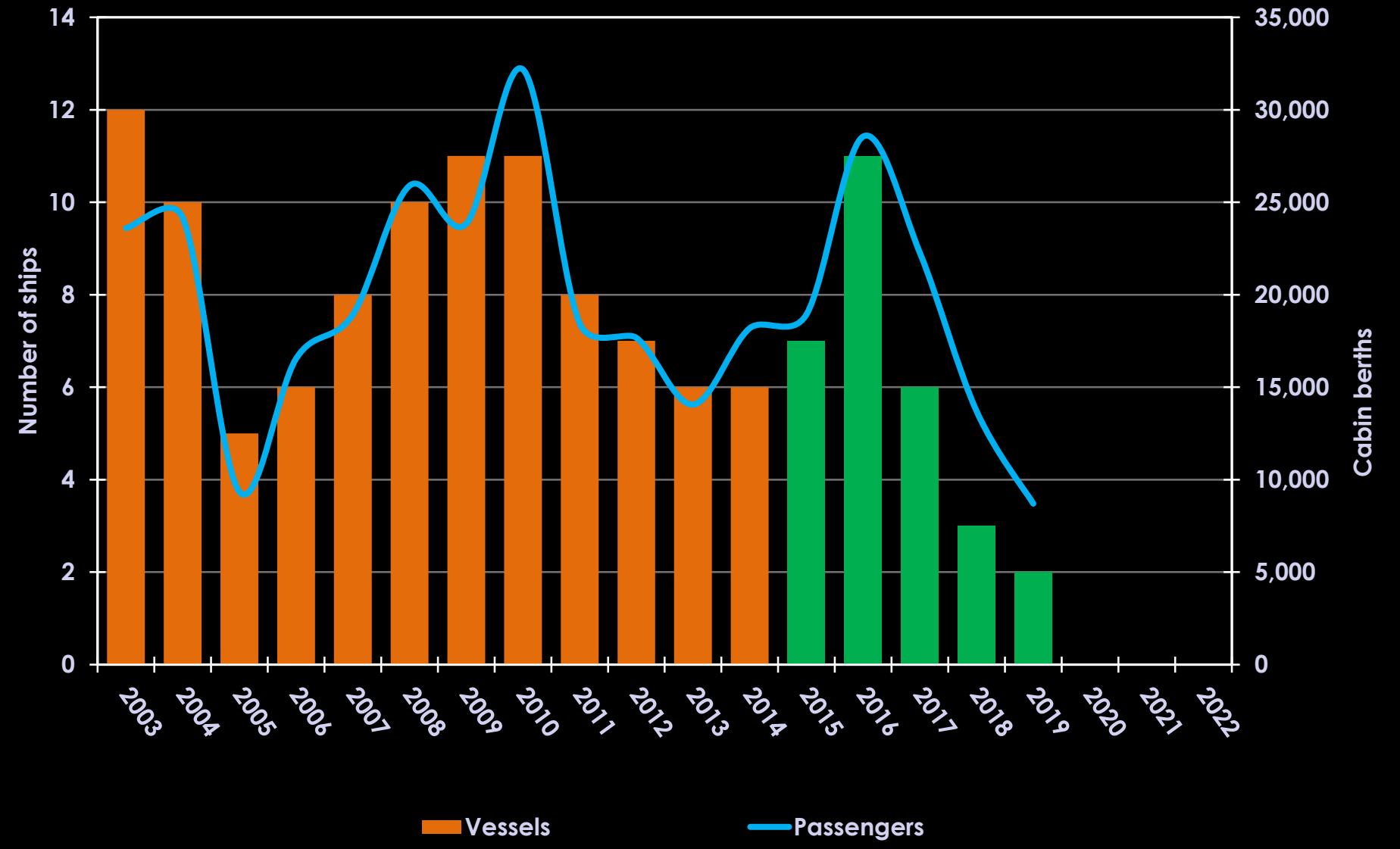
TOP 25 WORLDWIDE ATTRACTIONS



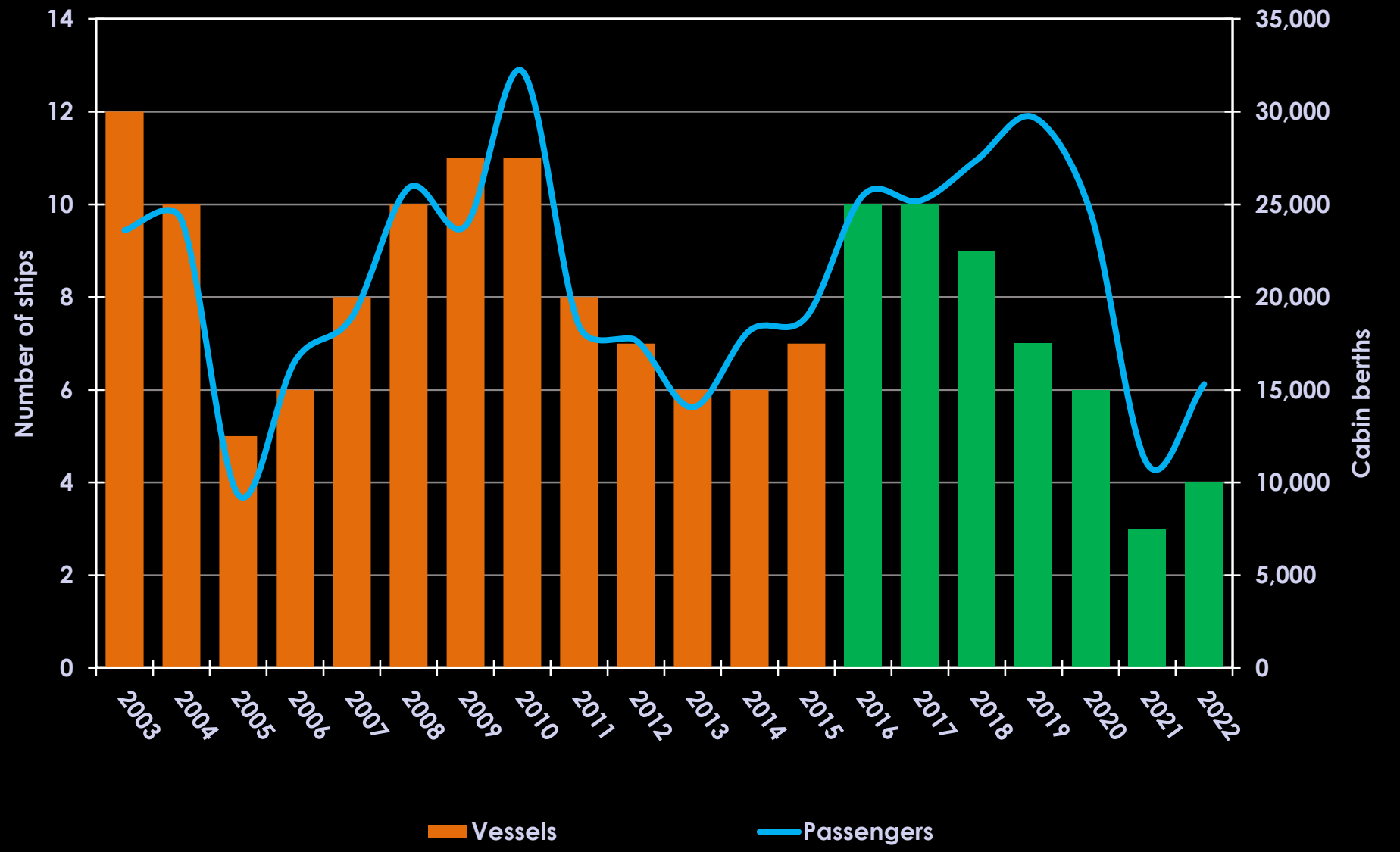
CRUISE INDUSTRY COMPANIES



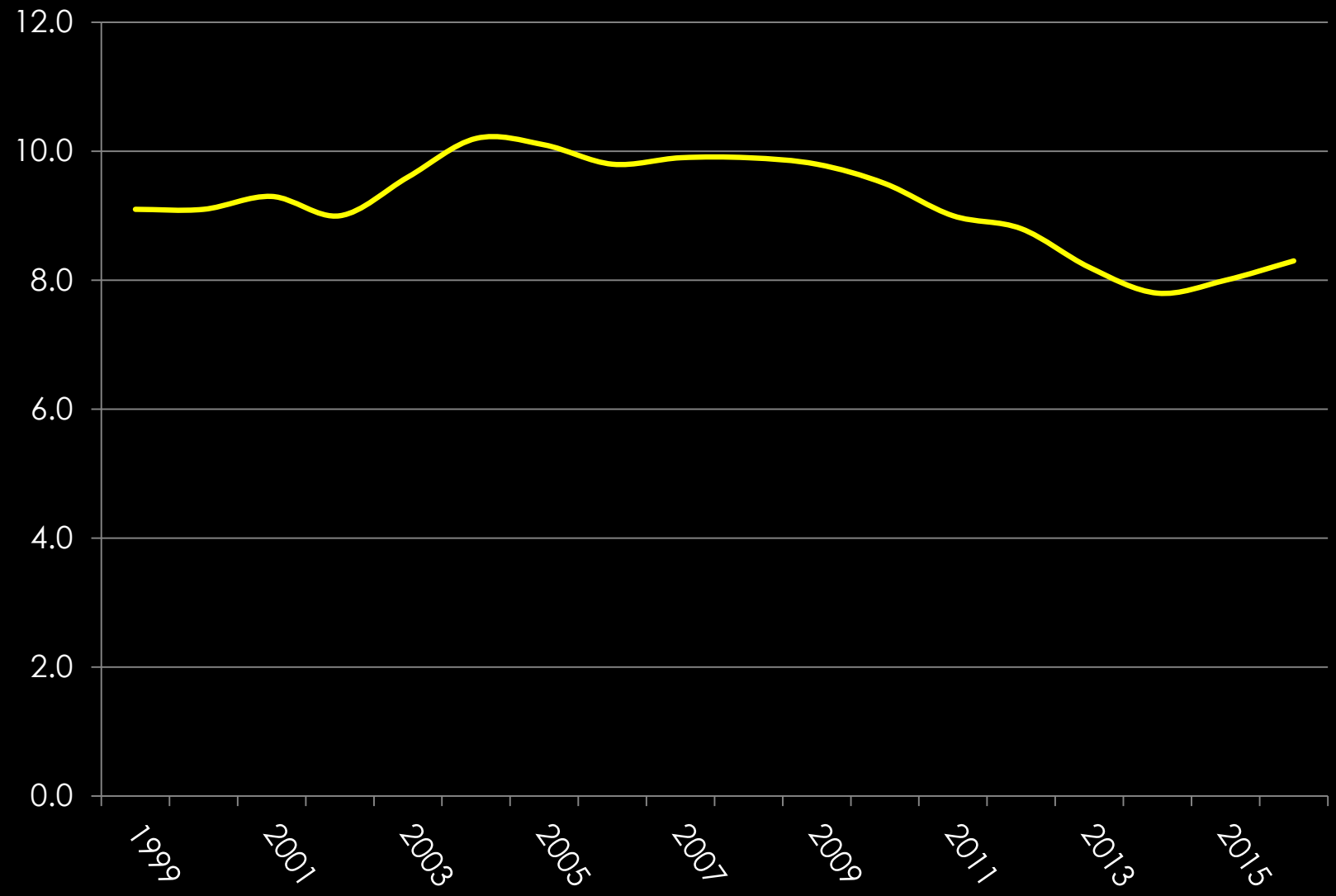
Ship orders as of 2014



SHIP ORDERS AS OF TODAY

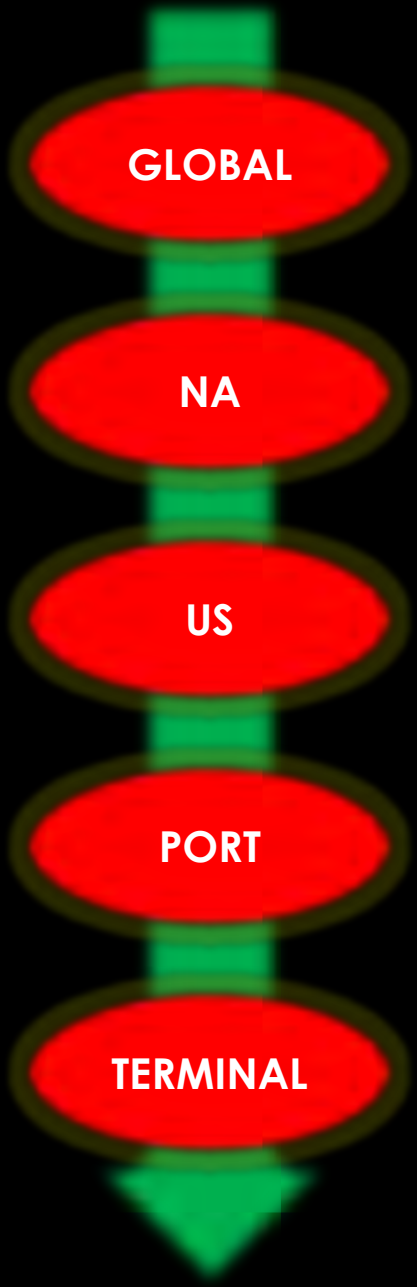


Average orders over the 10 year cycle

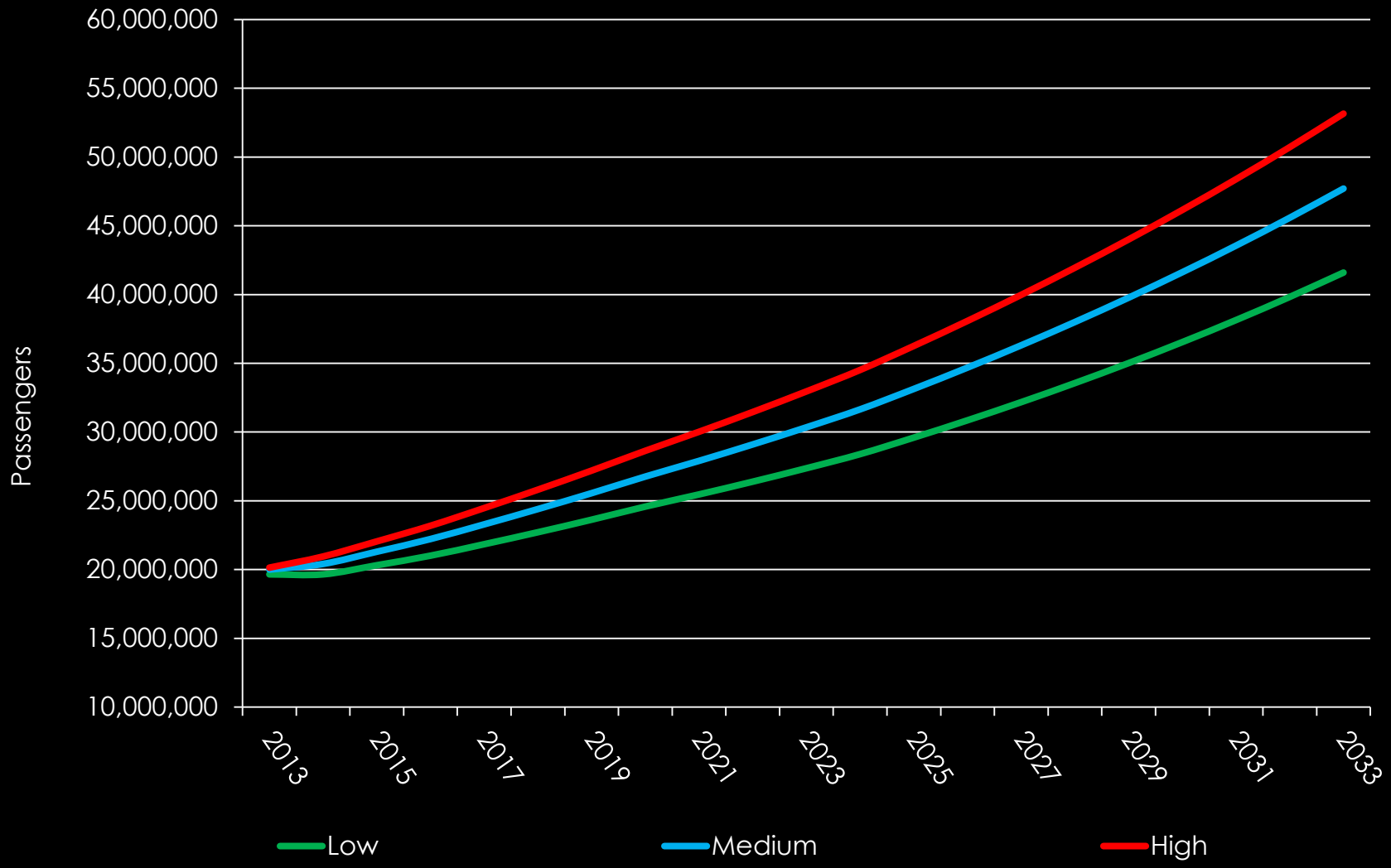


FORECAST METHODOLOGY

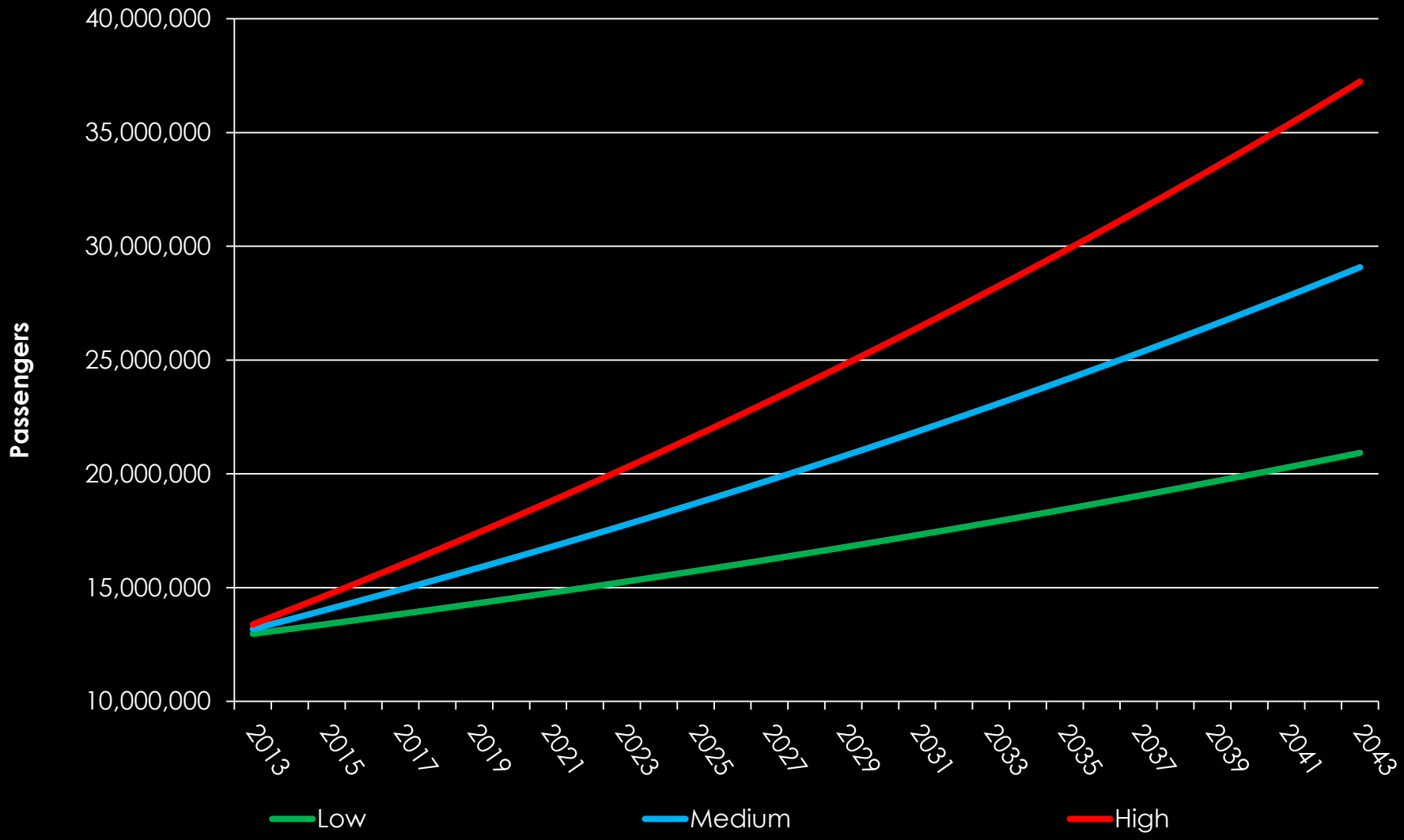
- Worldwide forecast
- Market capture of North America
- Market share of US
- Market share to Port
- Market share of terminals



Forecast world cruise growth



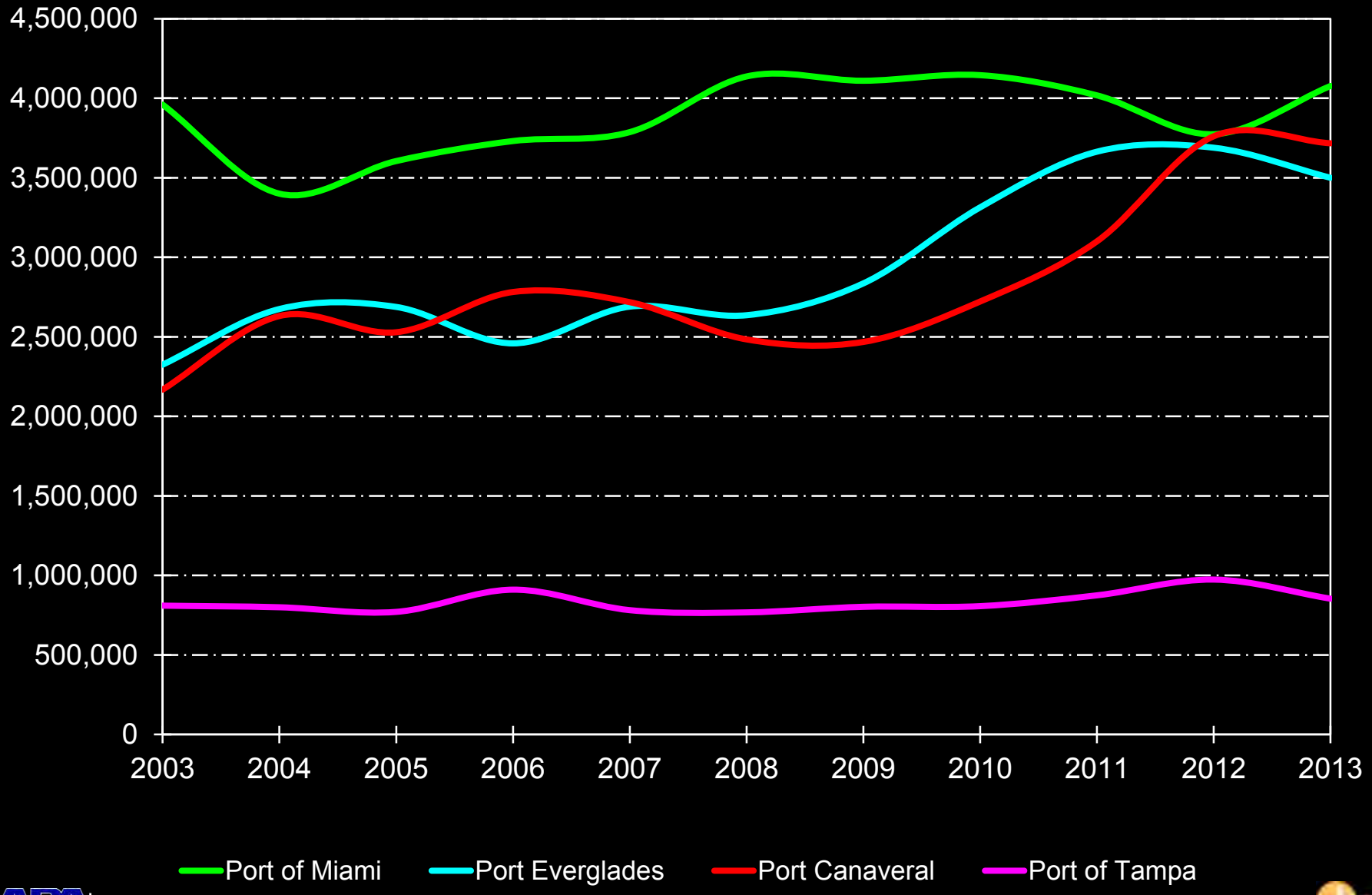
North American cruise growth



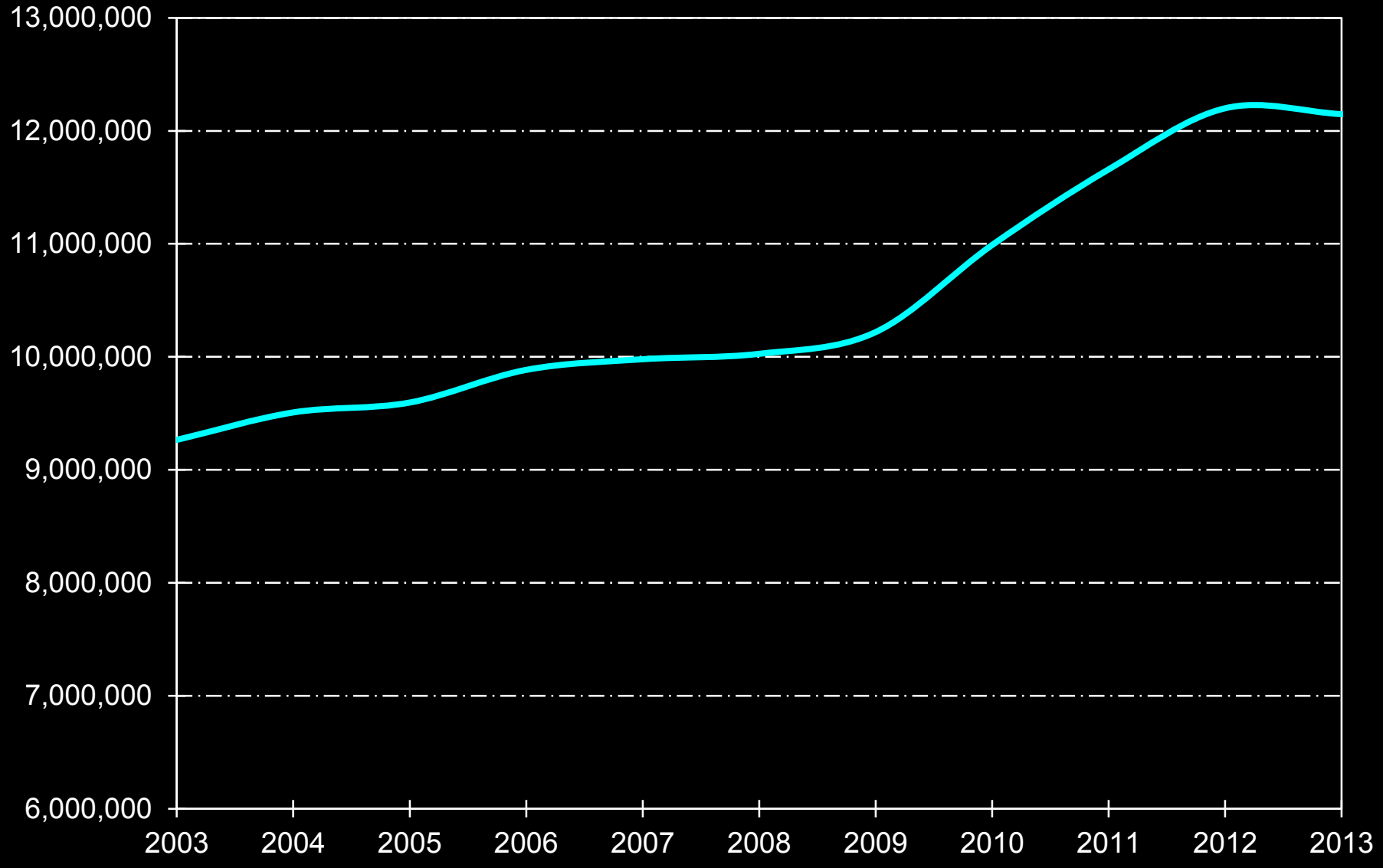
Keys

- Growth is not unlimited or linear
- Growth occurs in steps as capacity is added
- Lines tend to compete with each other at the same port, therefore causing large and fast increase
- There are glass ceilings at each port
  - Growth will diffuse to many ports as the lines continue to globalize
  - Lines do not compete with themselves
  - Capacity issues

Regional homeport passengers (multi-day)



Florida homeport passengers



North America homeport terminal demand

- If we add 100 more ships in the next 15 years
- Assume 50% to other markets
- These 50 ships will require = 75 homeport berths/week
- If 40% are seasonally deployed that translates into 105 berths/week
- There is a need of 20 to 25 terminals

FACILITY DEMAND

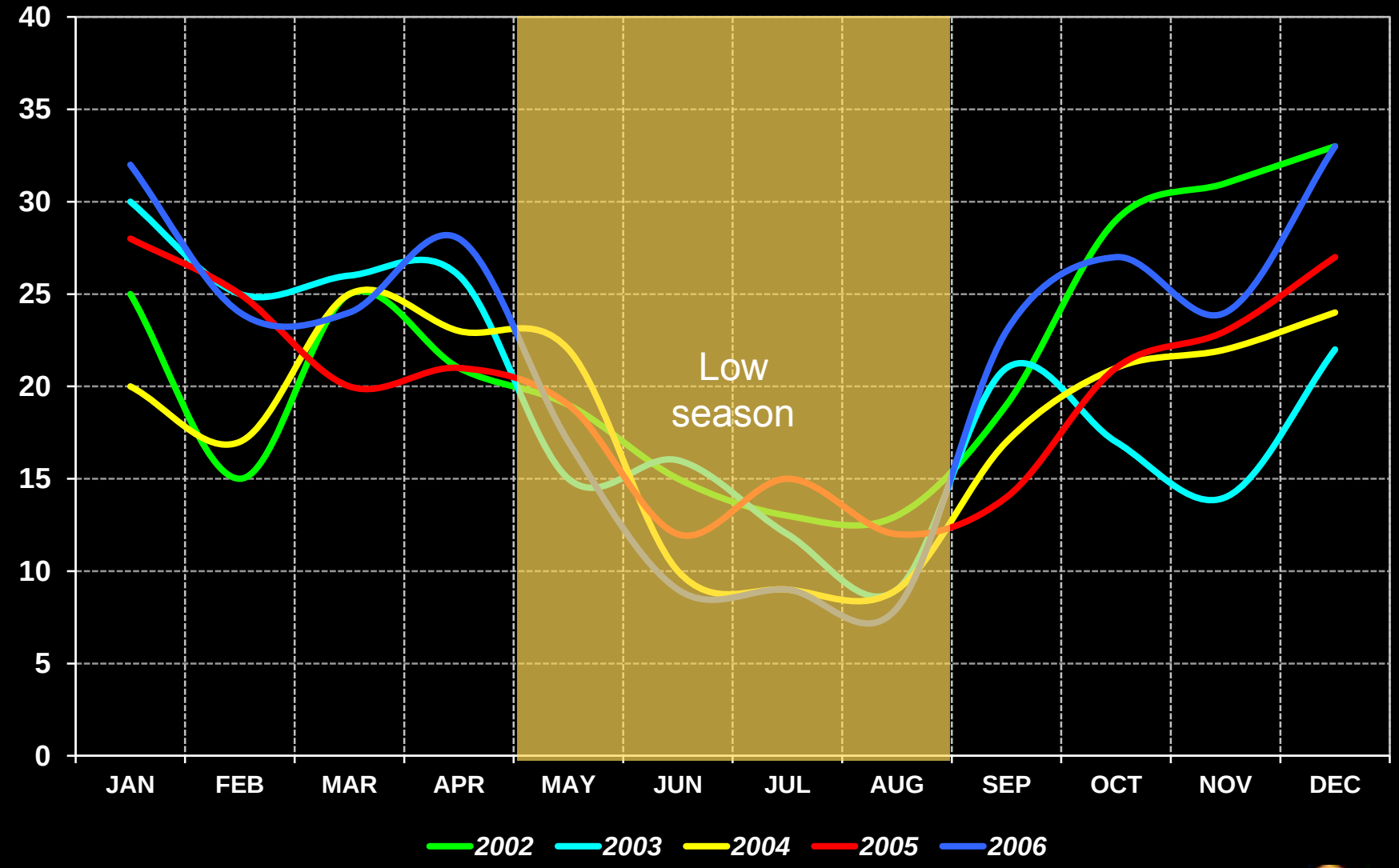
2

Major factors

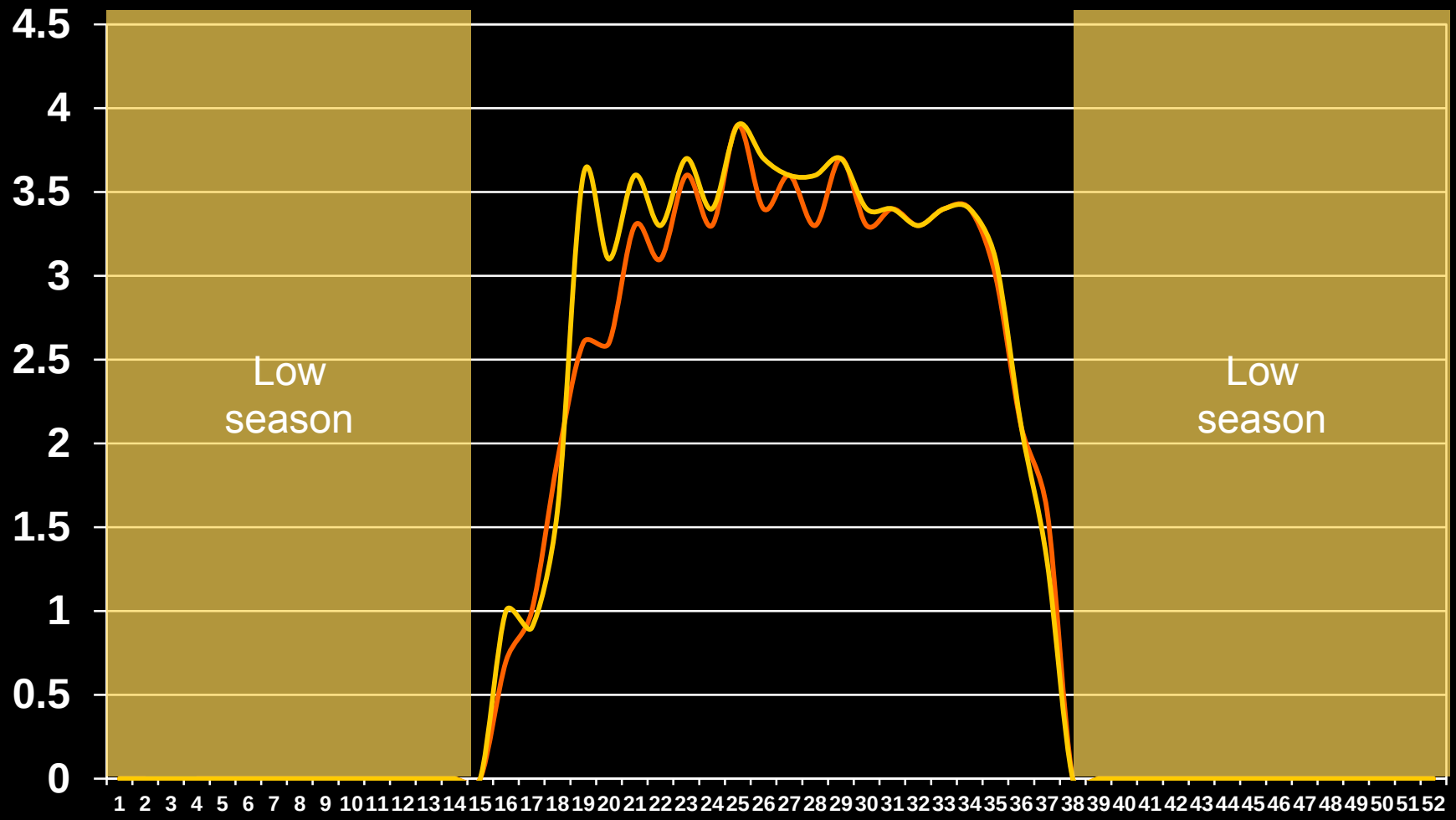
- Natural potential for development
- Timing of cruise line expansion and strategy
- Interline competition
- Seasonality (by month)
- Daily fluctuations

SEASONALITY

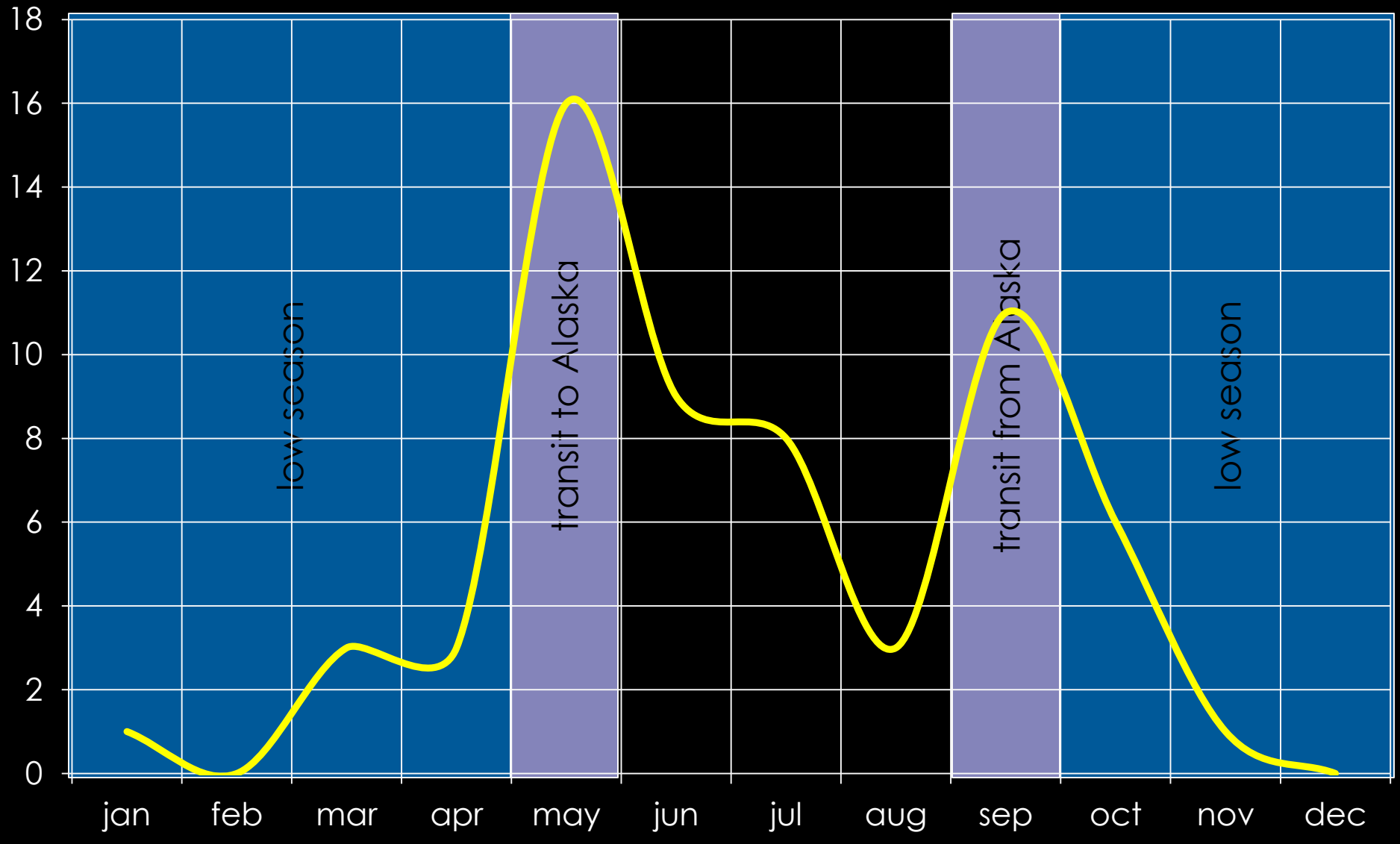
WARM WEATHER SEASONALITY (LOS ANGELES)



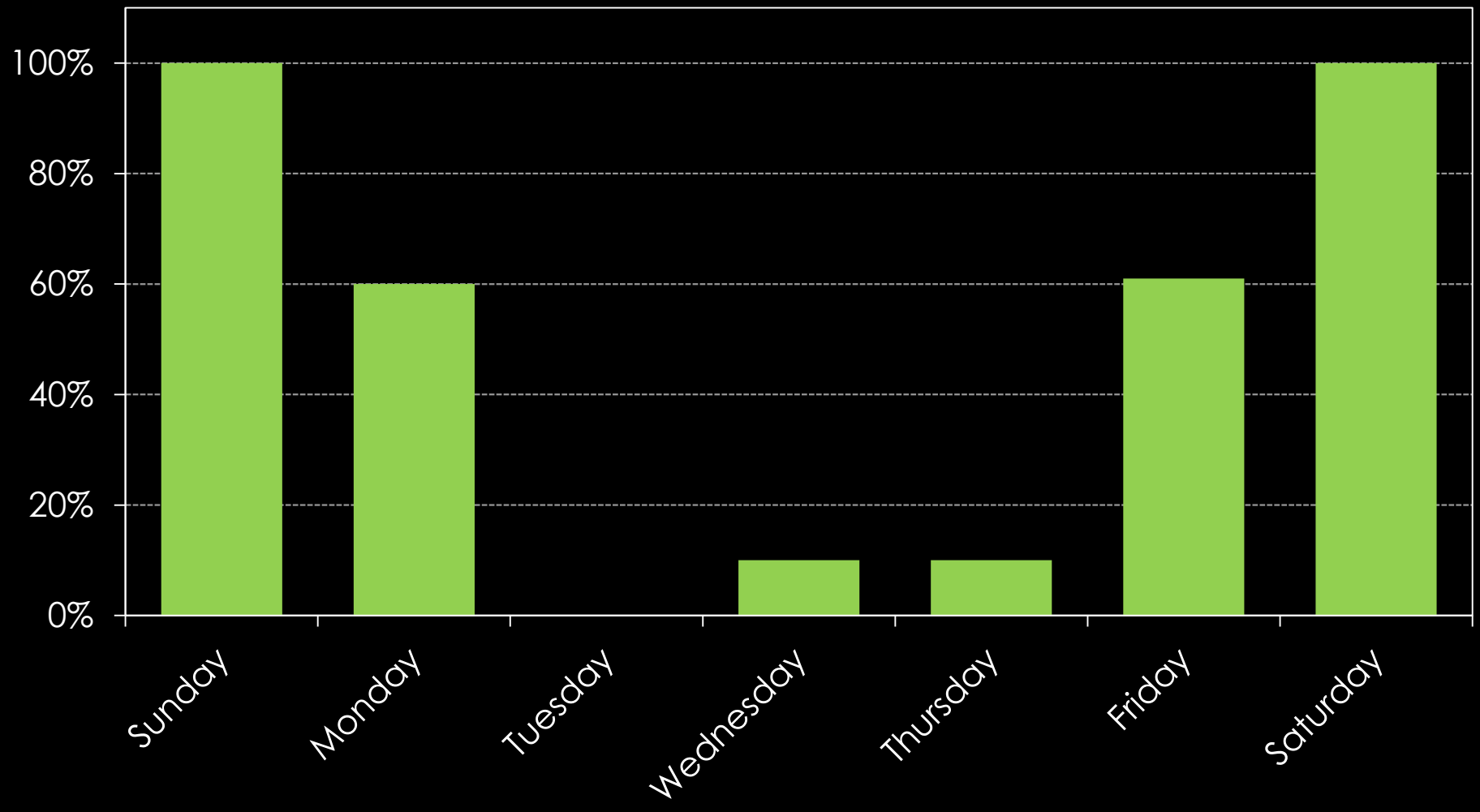
Cold weather seasonality (Alaska)



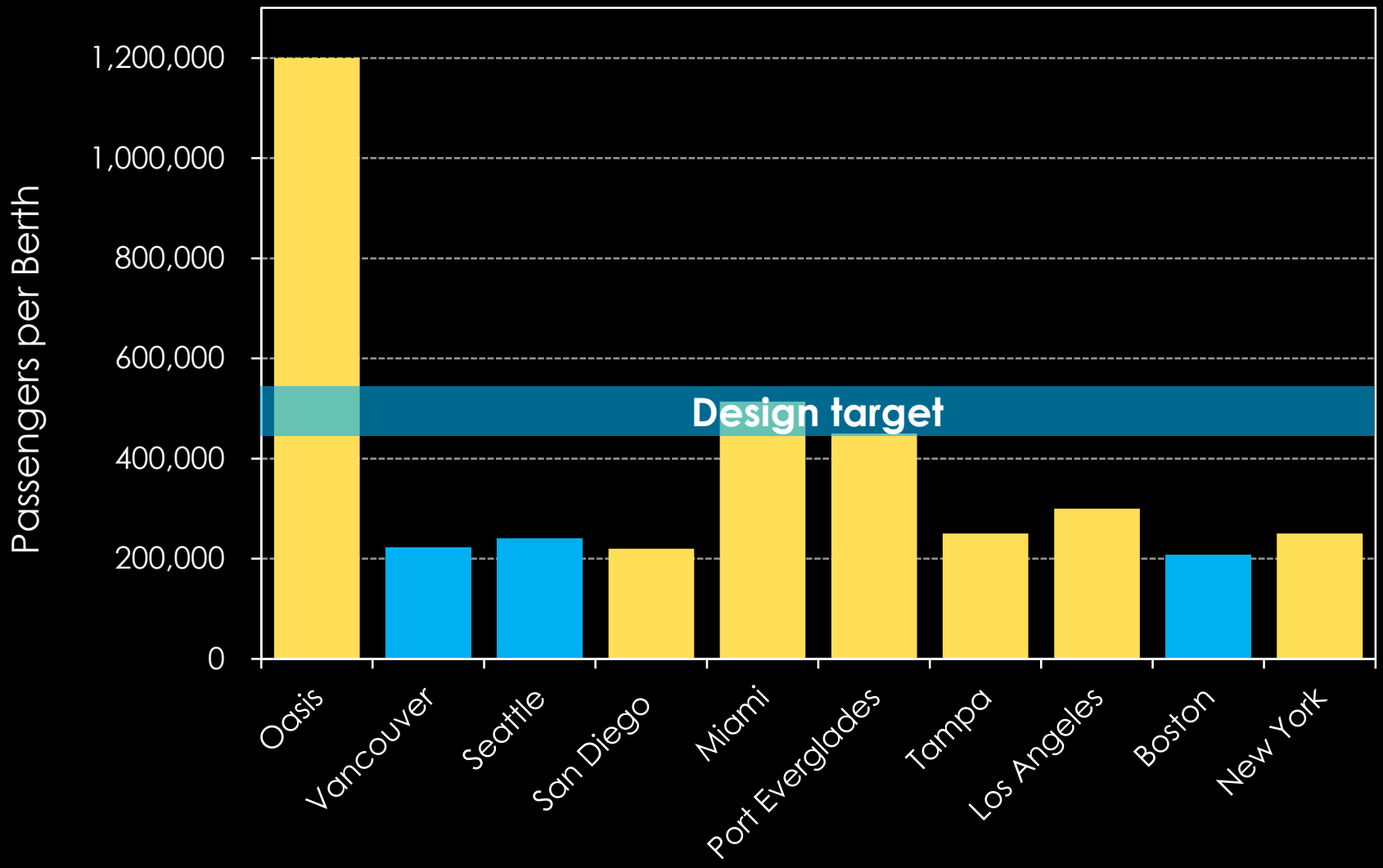
YEARLY SEASONALITY (SF 2009)



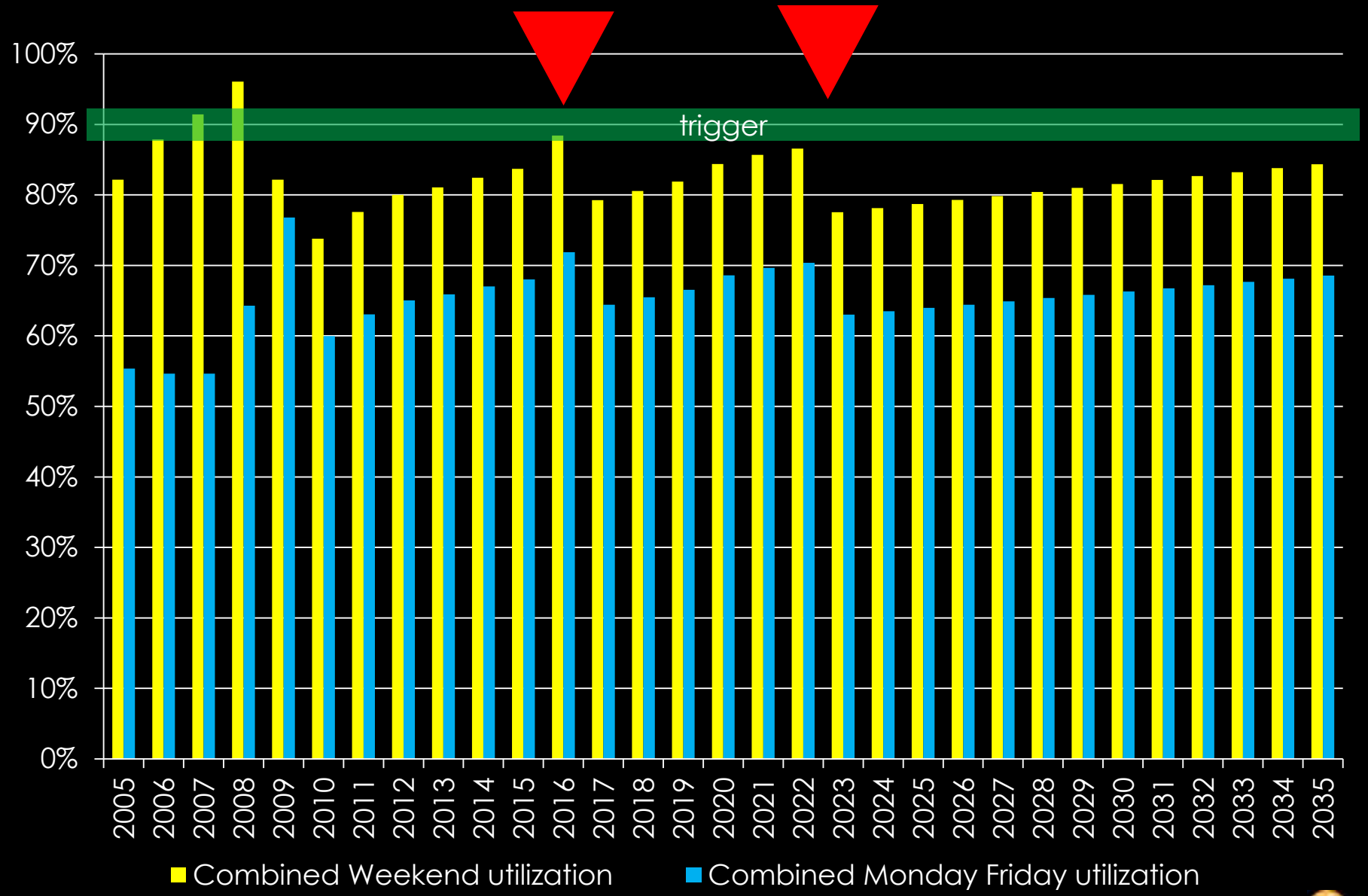
Daily seasonality



METRIC – BERTH USE (PASSENGERS PER YEAR)



BERTH UTILIZATION



Existing growth development model

- Ports wait for the cruise line to call
- Then you have at best 24 months to deliver a facility

- But…….

- Terminals are now much more complicated, expensive and difficult to execute

- Planning is essential

SHIPS

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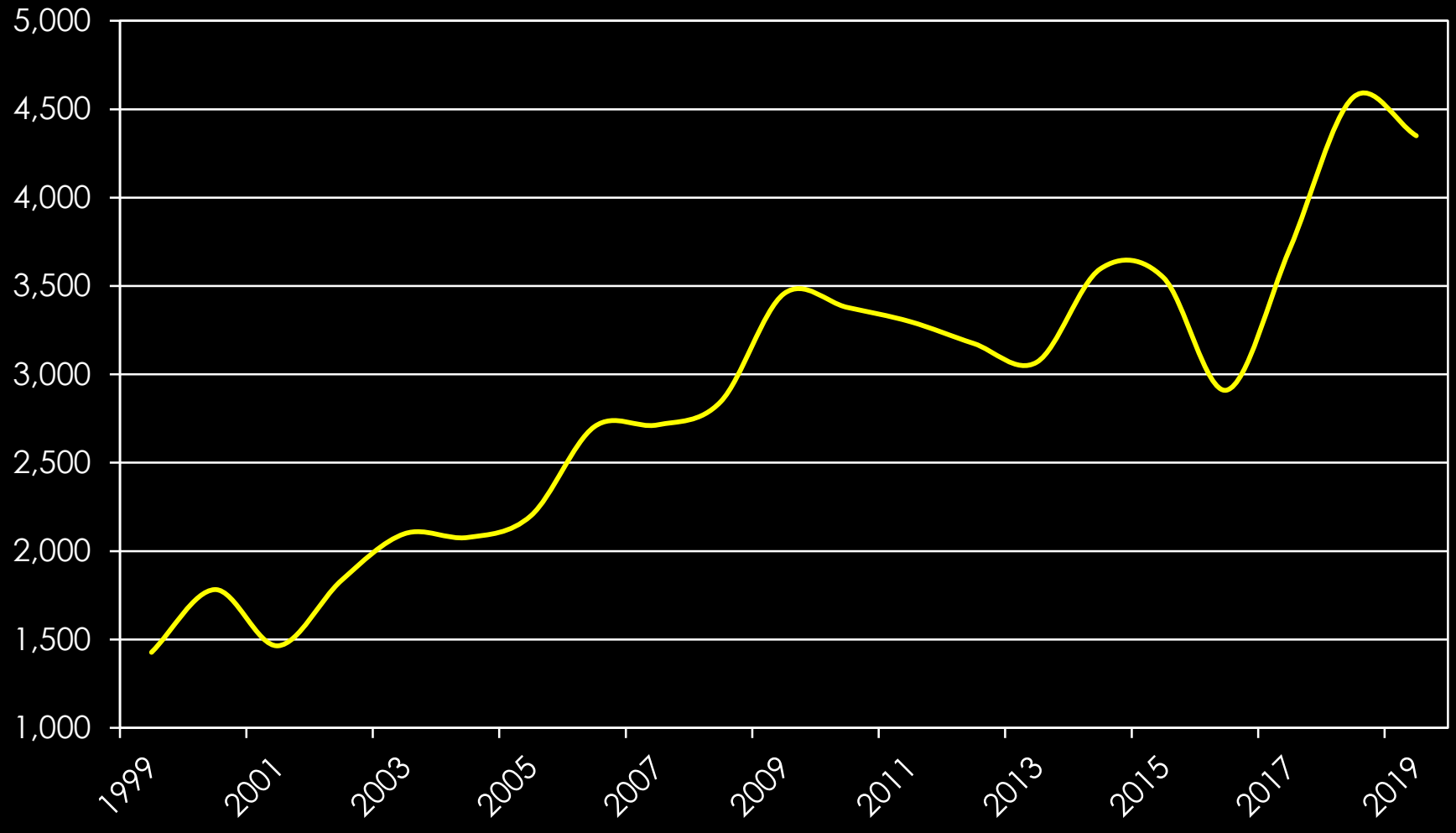
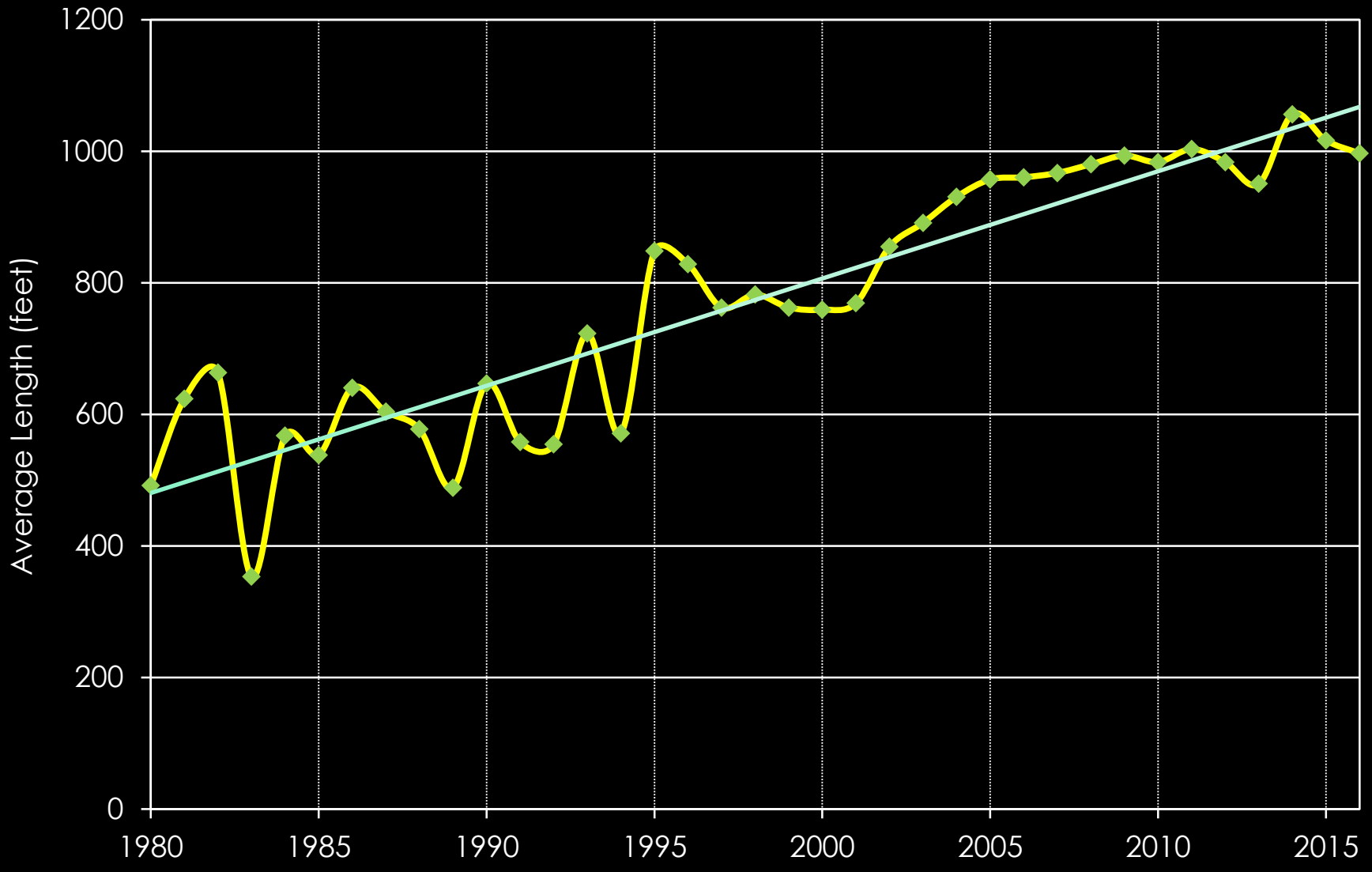
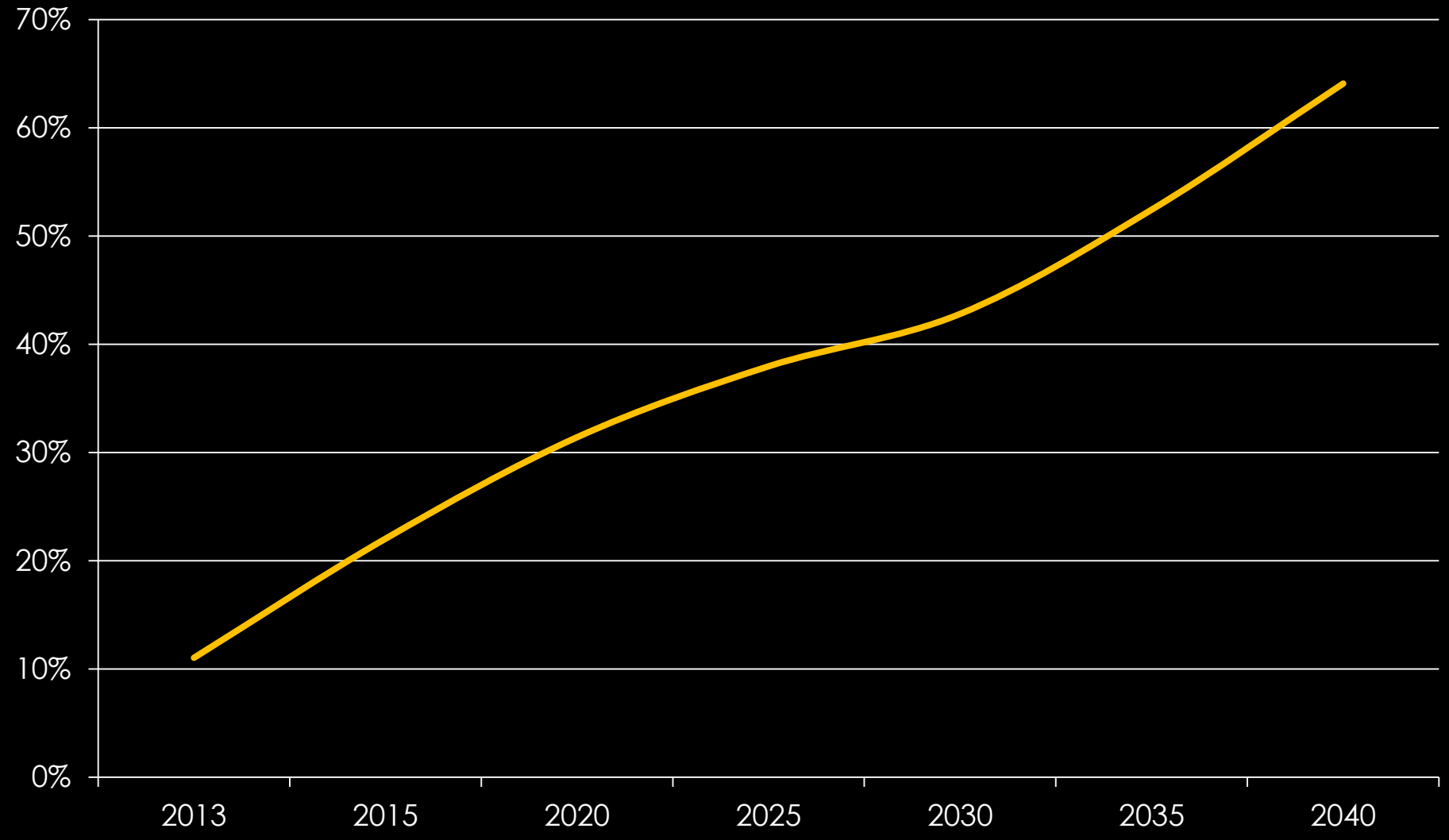
AVERAGE PASSENGERS PER SHIP BY YEAR OF CONSTRUCTION



AVERAGE SHIP LENGTH BY YEAR OF CONSTRUCTION



Percent of ships over 1,000 feet LOA



IMPACT OF LONGER SHIPS

Where is the ship building going?

- Reacting to the market
- Reacting to the economics of markets
- Driven by a handful of companies

- Reacting to the unknown

Past ship drivers – physical

- The width of the panama Canal
- The air-draft of the Verrazano Narrows and Golden Gate bridges
- The draft of smaller harbors (for non-transatlantic)

Future drivers – market and economies

- More passenger amenities
- Better sales yields
  - Outside cabins – larger perimeter
  - Balconies
  - Grander atriums
- Logistics
  - Distribution of passengers
  - Boarding and disembarking
- Better economics
  - Crew to passenger ratios
  - Power / fuel consumption

Design vessels

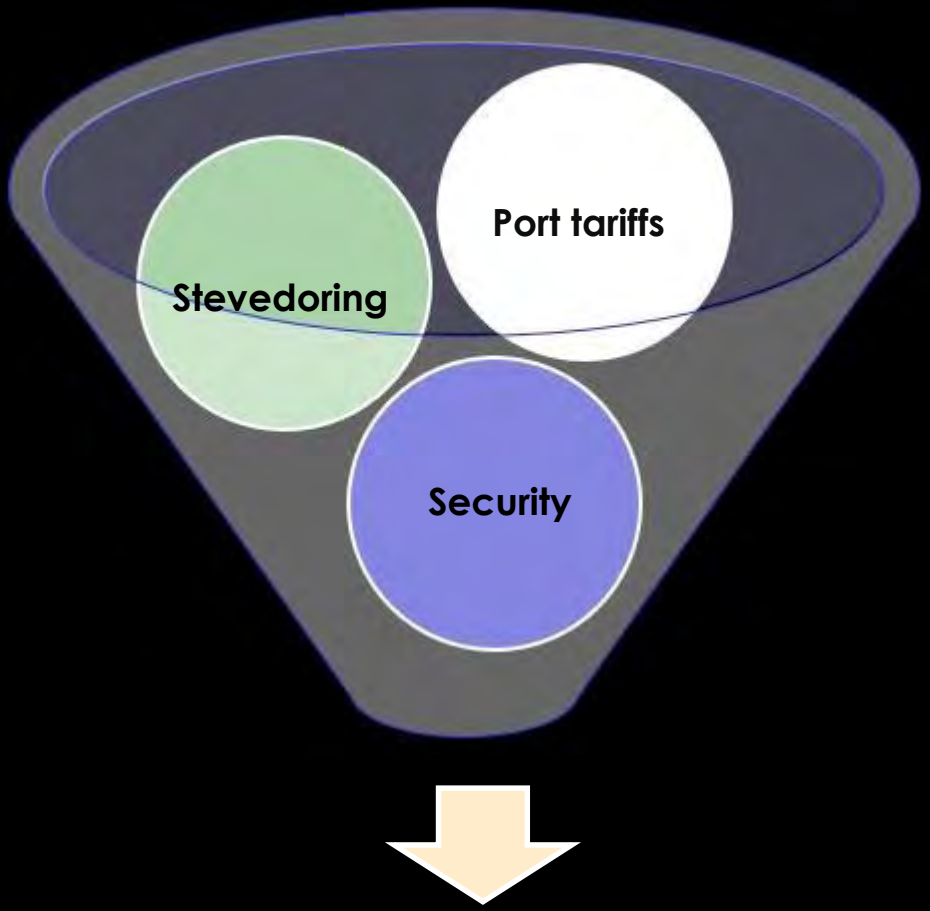
Type	Design Vessel 1980s (Panamax)	Design Vessel 2000 (post-Panamax)	Design Vessel 2020 (x-Panamax)
Passengers	2,000 to 2,600	3,000 to 5,000	>5,000
Crew	850	<1,200	>1,500
GRT	Up to 100,000	100,000 to 140,000	> 150,000
LOA (ft)	900 to 985	985 to 1,100	1,150 to 1,300
Beam (ft)	Up to 118	Over 118 (gen. 130 to 165)	150 to 200+
Draft (ft)	Up to 28	28 to 36	28 to 32
Air Draft (ft)	Less than 195	Up to 210	210+

Provide flexibility to absorb changes for each cruise line brand

Economics

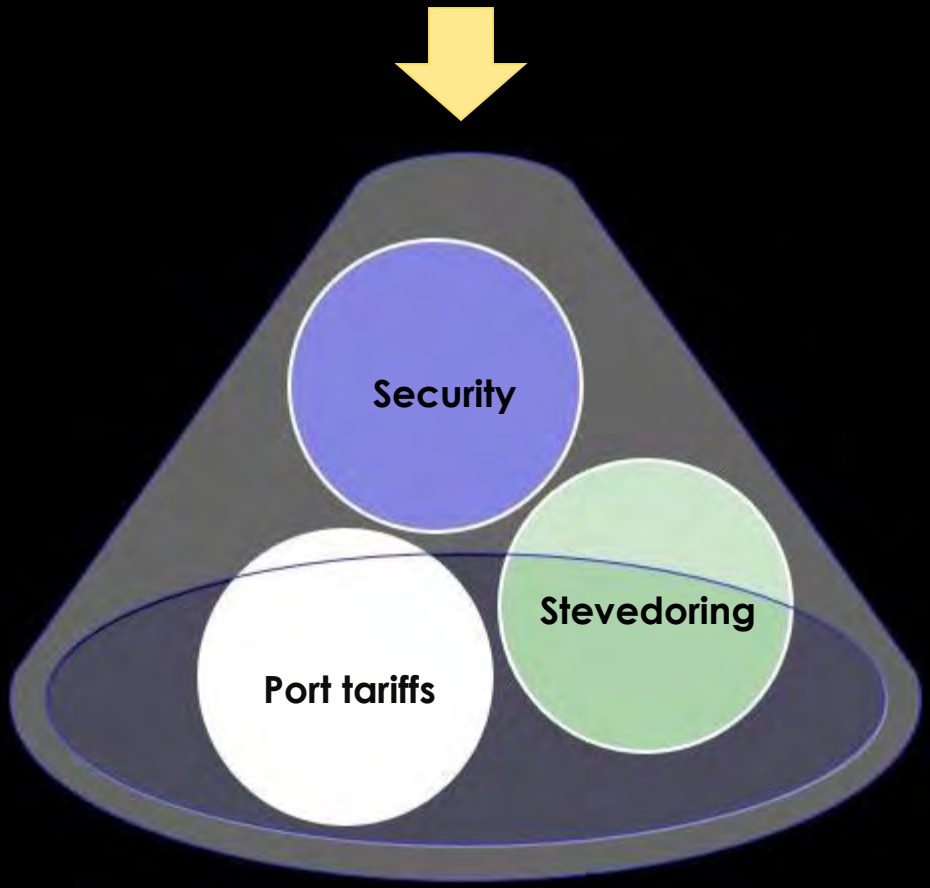
4

PORT COSTS



Revenue distribution

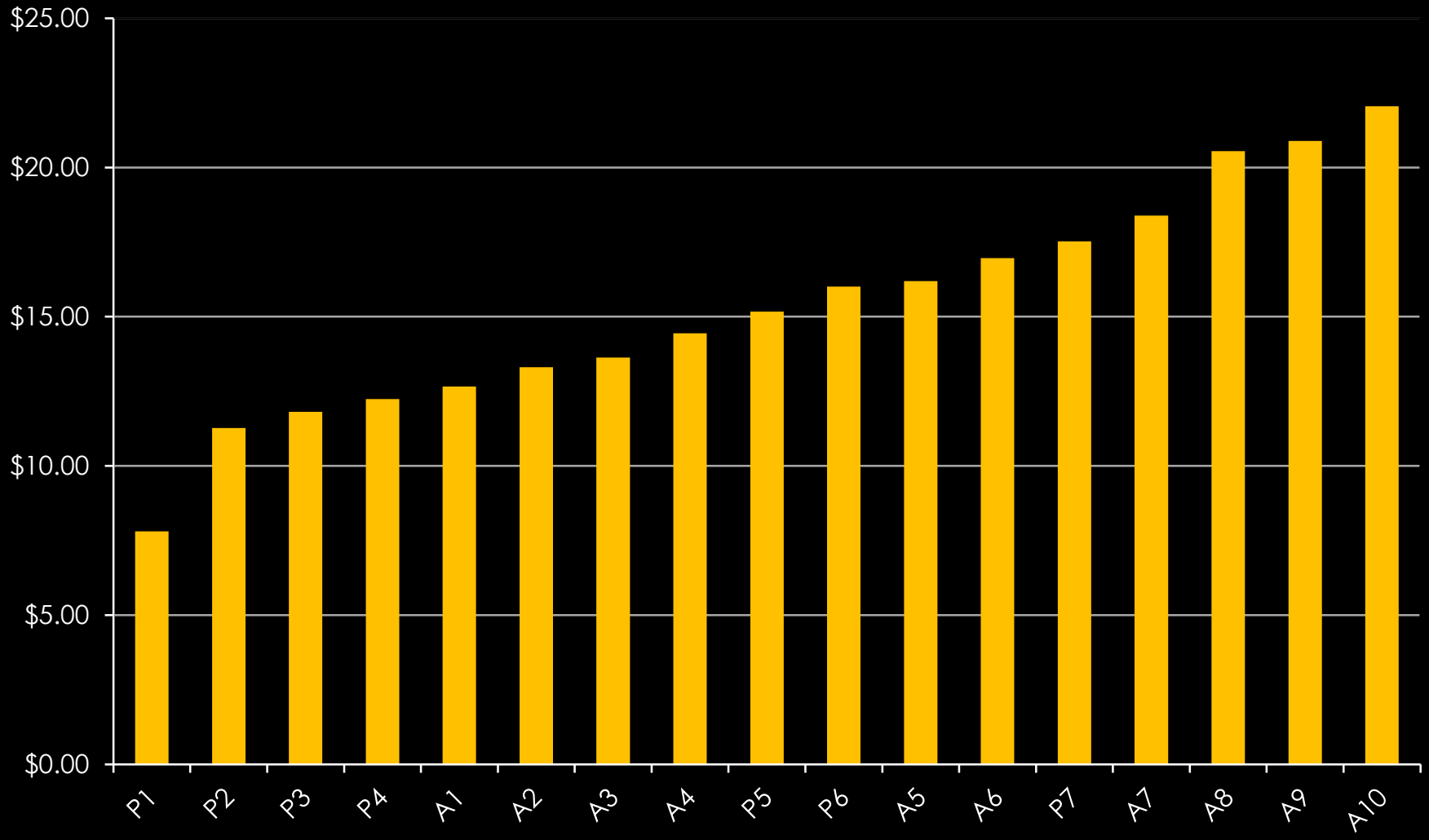
Potential revenues



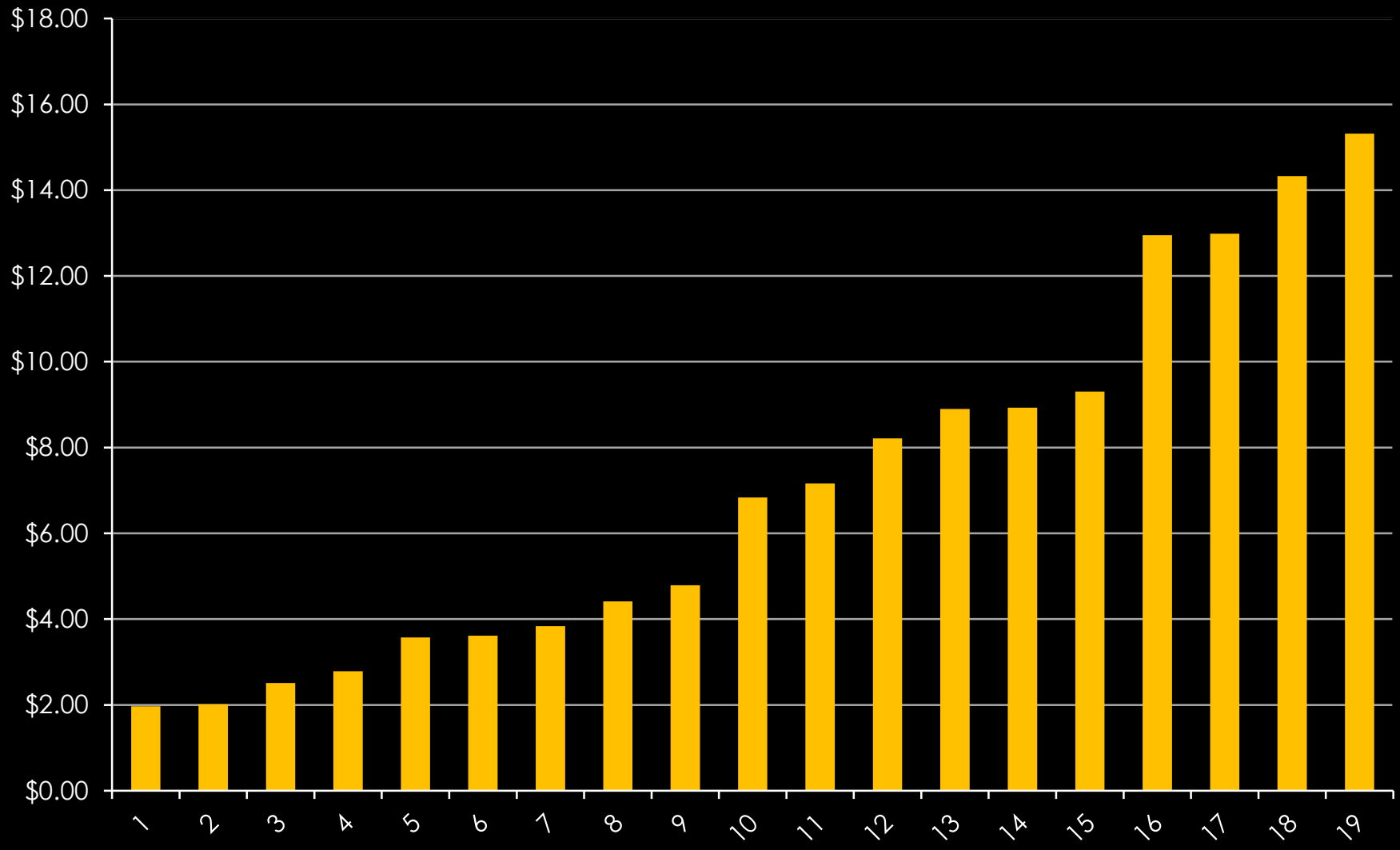
Establishing budgets

- Understand revenue and cost structure
- Lines drive tariffs competitively
- It is not – "whatever it costs" – the lines will pay
- Different solutions and issues
  - Start-ups with low volumes
  - Legacy ports with obsolete infrastructure
- Perform an affordability test at the start

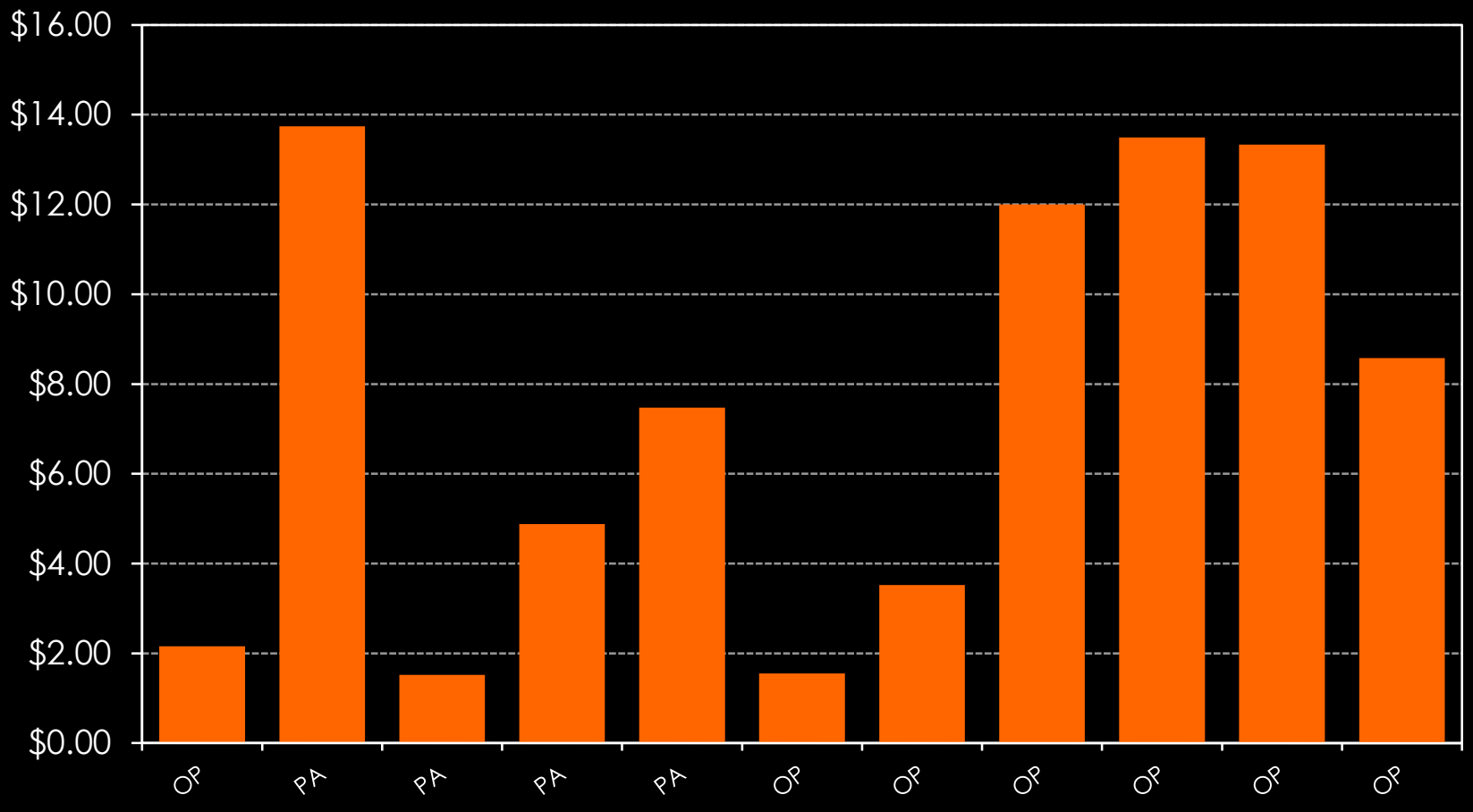
North American port revenues (US$/pax)



EUROPEAN PORT REVENUES (US$/PAX)



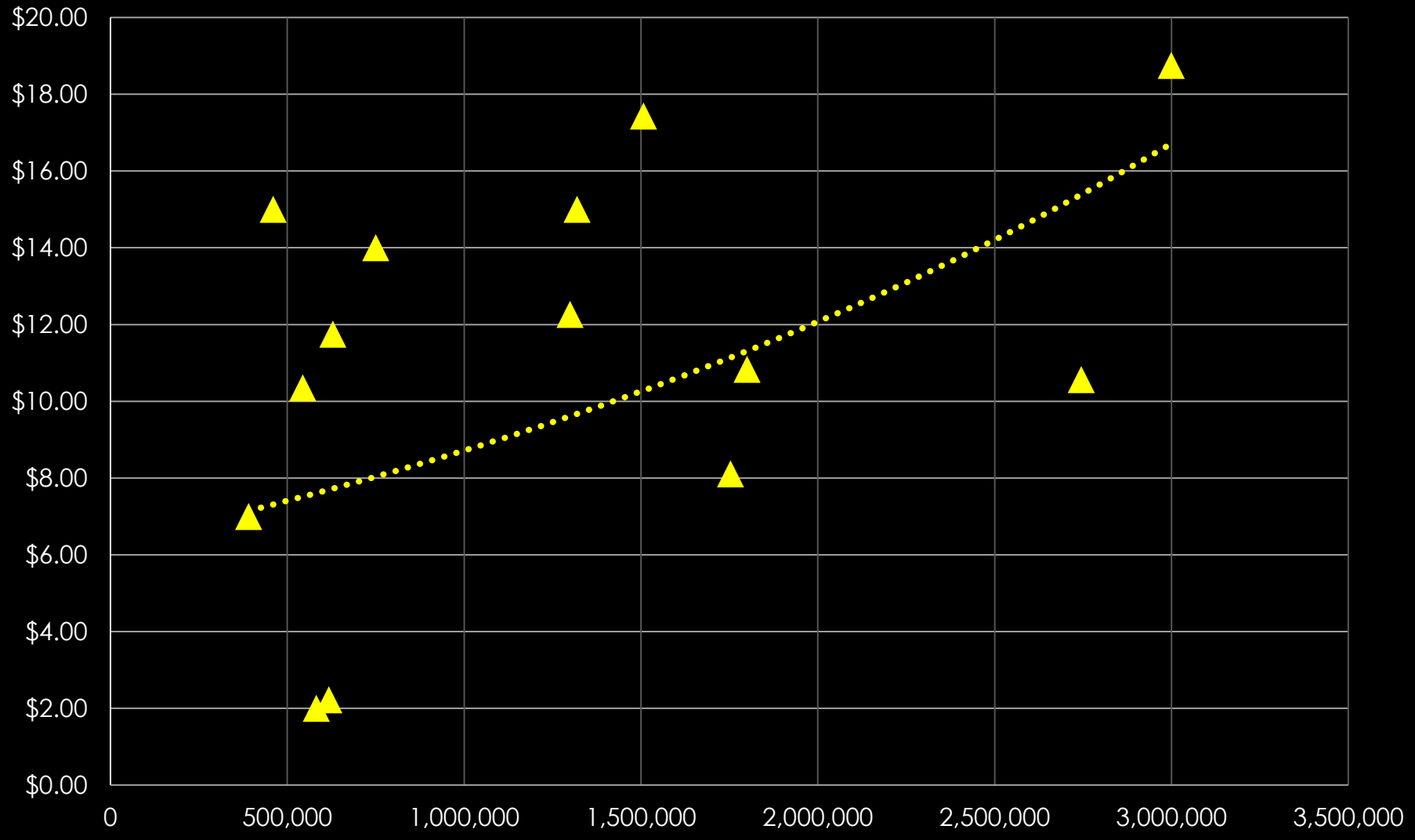
OPERATIONAL COST OF DIFFERENT TERMINALS (US$)



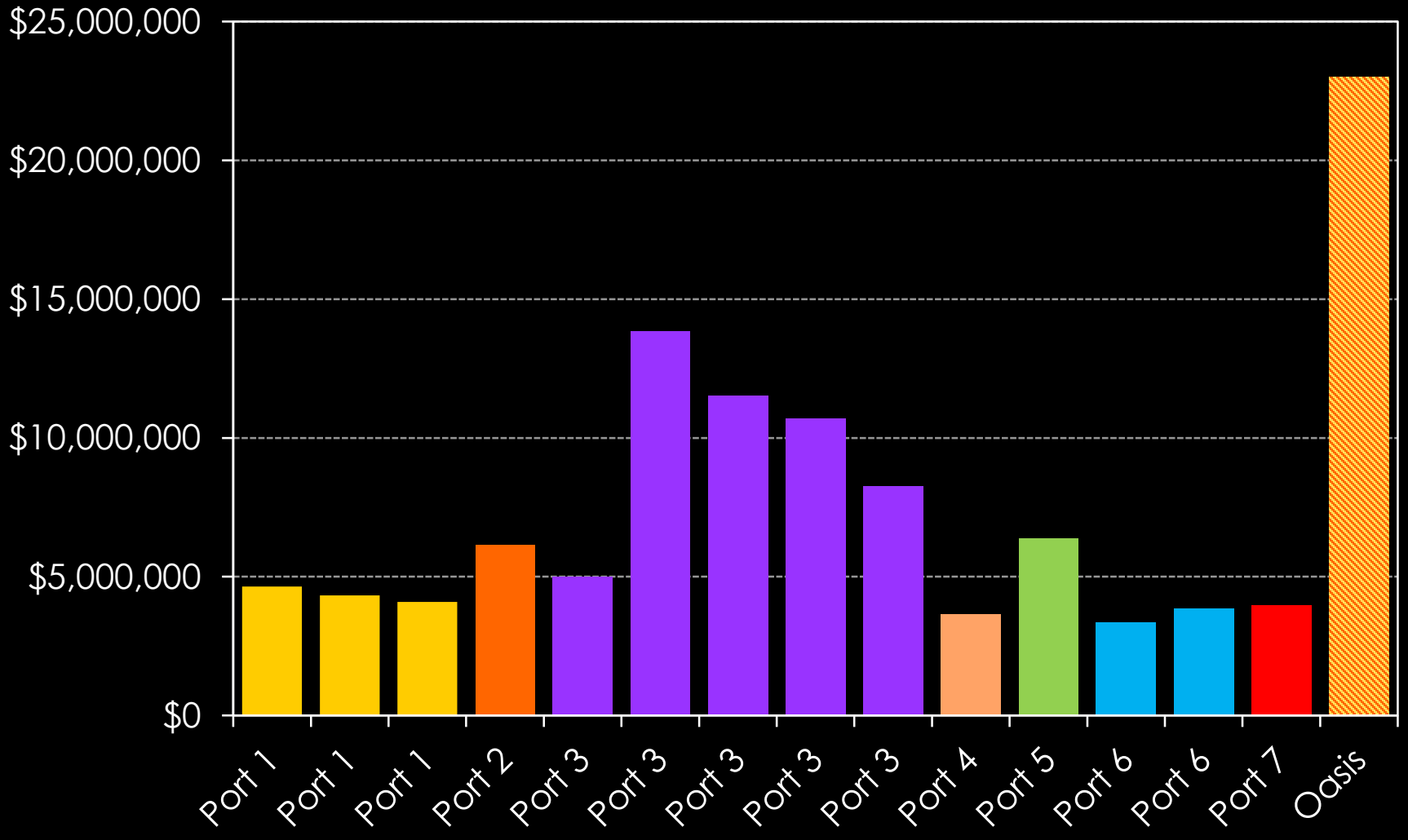
Averages

- Revenues
  - On average the total per passenger charge in the US is $14.52
  - This varies widely by region
    - West coast is lowest at $9.01
    - North Atlantic is highest at +$19.00
    - Legacy ports average at $15.51
- Costs
  - Operating costs of a terminal varies highly between $3.00 per passenger to over $12.00 per passenger
  - Ports with average operations can operate with a 50:50 ratio of costs to revenues
  - Very sensitive to volumes and historic labor arrangements
- Net revenues
  - This combination of revenue and costs create a wide disparity between ports as to their financial performance

Rate vs volume - Caribbean



METRIC – PORT GROSS REVENUES PER BERTH (US$)



DEVELOPMENT STRATEGIES

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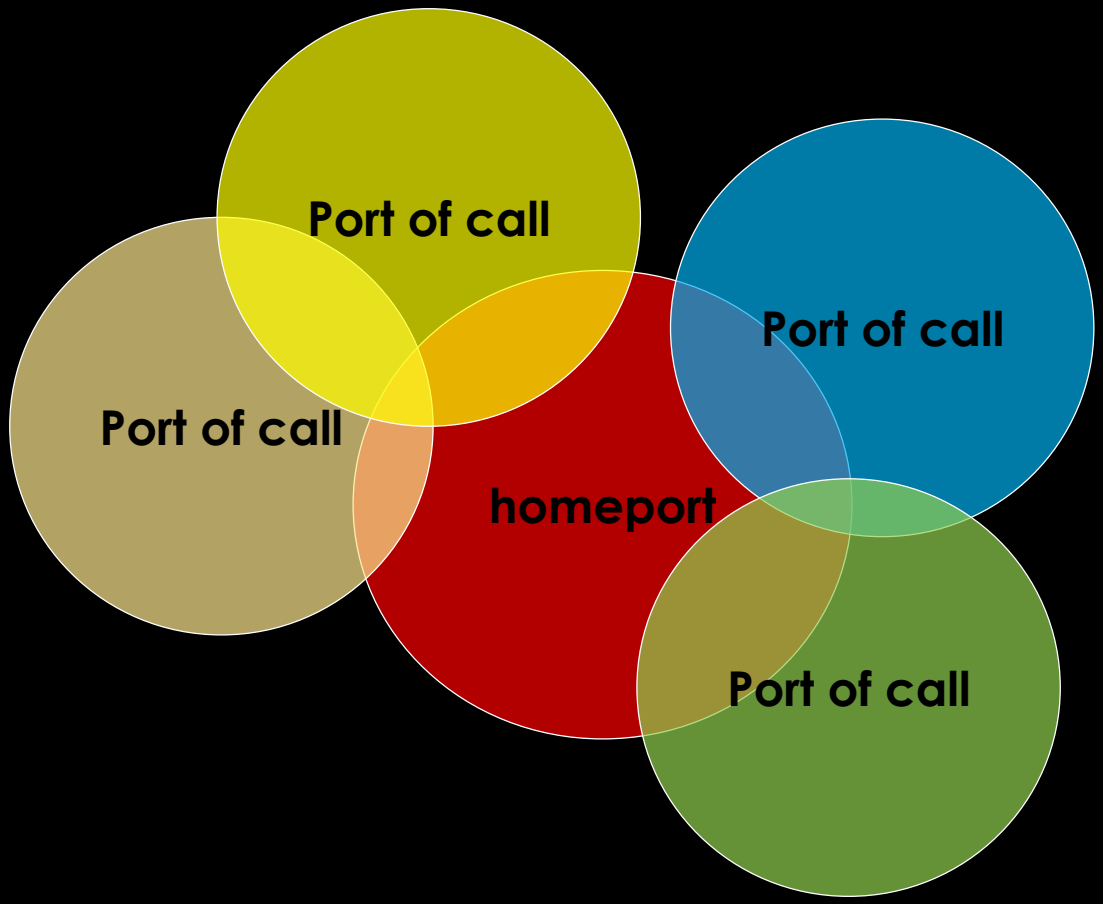
Competition or cooperation?



- Ports should offer complimentary experiences
- Variety
  - Active
  - Passive
  - Cultural
  - Eco-tourism
  - Shopping
- Multi –national
- Marquee value

ITINERARIES - BACKBONE OF THE INDUSTRY

- Lines are focused on cruise itineraries
  - easy
  - profitable
  - sell to cruise consumers
- Manageable distances to reduce speeds and fuel consumption
- Creation of cruise itineraries that fit within consumer vacation patterns
  - mini-breaks
  - week long cruises

Disney's Castaway Cay

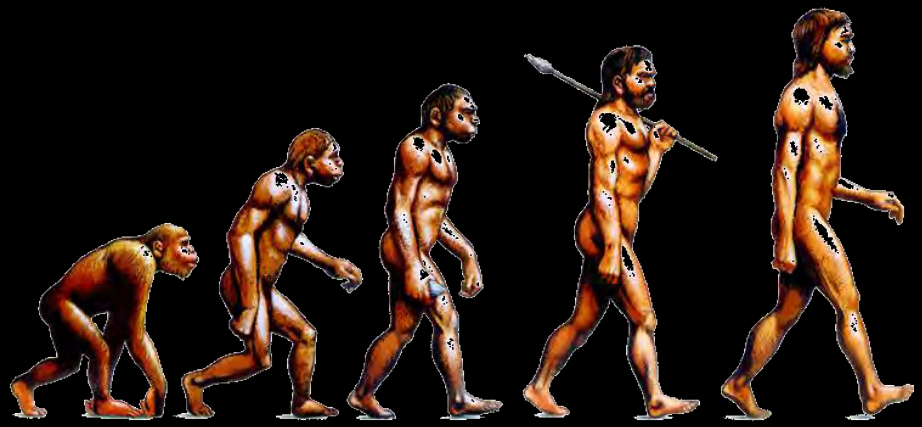
Grand Turk Cruise center

Mahogany Bay, Roatan - Carnival

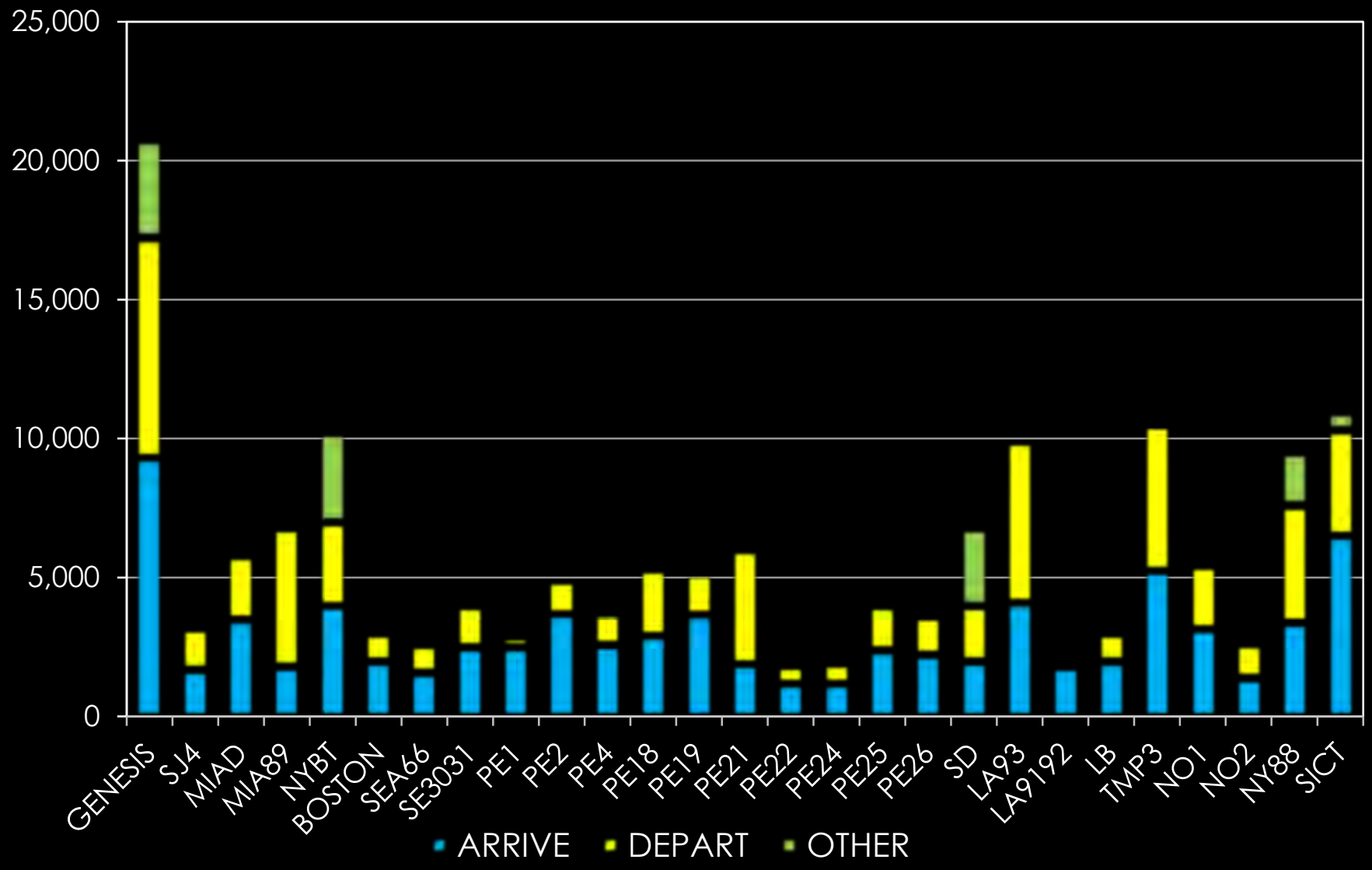
HOMEPORTS

- Delivers terminal and harbor
- Services vessels
- Handles baggage
- Handles passenger transfers
- Linked to a major airport with significant air carrier capacity
- Although in the US the drive market is now critical to passenger delivery
- Central to fuel efficient itinerary pattern(s)

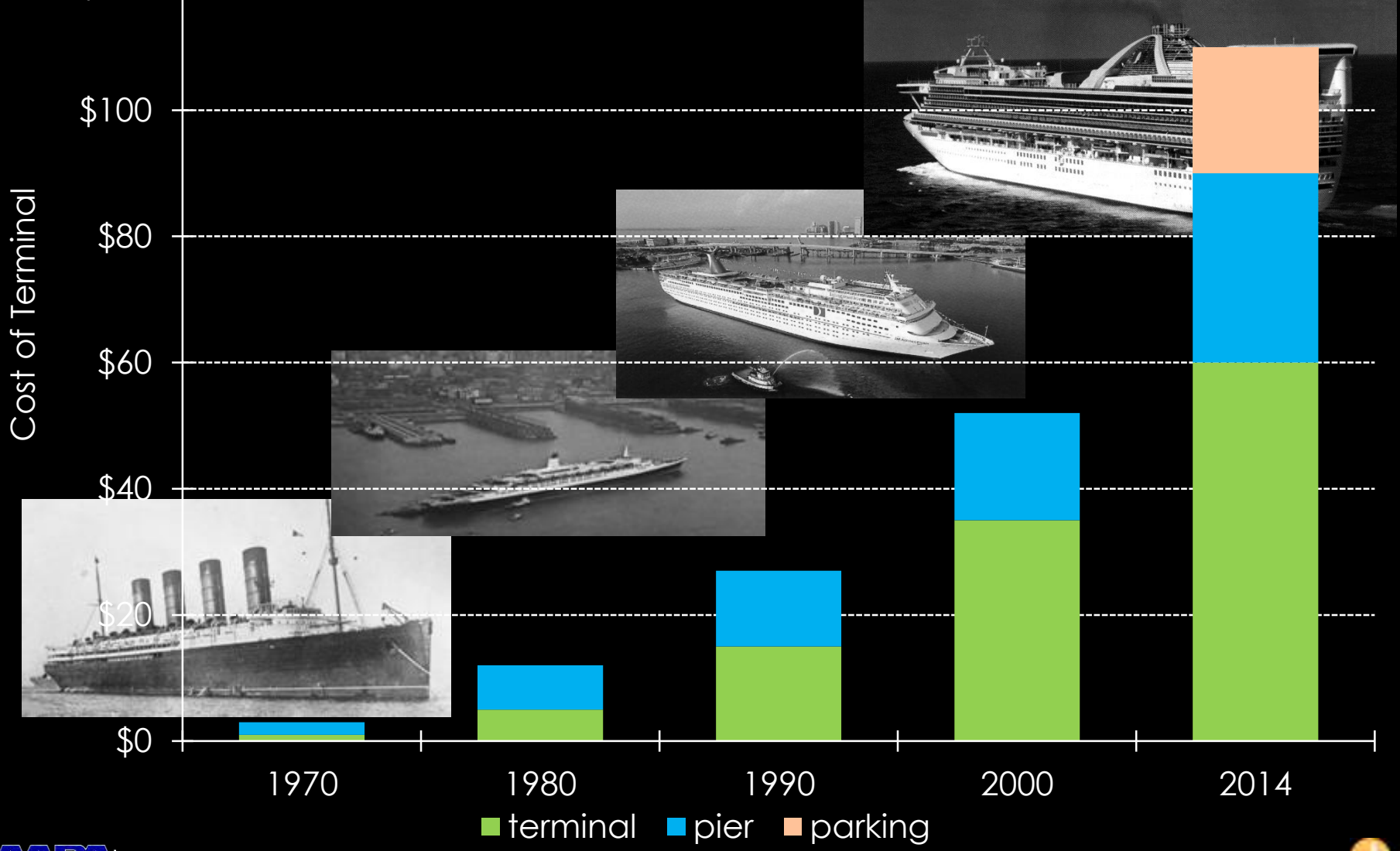
THE EVOLUTION OF THE CRUISE TERMINAL



CRUISE TERMINAL AREA COMPARISON (mt²)



DEVELOPMENT COSTS



TERMINAL PROGRAM

	Canaveral		PEV	Miami
	CT6	CT1	18	D
Embarkation				
Check-in	7,127	18,000	36,125	16,984
Lounge / VIP	11,582	33,500	51,639	19,770
Support	28,295	19,000	43,313	11,637
Security	7,889	15,600	9,708	6,664
Subtotal embarkation	54,893	86,100	140,785	55,055
Disembarkation				
Baggage	34,377	60,000	63,625	34,871
Customs / Immigrations	12,914	15,124	10,705	13,281
Support	5,378	28,200	32,620	8,365
Subtotal disembarkation	52,669	103,324	106,950	56,517
Grand total	**107,562**	**>200,000**	**247,735**	**111,572**

Realities today

- All ports started with low cost solutions
- Using existing abandoned berths and warehouses
- Low investments

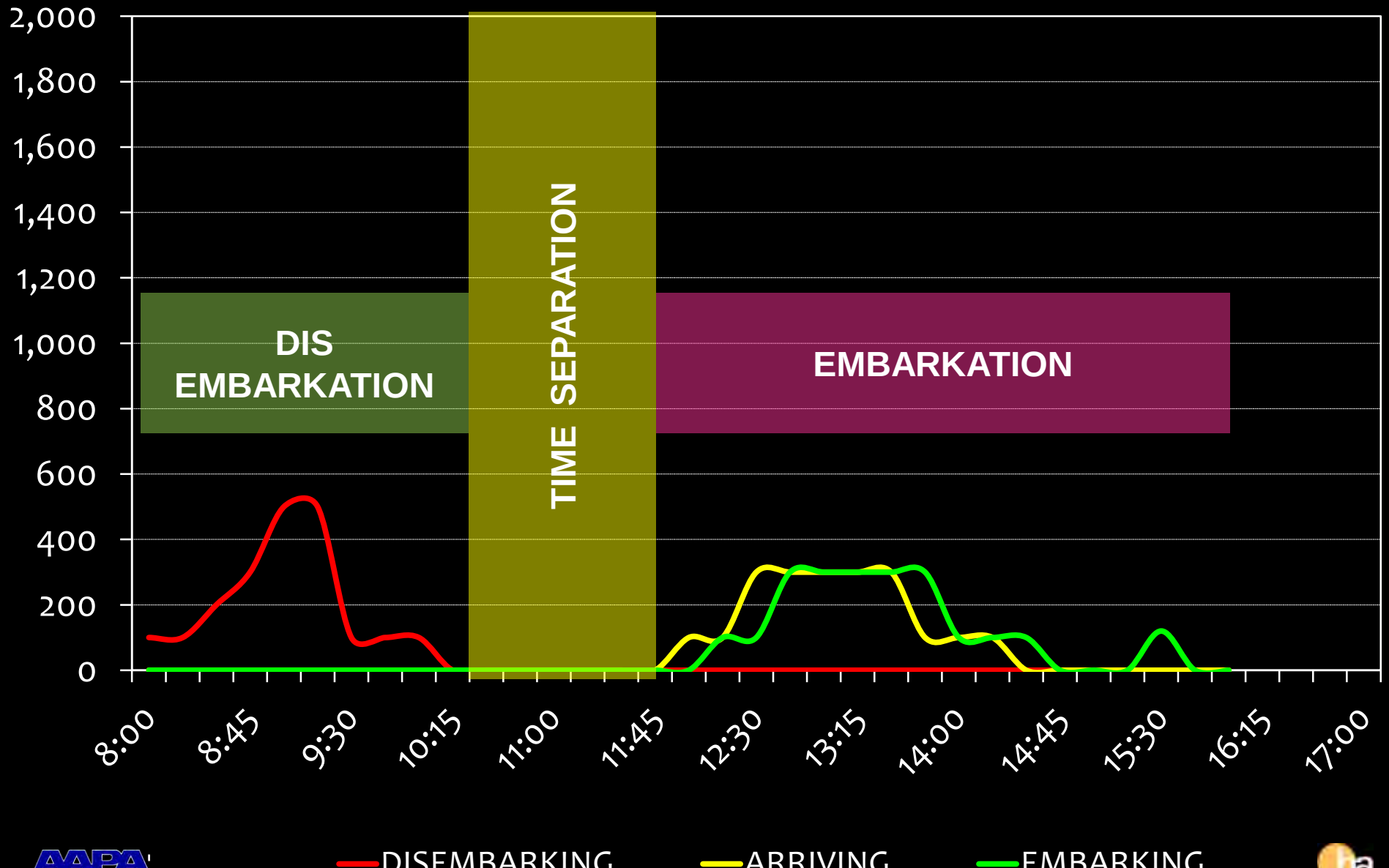
- Those easy solutions are all exhausted
- Few if any berths are available

- Ports are building new

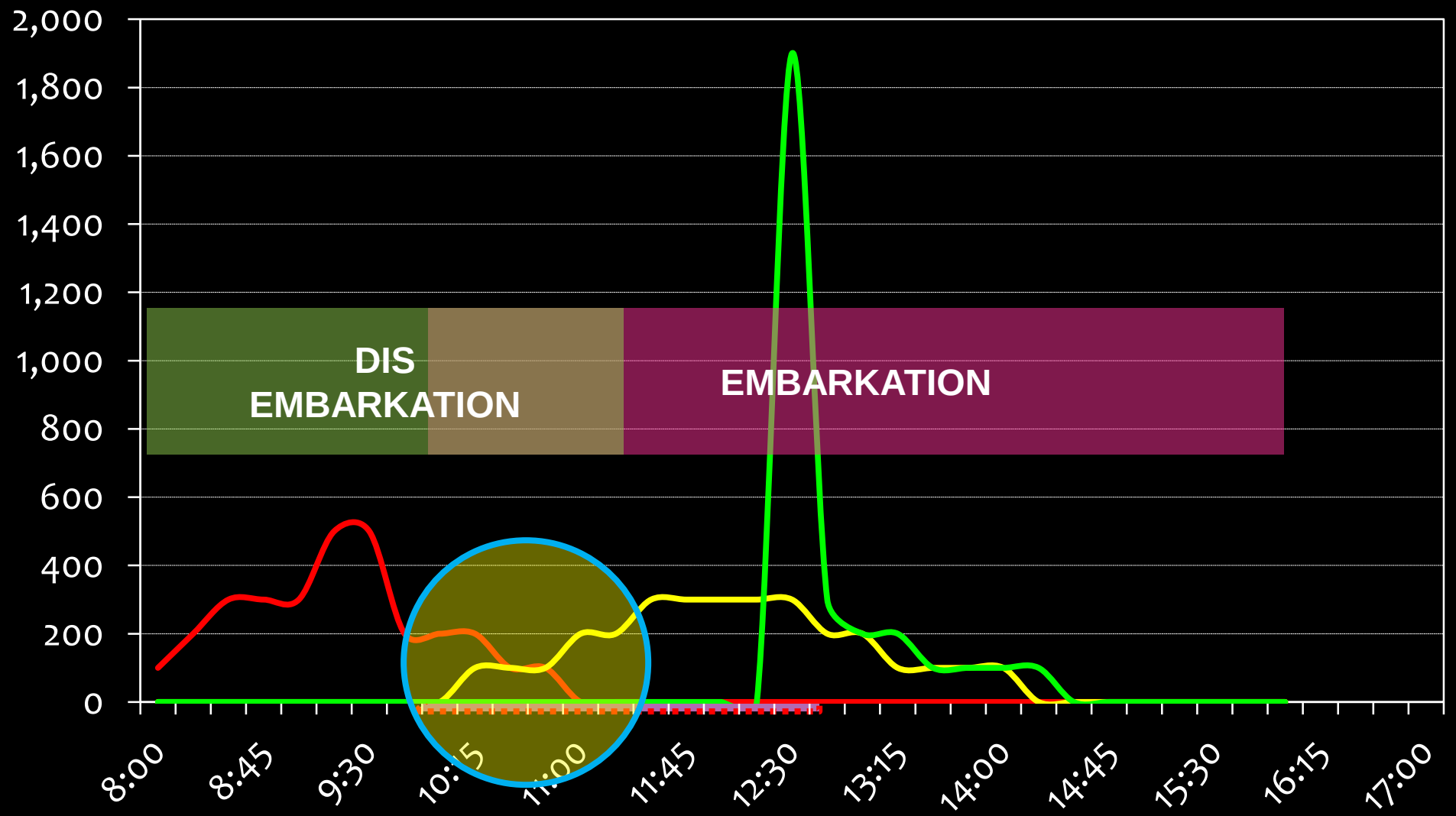
Both scenarios offer challenges

- Start-up ports
  - Lack of certainty
  - High start-up costs
  - Low volumes
  - Slow ramp up to profitability
- Legacy ports
  - Fixing an old terminal could be as expensive as a new one
  - Incremental increases
  - Rare that legacy ports have huge jumps in traffic
  - Usually large incremental costs

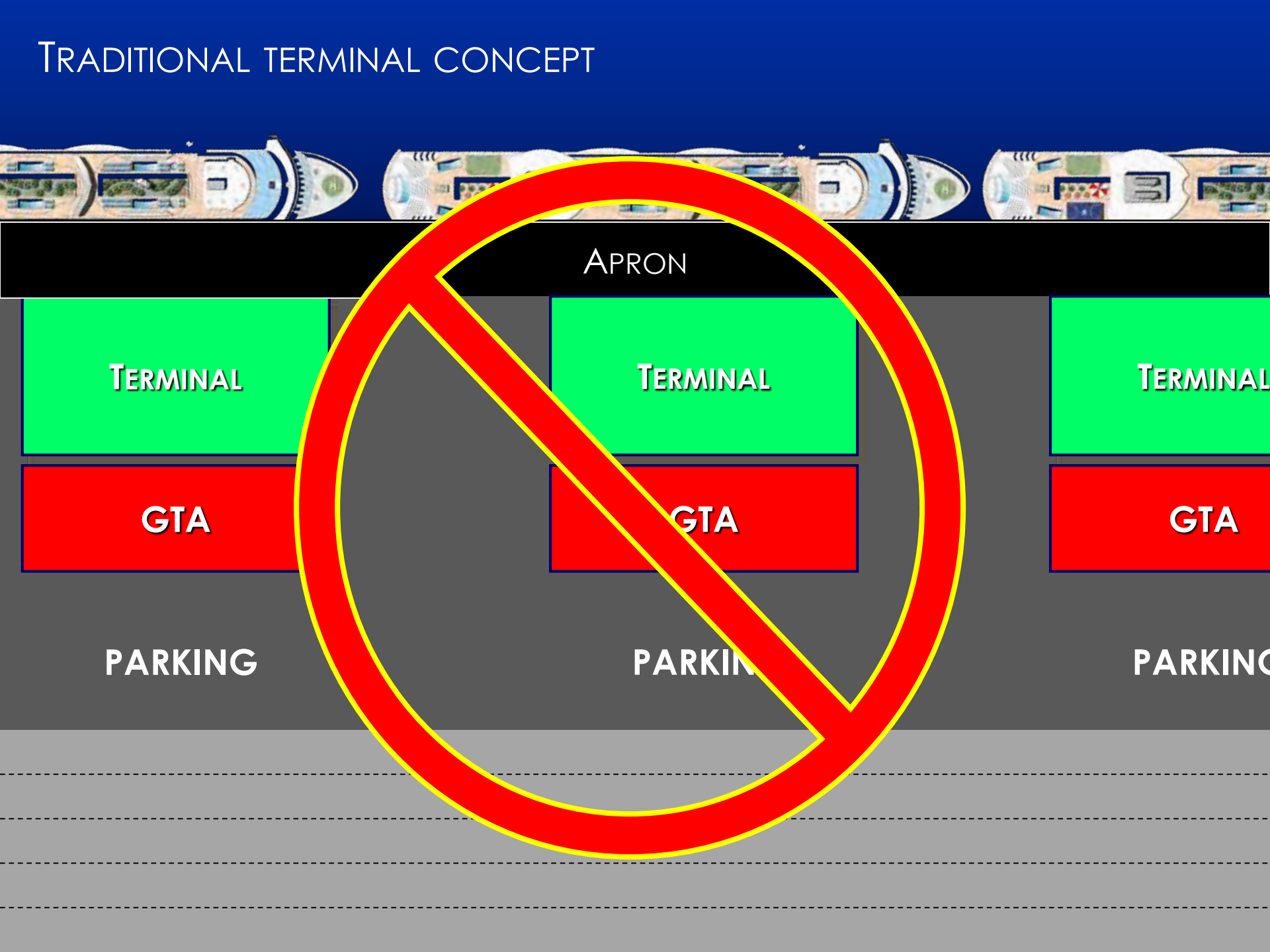
HOMEPORT PASSENGER MOVEMENTS – SMALL SHIPS



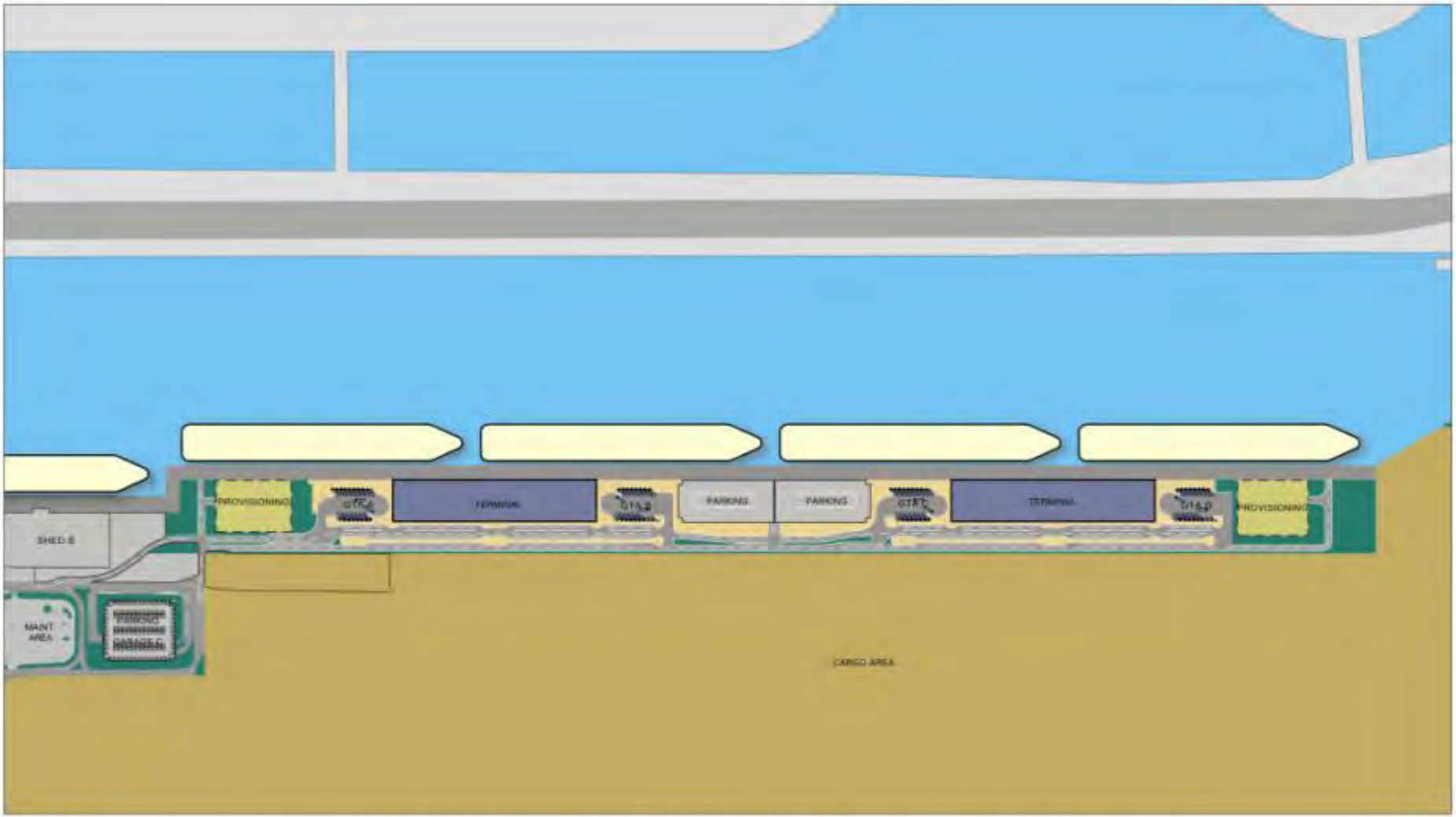
HOMEPORT PASSENGER MOVEMENTS - TODAY



Traditional terminal concept



ALTERNATIVE (TWIN TERMINALS)



INTEGRATED TERMINAL AT WATERSIDE

APRON

PARKING

TERMINAL

GTA

REMOTE PARKING

APRON

TERMINAL

GTA

PARKING

REMOTE TRANSPORTATION

APRON

TERMINAL

GTA

PARKING

REMOTE CHECK-IN

APRON

TERMINAL

CHECK-IN

GTA

PARKING

REMOTE TERMINAL

APRON

BOARDING

TERMINAL

GTA

PARKING

PERFORMANCE STANDARDS

Critical design issues

1. Segregate embarkation from disembarkation
2. Segregate modes of transportation
3. Provide the latest security – with flexibility
4. Improve functionality
5. Luggage handling technology
6. Integrate terminal into waterfront
7. Secondary uses

PASSENGER EXPERIENCE

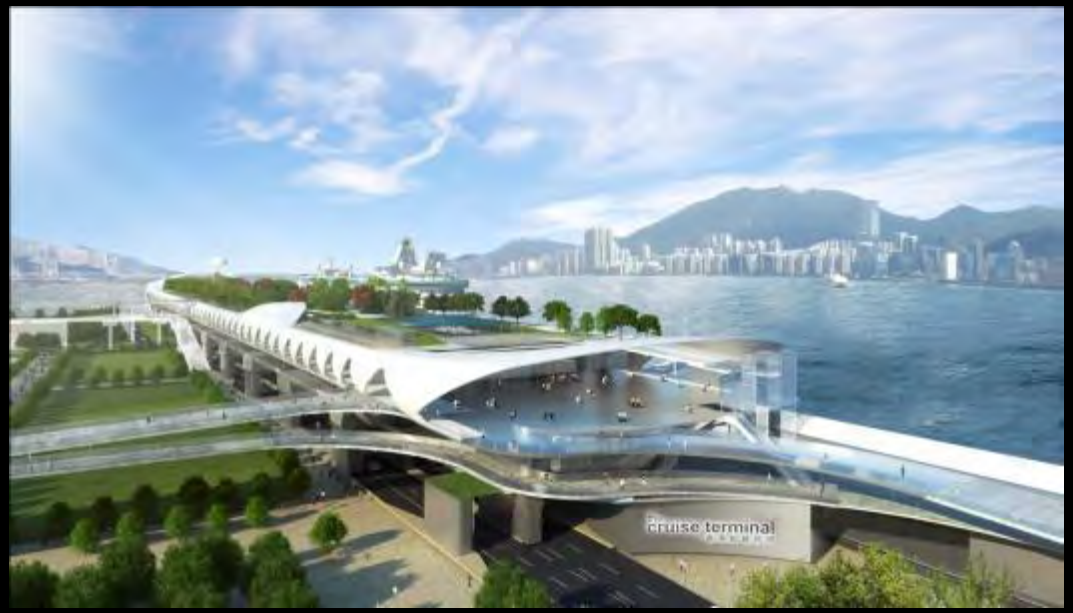
Facilities without operational targets…

- **Will not work anymore**
- Ships are too big
- Too many passengers

- There is no such thing as a small ship or large ship port
  - The complexity of the fleet
  - The introduction of multiple class vessels
  - The mobility of the fleet

- All ports must be flexible to support universal designs

Newest terminals in the newest markets



Performance standards

- Passenger experience
  - Time
  - Flow
  - Queues
  - Spaciousness
  - Direction
  - Friendliness
- Cruise company
  - Cost
  - Efficiency
  - Labor
  - Turn around time
  - Passenger experience
- Destination
  - Revenues and costs
  - Volumes

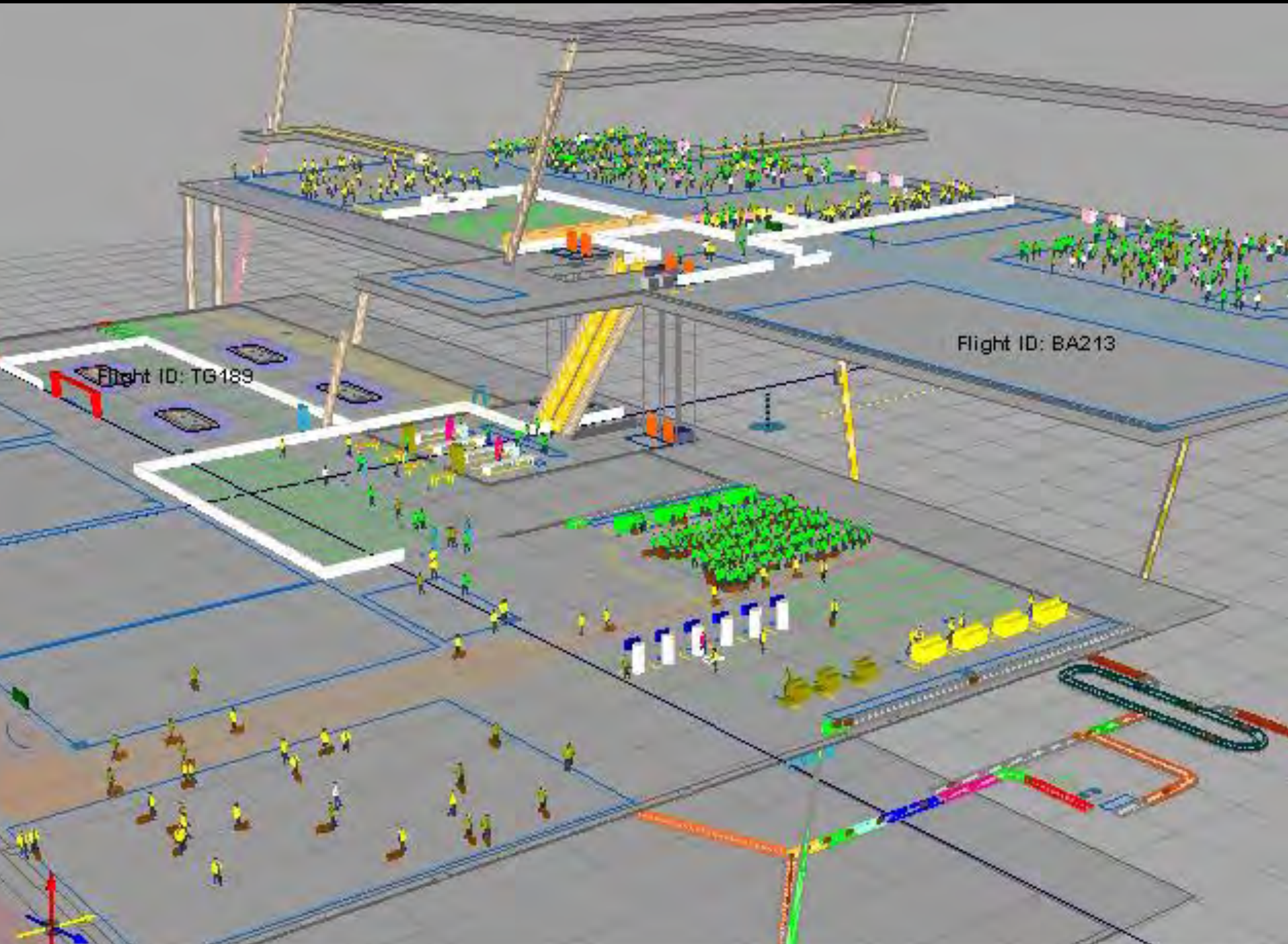
Performance standard

- Establish levels of terminal performance to match frequency or likelihood of demand
- Size the terminal with the Base Design Load (BDL)
  - Time to clear the ship
- Provide processing capacity for Peak Design Load (PDL)
  - Flow and capacity
- Concentrate on throughput improvements to reduce space needs

SIMULATION

7

Balance of capacities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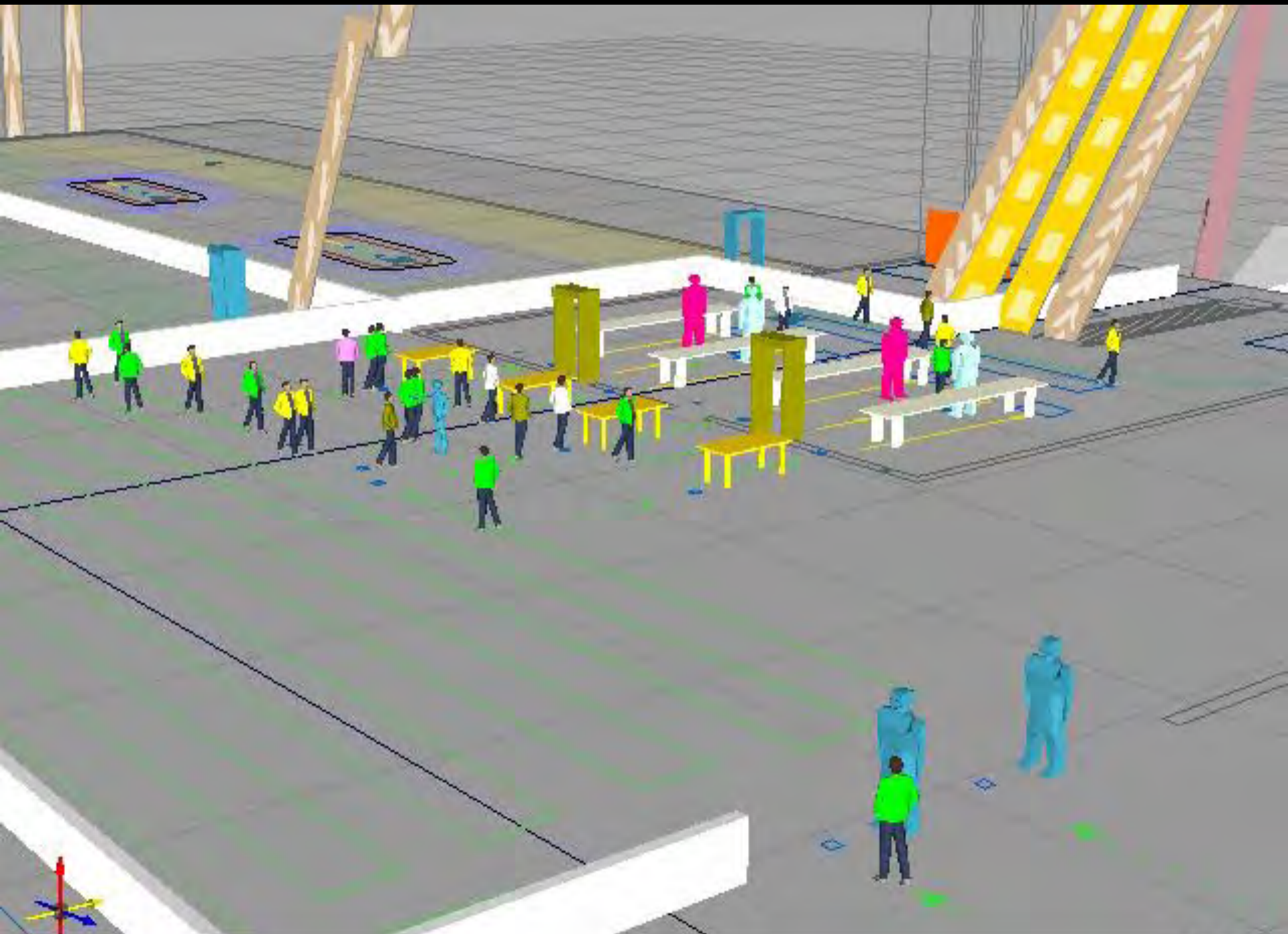
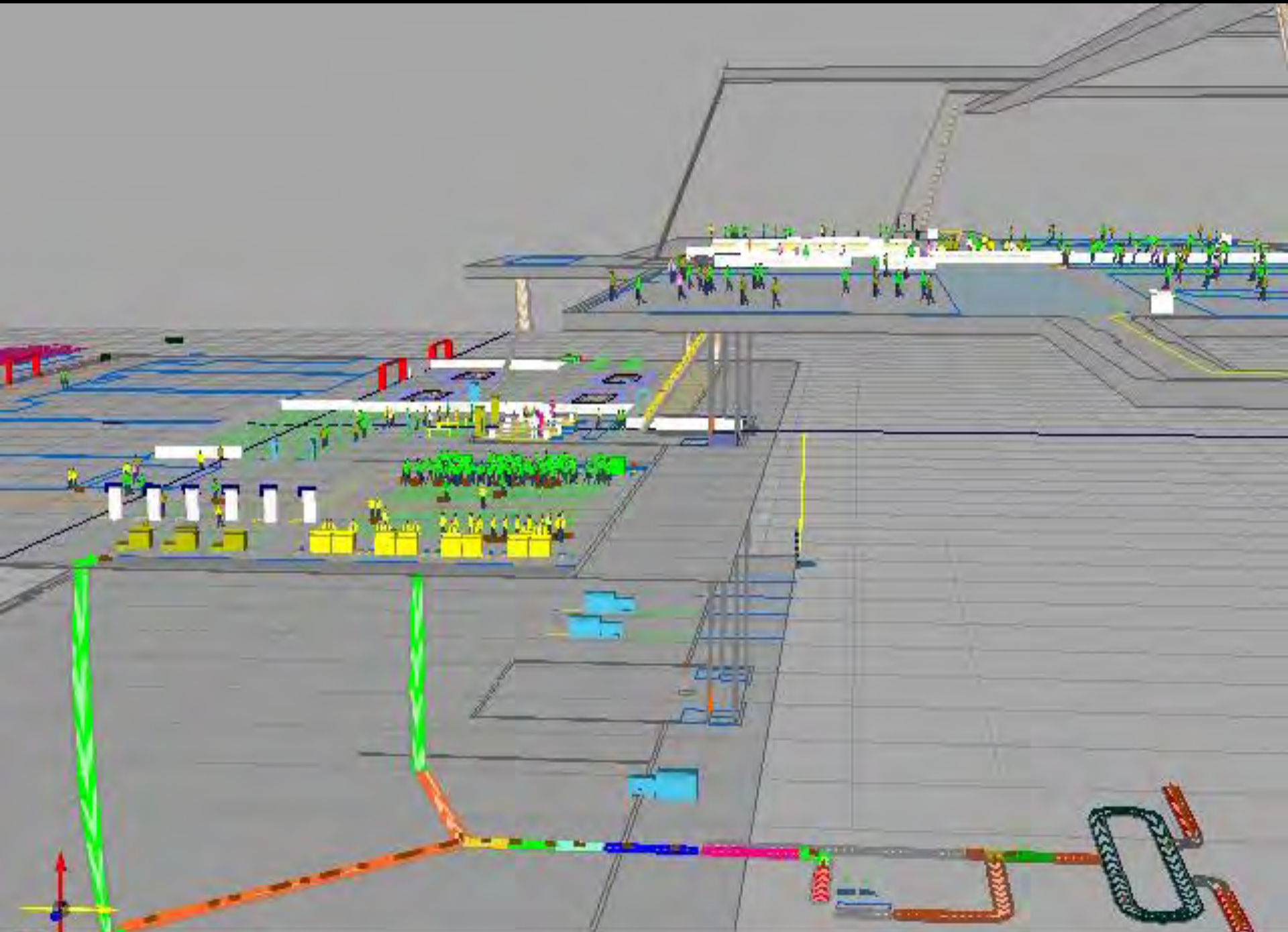
Flight ID: BA213





TRANSPORTATION

8

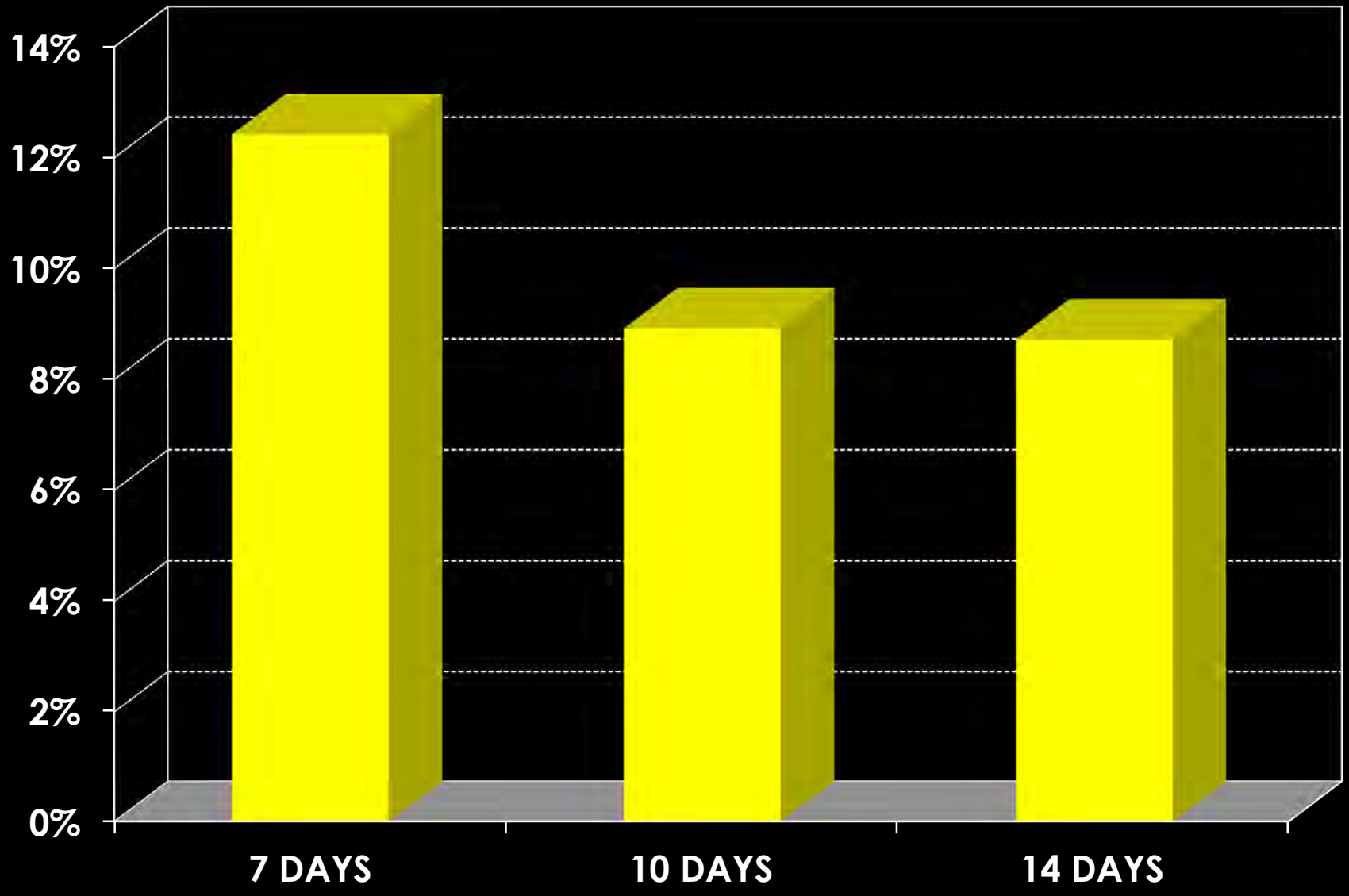
Challenges

- Marine - although a challenge it is not the major issue
- Land based activities need the focus and attention

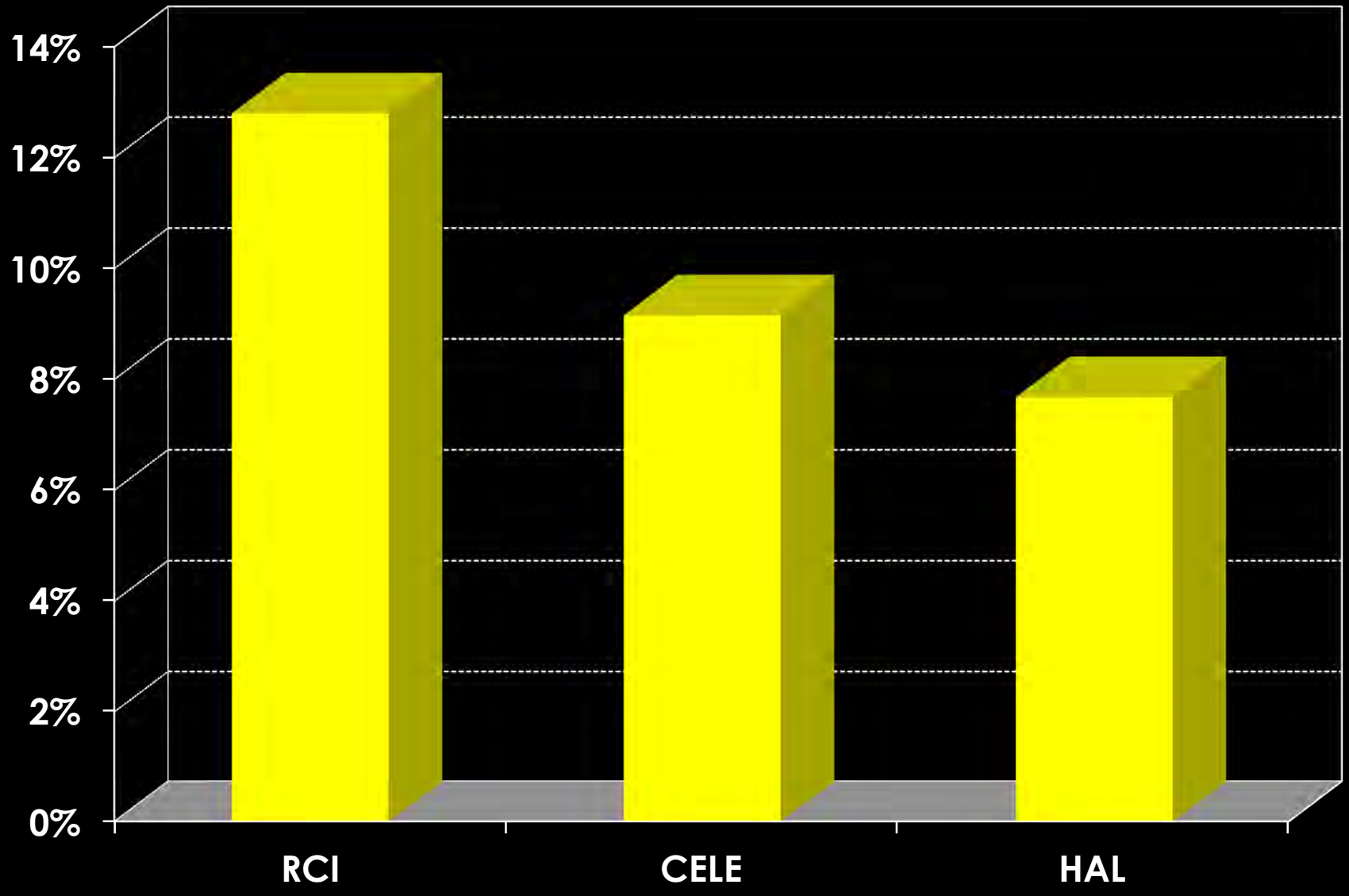
Traffic Impacts

- The main impact is to curbside operations
- The ideal Homeport has curbside capable of:
  - 10 to 16 bus operations simultaneously
  - Separate taxi operations with 30 to 50 meters active curb
  - Separate private vehicle drop-off/pick-up 30 to 50 meters
- Marshalling Area
- Parking highly variable by:
  - Cruise Line
  - Length of Cruise
  - Market
  - Cumulative impact
  - Maturity of market
  - Drive-sail vs. fly-sail composition

Parking vs. Length of cruise



Parking vs. Cruise line



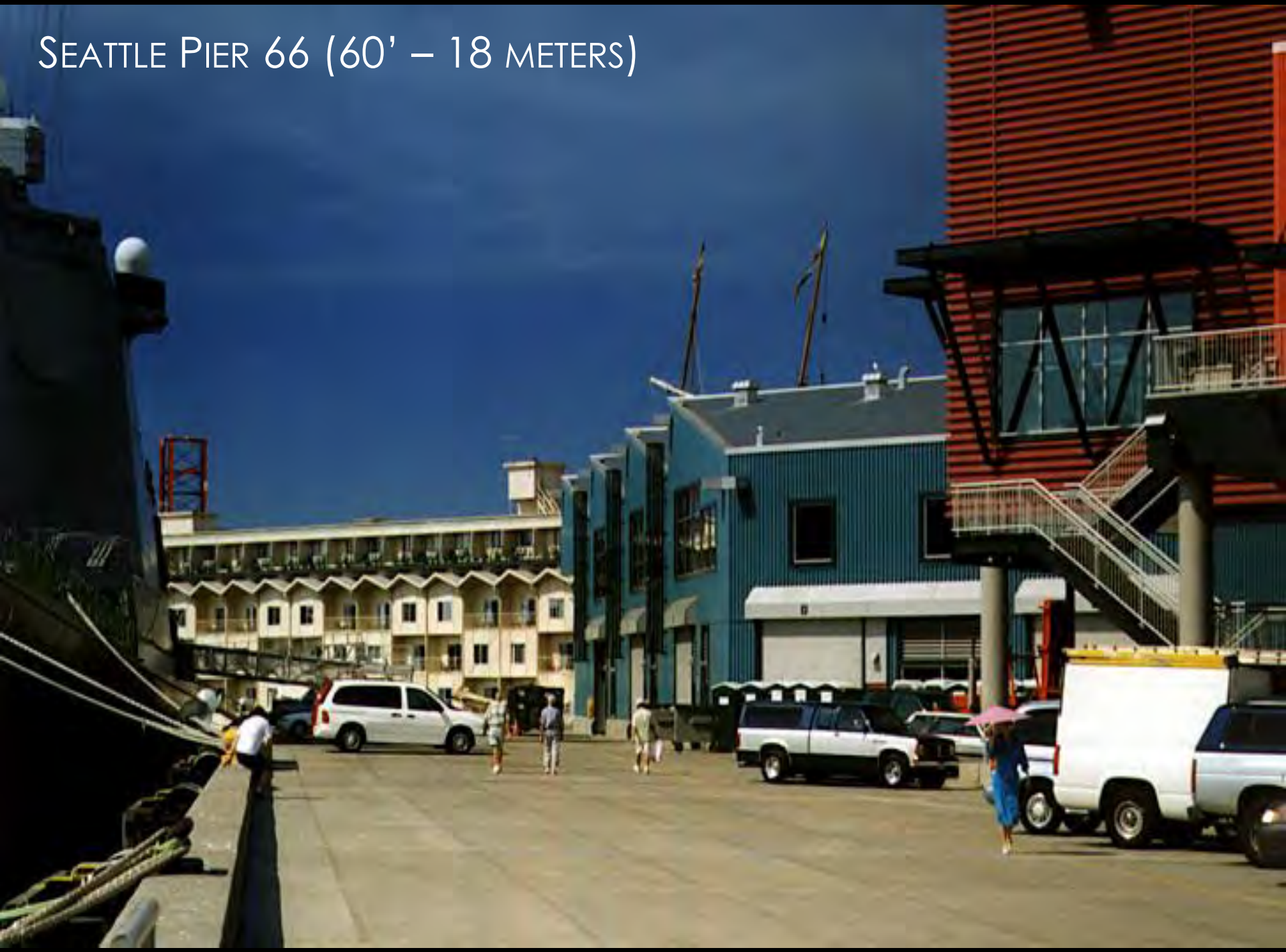
MARINE

9

Manhattan pier 88 (50' – 15 meters)

San Diego (35’ – 11 meters)

Seattle Pier 66 (60' – 18 meters)



Gangway Systems

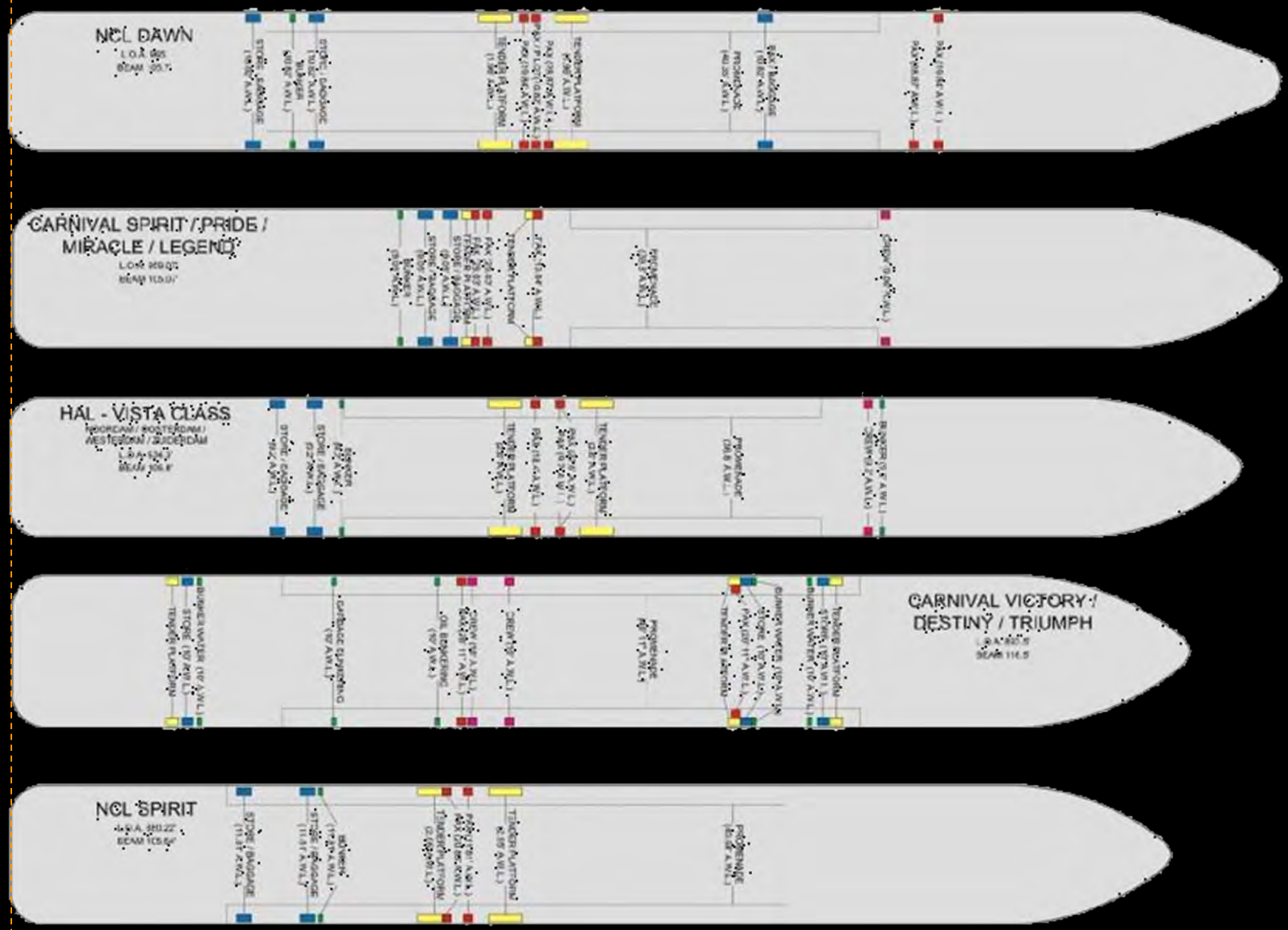
Gangways

- Most terminals have one gangway

- Some lines insist on two gangways
- Some ships must have two gangways

- The Oasis class requests three gangways

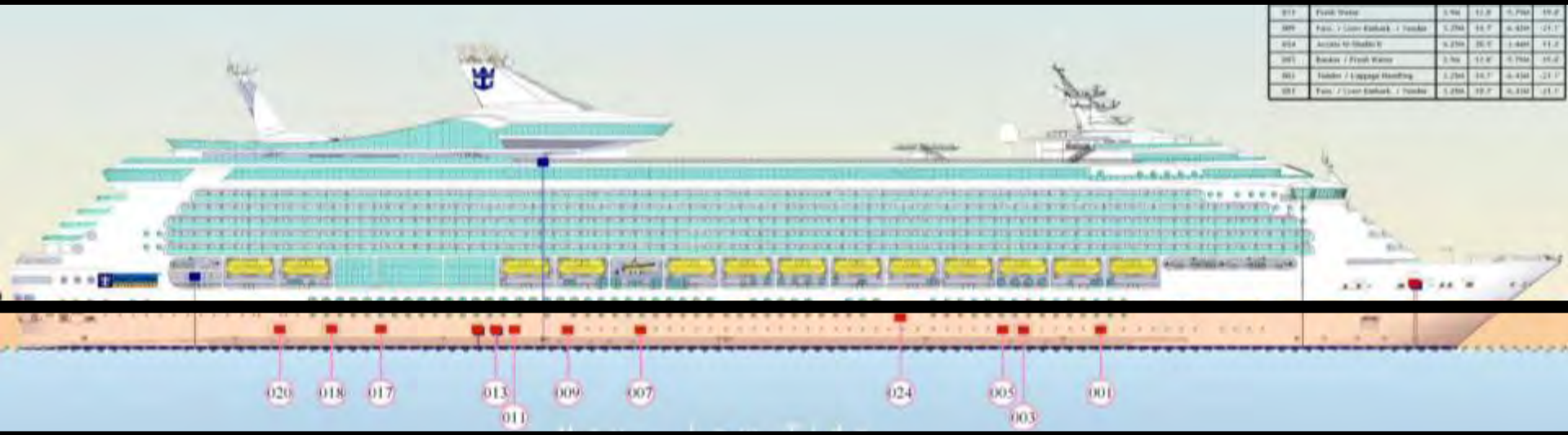
PASSENGER AND SERVICE DOORS



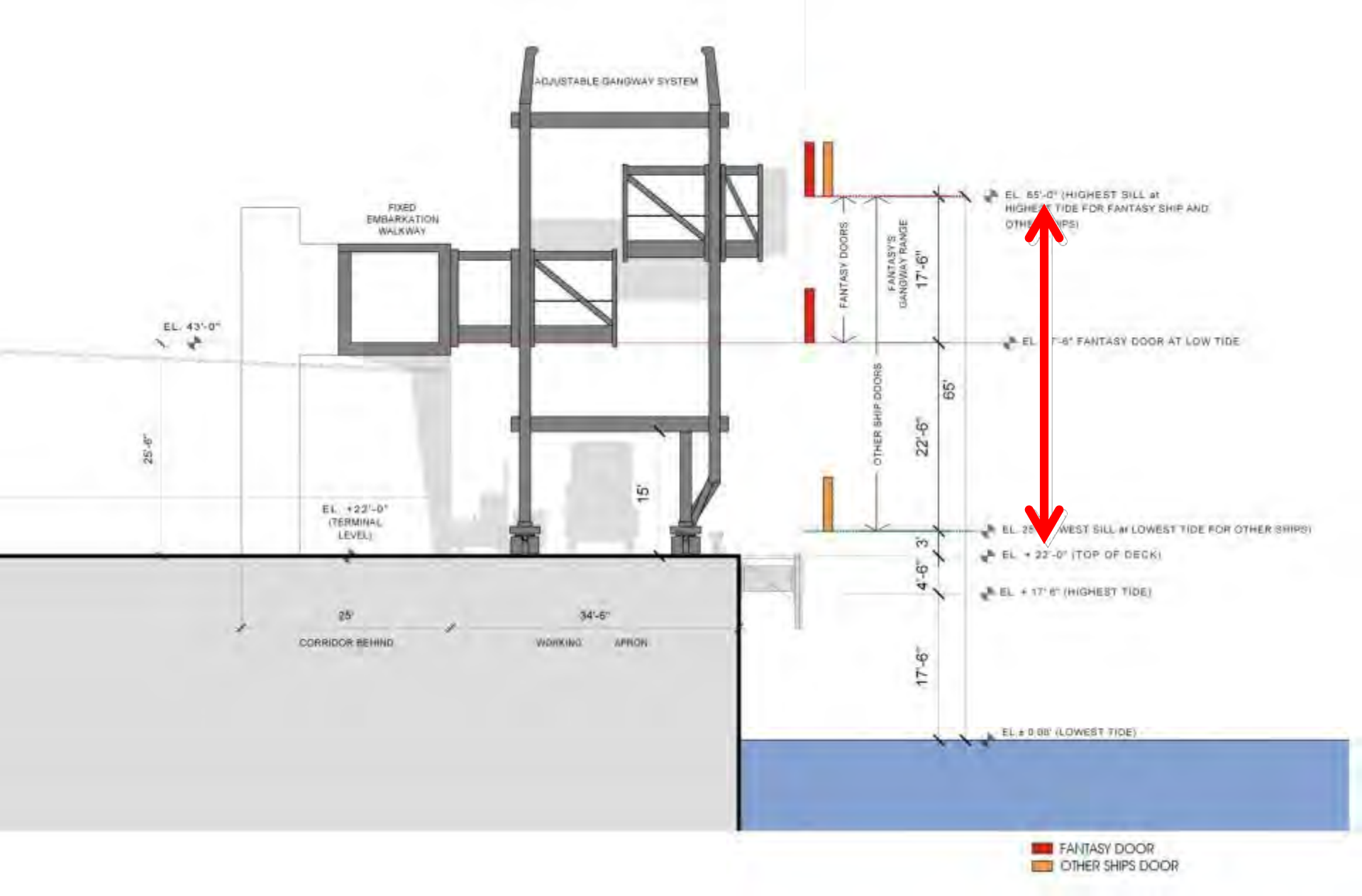
GANGWAY DESIGN GUIDELINES

- Horizontal Movement
  - Define by the different berthing scenarios
- Vertical Movement
  - Provide for ship sections +
  - Tide
- Stowage
- Cost

Door level analysis



GANGWAY


ADJUSTABLE GANGWAY SYSTEM
FIXED EMBARKATION WALKWAY
EL. 43'-0"
25'-6"
EL. +22'-0" (TERMINAL LEVEL)
15'
25'
CORRIDOR BEHIND
34'-6"
WORKING APRON
FANTASY DOORS
FANTASY'S GANGWAY RANGE
17'-6"
OTHER SHIP DOORS
22'-6"
65'
4'-6"
3'
17'-6"
EL. 65'-0" (HIGHEST SILL at HIGHEST TIDE FOR FANTASY SHIP AND OTHER SHIPS)
EL. 47'-6" FANTASY DOOR AT LOW TIDE
EL. 25' LOWEST SILL at LOWEST TIDE FOR OTHER SHIPS)
EL. + 22'-0" (TOP OF DECK)
EL. + 17' 6" (HIGHEST TIDE)
EL. ± 0.00' (LOWEST TIDE)
FANTASY DOOR
OTHER SHIPS DOOR

Impact of new large ships on gangways

- Stand off distances are much larger
- Gangways need to be set back more

SHORE POWER

- Several ports are operable
- Reasons for ports or cities
  - Air quality emissions
  - Neighborhoods
- Reasons for the cruise lines
  - Cheaper power
- Challenges
  - Availability of cheap power
  - Cost of installation
    - Cheapest US$1.6 million for Seattle
    - Others +/- US$5.0 million

JUNEAU – FIRST INSTALLATION - 2001

Seattle Transformer, Main and Secondary Metering

Transformer Capacity: 32.50 Megawatts
Seattle Primary Voltage is 27 kv

On Shore Power Trench and Cabling

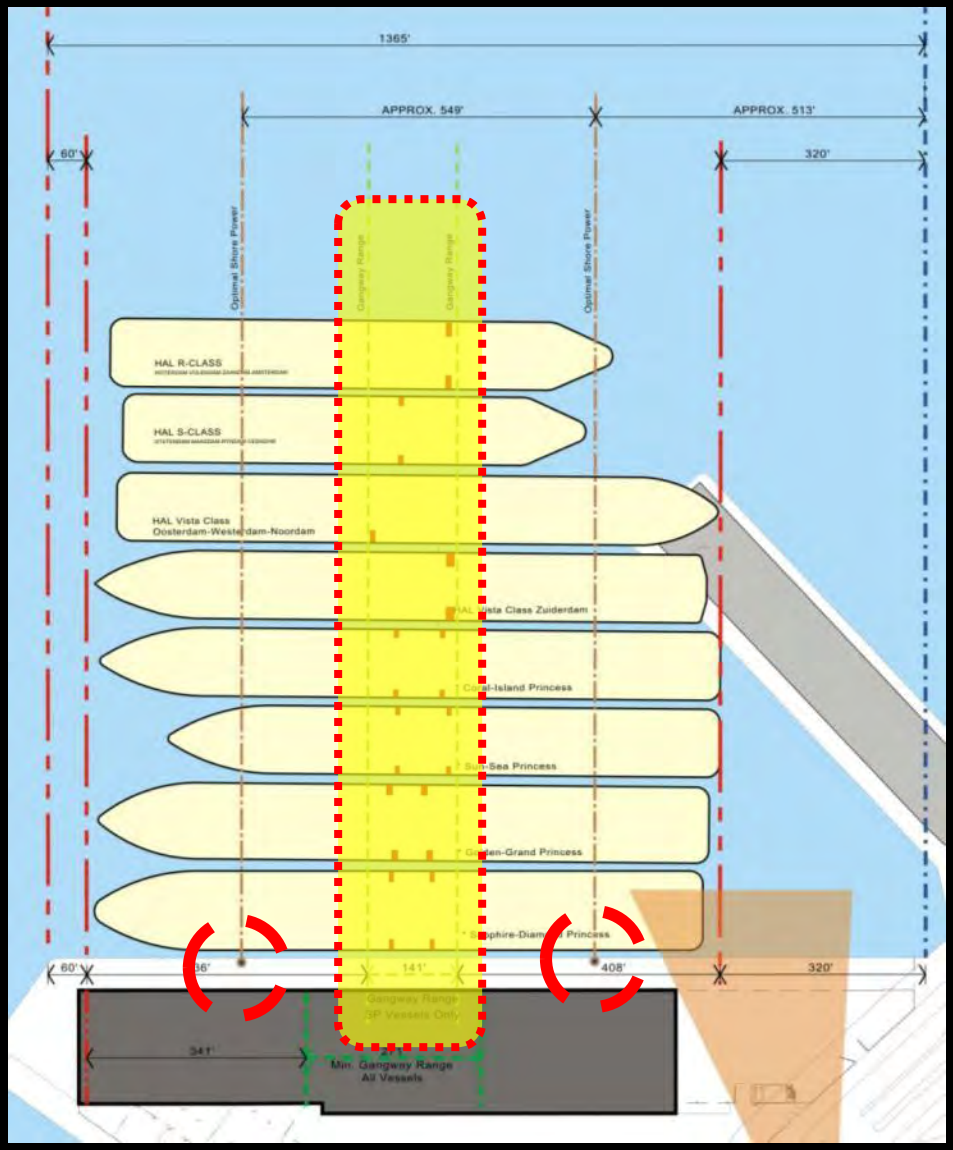
Seattle Cabling System – Power Cable Winch

- Seattle and Juneau single berth systems.
- Los Angeles mobile cabling units.
- Typically connection available on one side of vessel only.

Onboard Power Hook Up

- 3 Power Connectors.
- 1 Supervisory Control And Data Acquisition Connector.
- 1 Neutral Connector.
- Standardization of Cable Connections.

GANGWAY / SHORE POWER COORDINATION



FINANCIALS

10

Financing improvements

- For ports, usually the most difficult hurdle to overcome
- The industry is full of misperceptions
- In many cases ports relate to use financing models that work for cargo or other development – not the same
  - Allocation of costs
  - Allocation of risks
- Most ports have limited financial resources
- Many Caribbean and Latin American ports do not have total control of excess revenues

Both scenarios offer challenges

- Start-up ports
  - Lack of certainty
  - High start-up costs
  - Low volumes
  - Slow ramp up to profitability
- Legacy ports
  - Incremental increases
  - Rare that legacy ports have huge jumps in traffic
  - Usually large incremental costs
  - Fixing an old terminal could be as expensive as a new one

Financing realities

- Lines do not want tariff increases
- Lines have supported increases in strategic locations
- Lines have relocated due to cost differential
- Ports have used costs as a differentiator
- Ports in North America have not used visitor industry funds to support investments
  - Asia ports are funded through Tourism

Investments

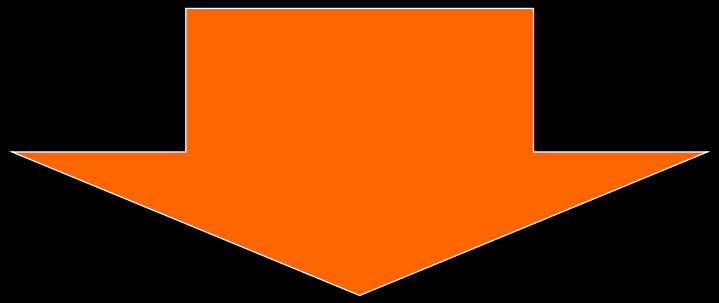
- Does it make sense?
  - Revenues support operations and return
- How do you mitigate risk of the investment?
- How do you stay competitive?
- How do cruise lines participate?
  - Direct investment
  - Underlying guarantees?

Back of the envelope analysis

- $50 m per terminal a port needs to net about $5.0 m per year
- To net about $5.0 m per year the port needs to gross about $10.0 m per year
- With 500,000 passengers / berth, the port needs to collect about $20 per passenger

SOURCING THE FUNDS

- Who has access to capital?
- Who can source the capital with the best terms?
  - Port
  - Cruise line
  - Operator
  - Private investor



- Who will take the risk?
  - Cruise line guarantees
  - Sovereign guarantees
  - Public Bonds guarantees

Evolution of cruise line involvement

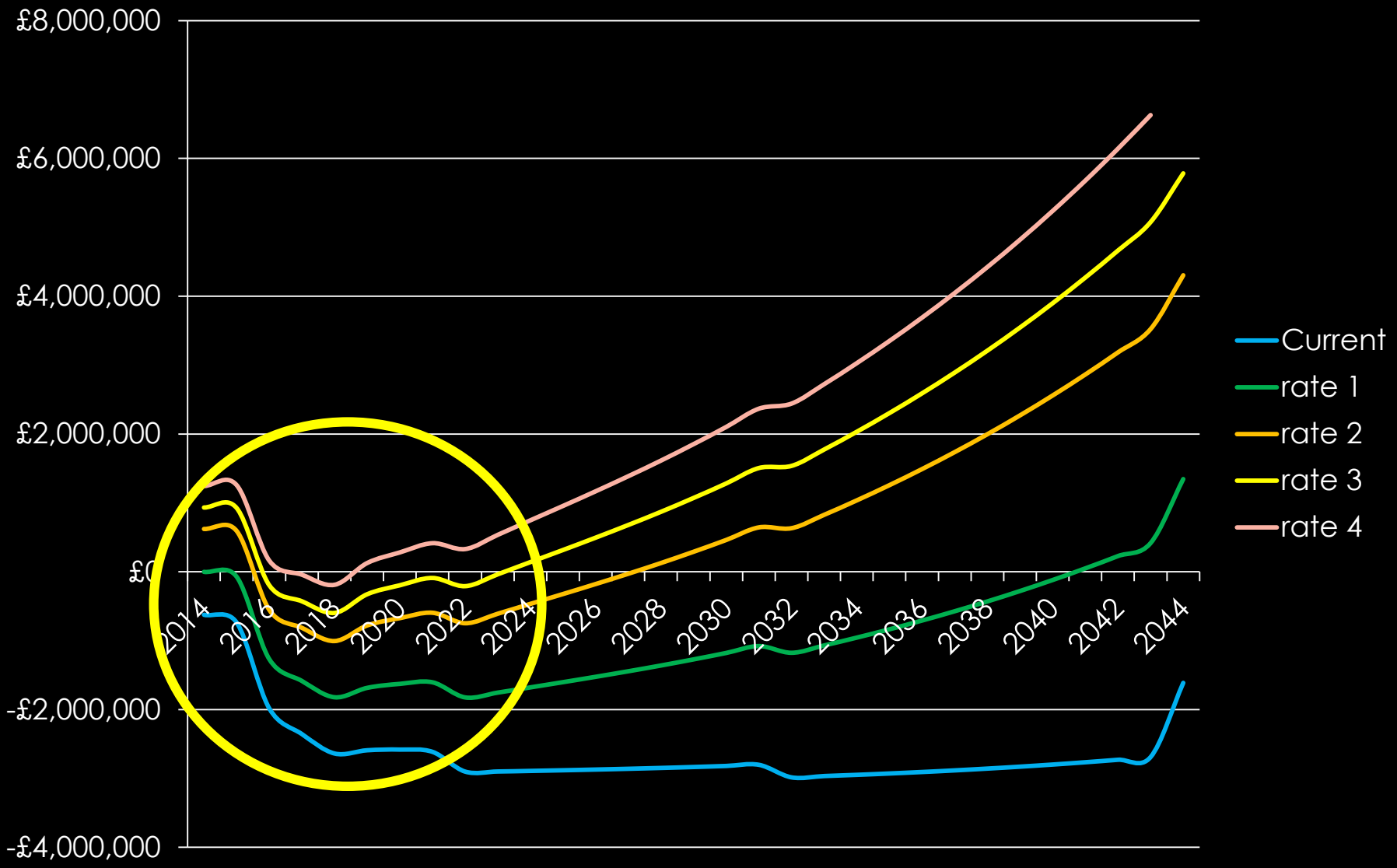
Agreements (PBA's) – Port perspective

- Used to support "investment" decisions
- Used to mitigate risk or assist with financing
- Used to obtain other funding
- Ties up the flexibility of the port
- Might result in discounting

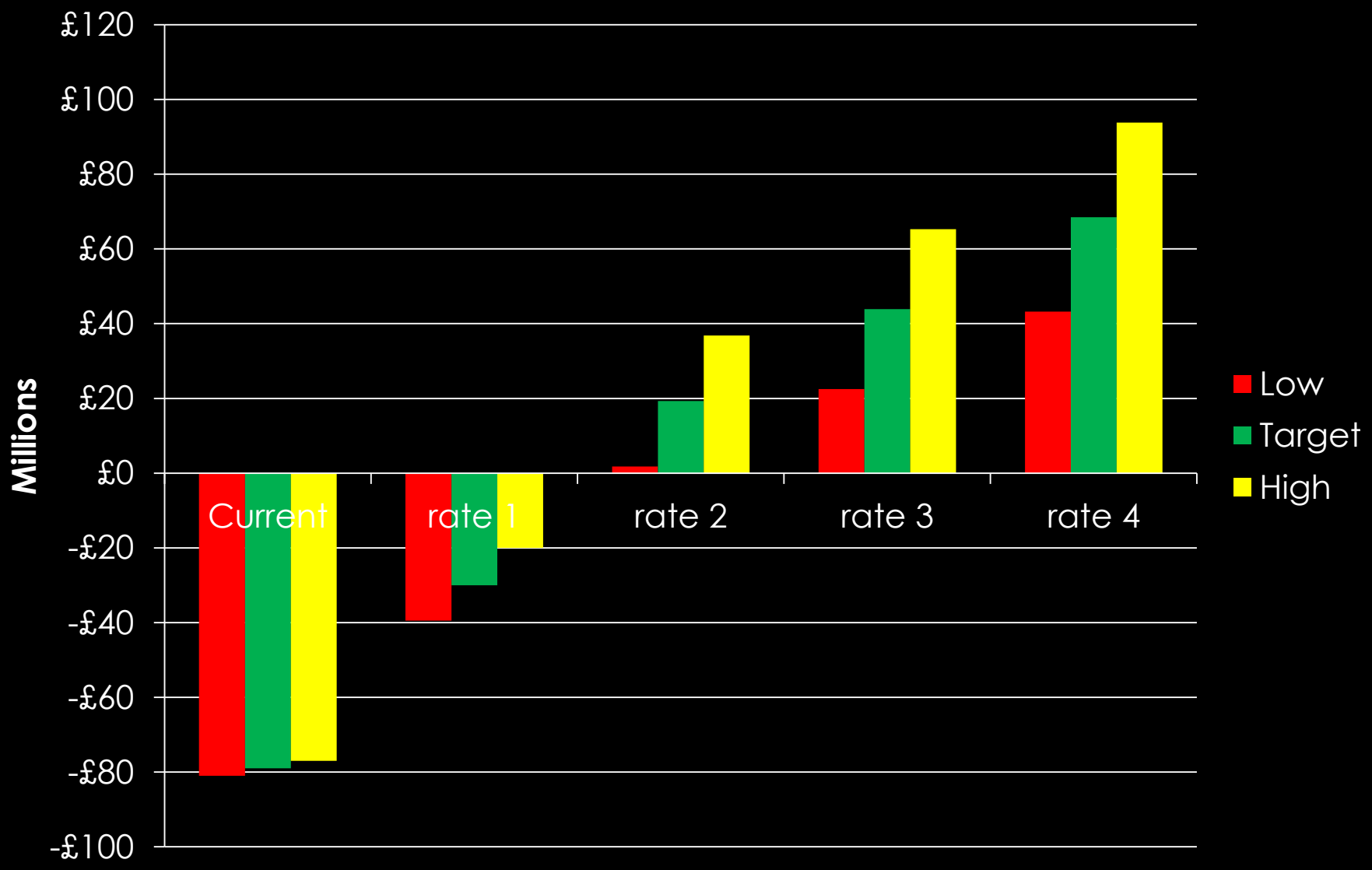
Agreements – Lines perspective

- Guarantee preferential berths
- Control or reduce tariffs
- Obtain a competitive edge

Net annual revenues from cruise operations (with investment)



30 YEAR EBITAD – SENSITIVITY TO VOLUMES AND TARIFFS



IRR – RISK ASSESSMENT (THIS IS FOR REFERENCE ONLY)

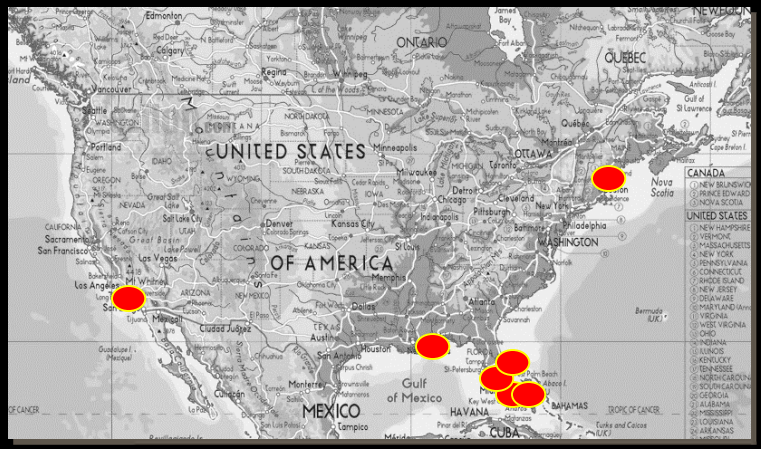
Traffic / Tariffs		Levels of anticipated traffic		
		Low	Target	High
Levels of tariff	Current	NA	NA	NA
	Rate 1	-6.6%	-4.2%	-2.3%
	Rate 2	1.1%	3.3%	5.3%
	Rate 3	3.8%	6.1%	8.3%
	Rate 4	6.1%	8.7%	11.1%

Operations

11

North American operation models

- Operated by the Port Authority
  - Miami
  - Port Everglades
  - San Diego
  - Canaveral
  - Tampa
  - Boston
  - New Orleans



- Concession to a terminal operator
  - San Francisco
  - Seattle
  - Los Angeles
  - Vancouver
  - New York

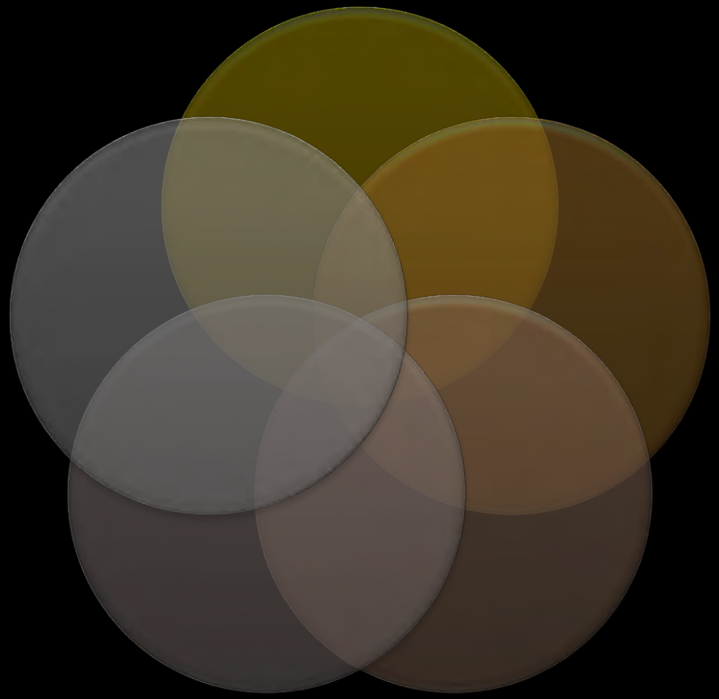
Terminal operations

- The operator is the building manager:
  - Maintenance
  - Perimeter security
  - Traffic control
  - Marketing
  - Scheduling
  - Housekeeping (Janitorial)
  - Sometimes:
    - Gangways
    - Ship spotting
- The actual ship operations are done by the:
  - Cruise lines
  - Stevedores
  - Ground handling

1 - Port Authority operated terminal

OWNER
- Port Authority

CRUISE LINE
- Passengers



STEVEDORE
- Independent company

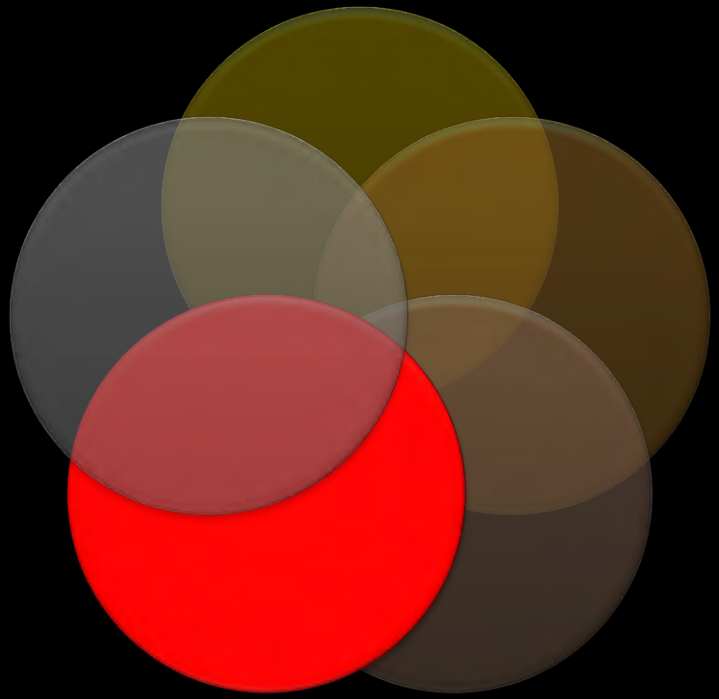
OPERATOR
- Port Authority

GROUND HANDLING
- Independent company

2 - Stand-alone third party terminal operator

OWNER
- Port Authority

CRUISE LINE
- Passengers



STEVEDORE
- Independent company

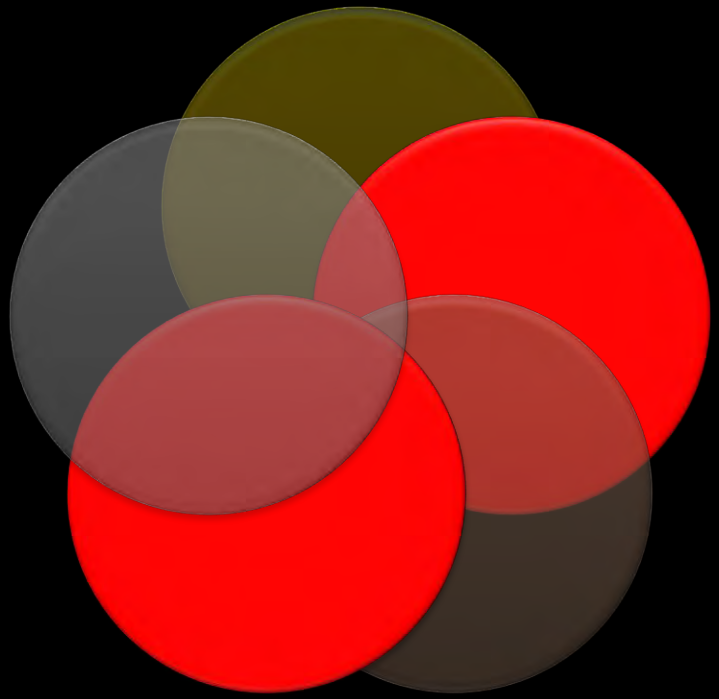
OPERATOR
- TO Company

GROUND HANDLING
- independent company

3 - Combined terminal operator + stevedoring

OWNER
- Port Authority

CRUISE LINE
- Passengers



STEVEDORE
- TO Company

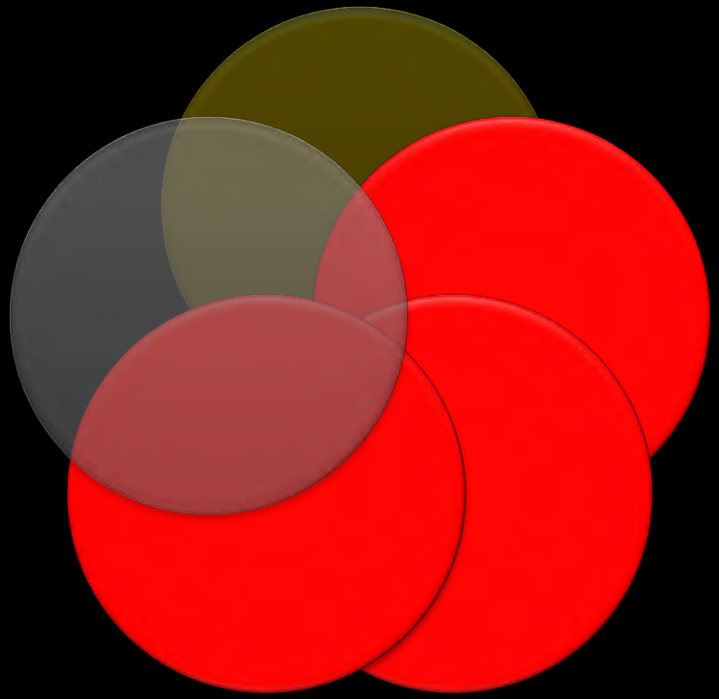
OPERATOR
- TO Company

GROUND HANDLING
- independent company

4 - TOTAL INTEGRATED MODEL

OWNER
- Port Authority

CRUISE LINE
- Passengers



STEVEDORE
- TO Company

OPERATOR
- TO Company

GROUND HANDLING
- TO Company

5 - Outsourced model

OWNER
- Port Authority

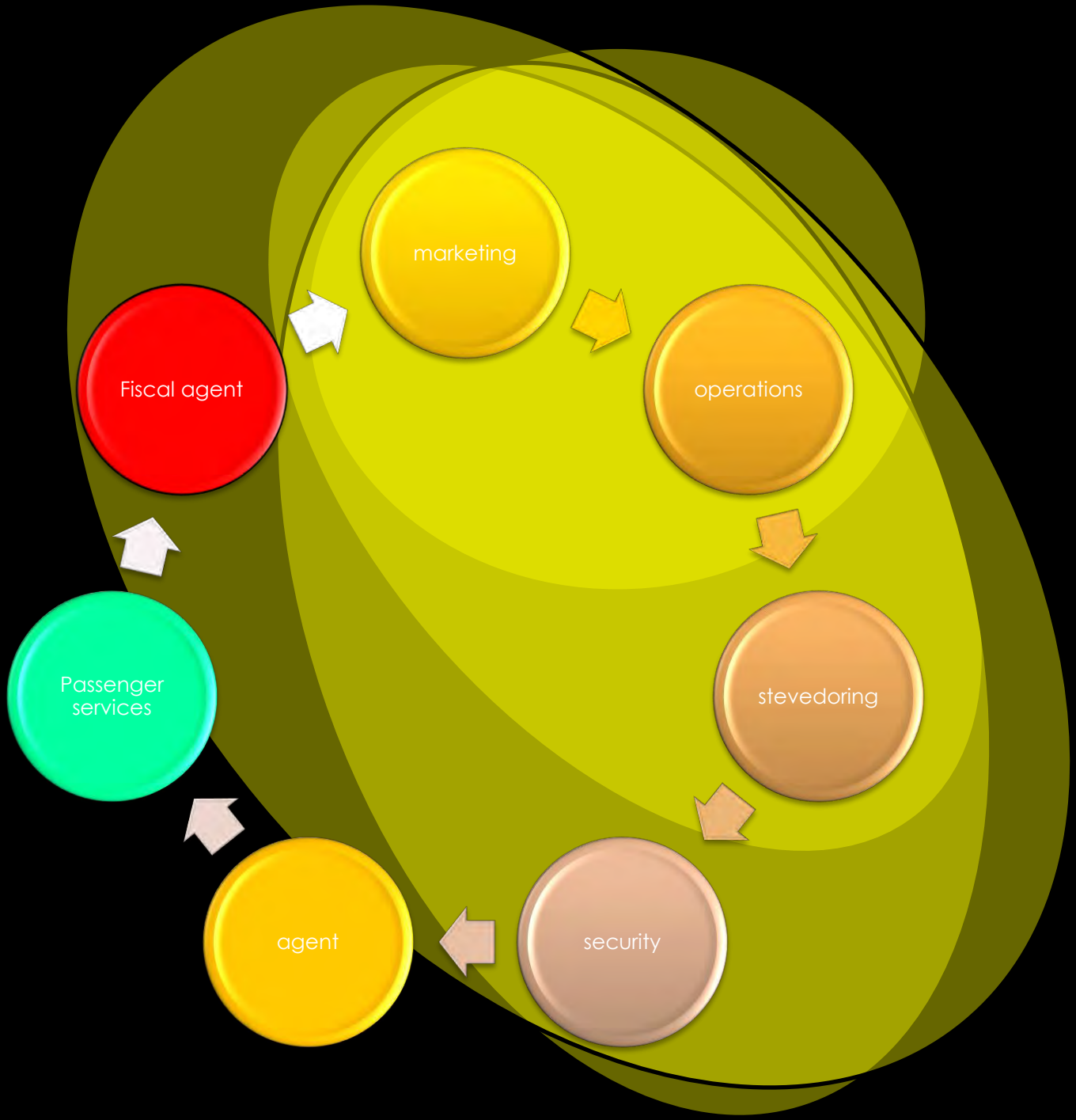
CRUISE LINE
- Passengers

STEVEDORE
- Independent company

OPERATOR
- Port Authority
  - Housekeeping company
  - Security Company
  - Parking company
  - Maintenance company

GROUND HANDLING
- Independent company

MODELS


marketing
operations
stevedoring
security
agent
Passenger services
Fiscal agent

Secondary uses

12

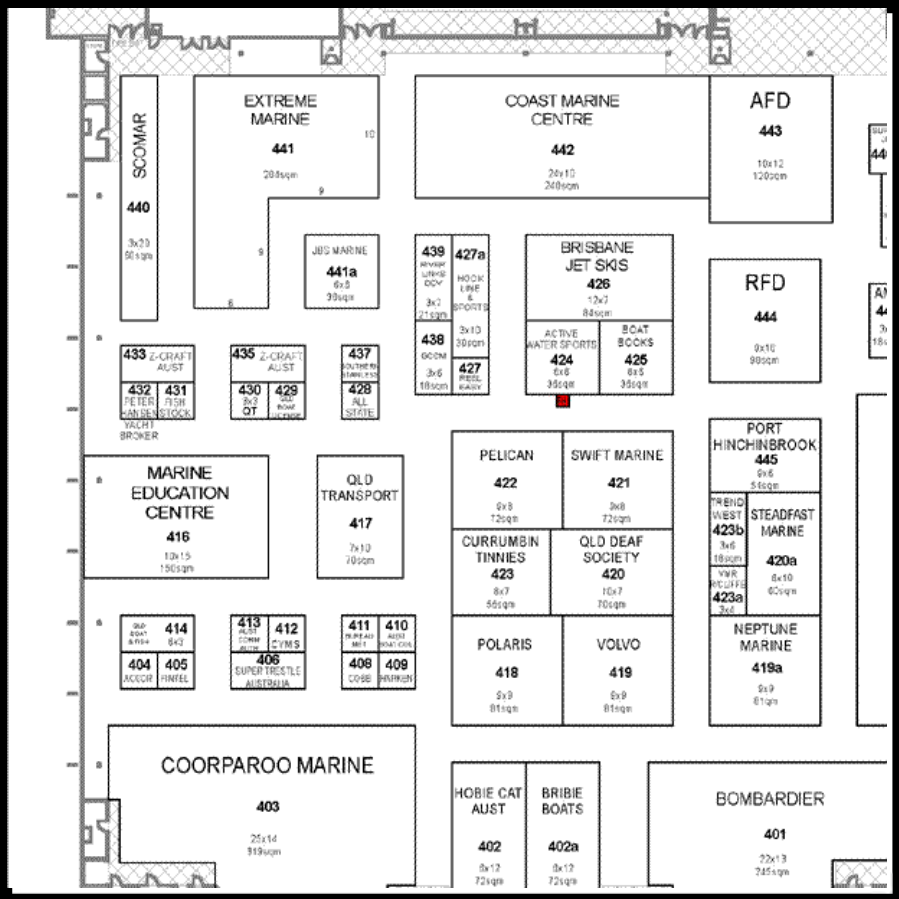
Broadway Pavilion

SECONDARY USES

- Between Cruises
- Nighttime
- Combination Uses

Ground Floor Exhibition / Trade Show Space

- Indoor Open Space
- 6 meter clear Height



MULTI-USE TERMINAL DESIGN

- Break out space
- 5 to 6 meter clear height






WATERFRONT

13

The Life Cycle of the Urban/Port Waterfront

In Europe all waterfronts have gone through the entire life cycle

In the new world, most ports have evolved differently skipping the formation period

Cruise ships enter the mix

- Bringing an urban use to a older waterfront
- The perfect blend between people and shipping

- But ----- cruise ships are also bringing certain issues that need to be planned
  - Congestion
  - Security
  - Access

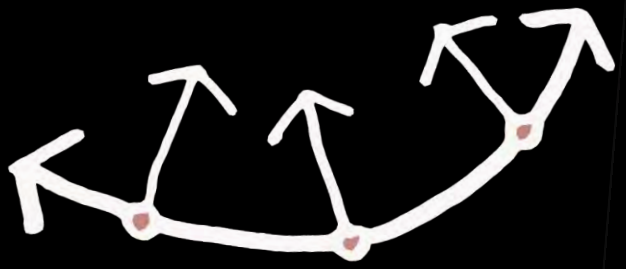




SHIPS ARE GROWING FASTER THAN WATERFRONTS CAN BE TRANSFORMED

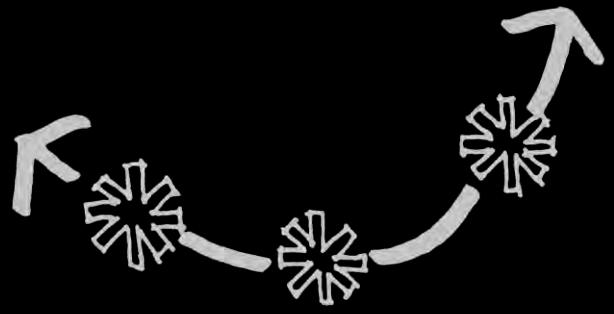
Accessible and continuous

Connected to the City



Made up of distinct elements

Unifying distinct and different districts



Case study – Tampa Bay

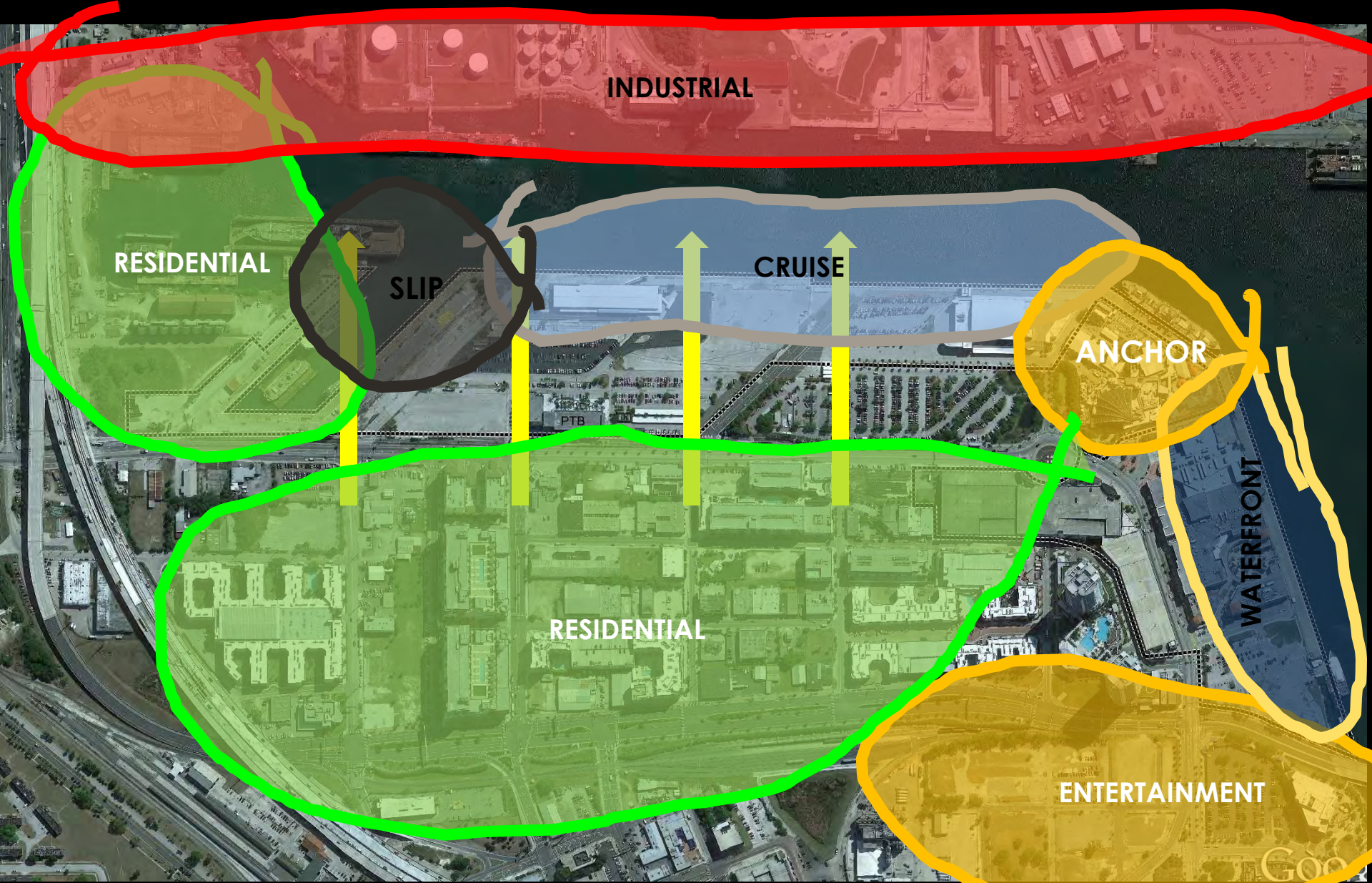
14

Property positioning

- **Then…**
  - Channelside properties were acquired with the underlying purpose to serve the cruise industry
  - Elements were added to create a tourism destination

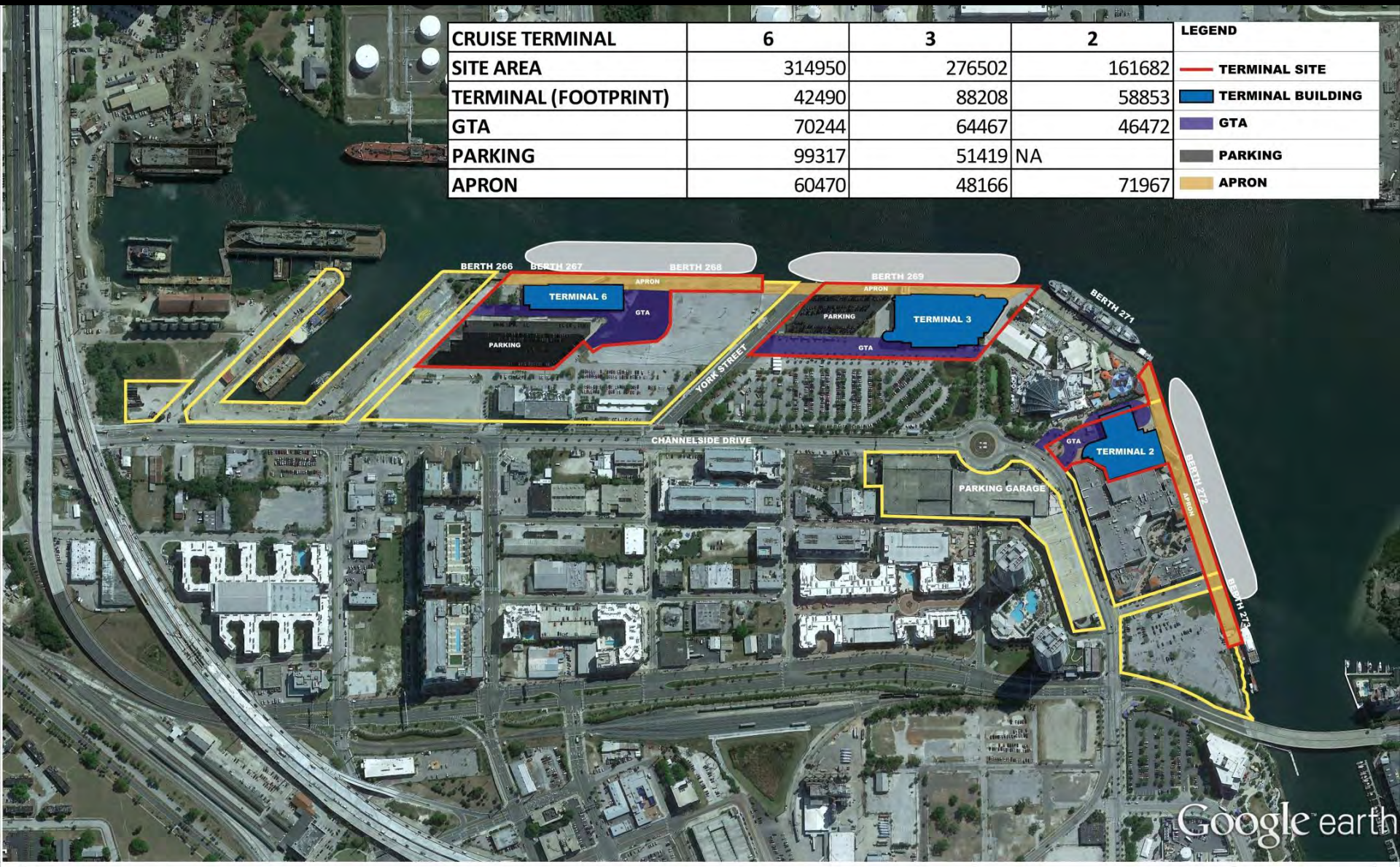
- **Now**
  - The site is limited for the cruise industry
  - Surrounding land uses are residential

SITE ORGANIZATION



Existing cruise terminals

CRUISE TERMINAL	6	3	2
SITE AREA	314950	276502	161682
TERMINAL (FOOTPRINT)	42490	88208	58853
GTA	70244	64467	46472
PARKING	99317	51419	NA
APRON	60470	48166	71967



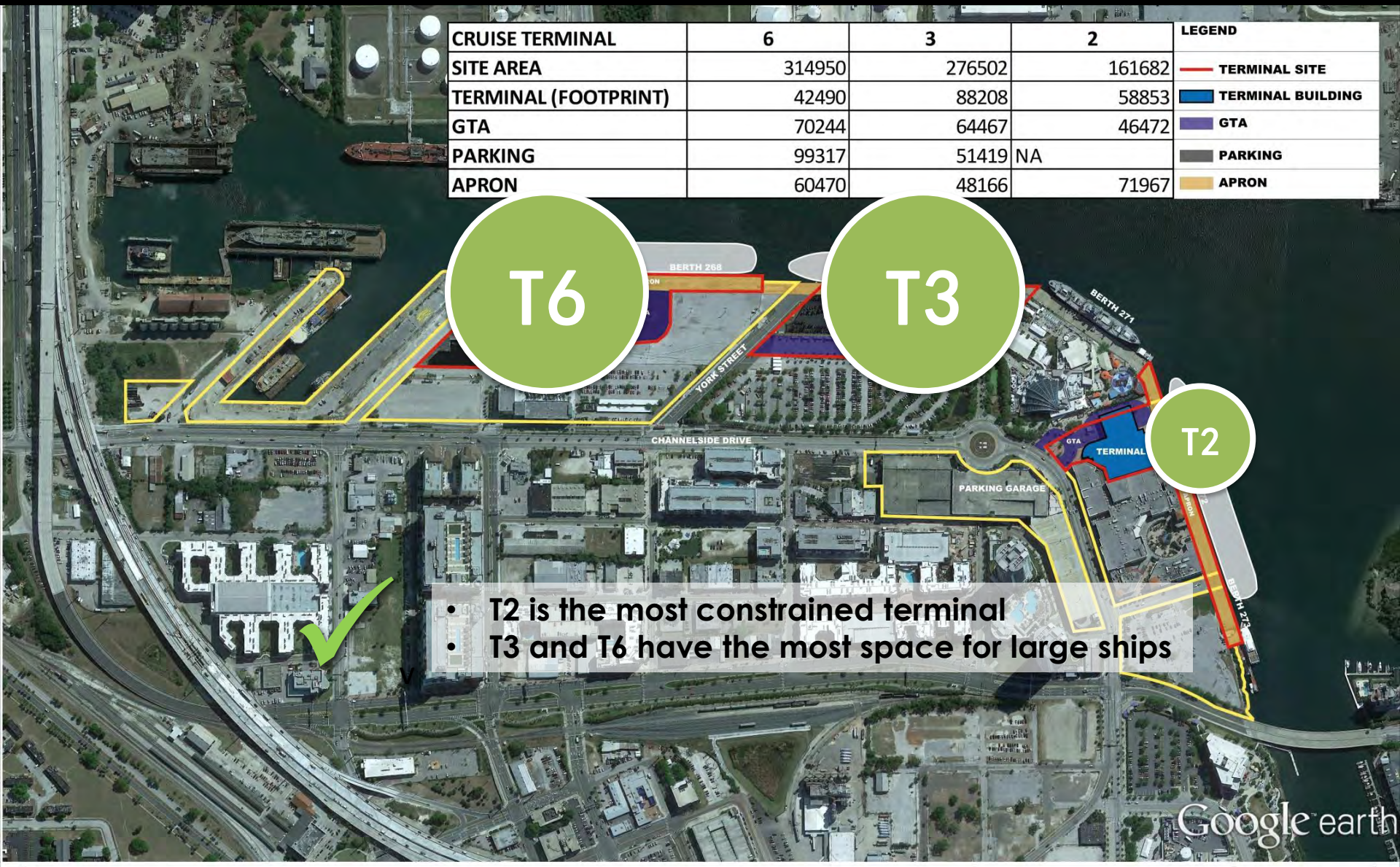
Channelside Master Plan
Tampa , Florida

EXISTING CRUISE TERMINALS

Graphic Scale

FEBRUARY 13, 2014

Option C3



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GTA	70244	64467	46472
PARKING	99317	51419	NA
APRON	60470	48166	71967

LEGEND
- TERMINAL SITE
- TERMINAL BUILDING
- GTA
- PARKING
- APRON

- T2 is the most constrained terminal
- T3 and T6 have the most space for large ships

PORT TAMPA BAY
RENAISSANCE PLANNING GROUP
ba BERMELLO AJAMIL & PARTNERS INC

Channelside Master Plan
Tampa , Florida

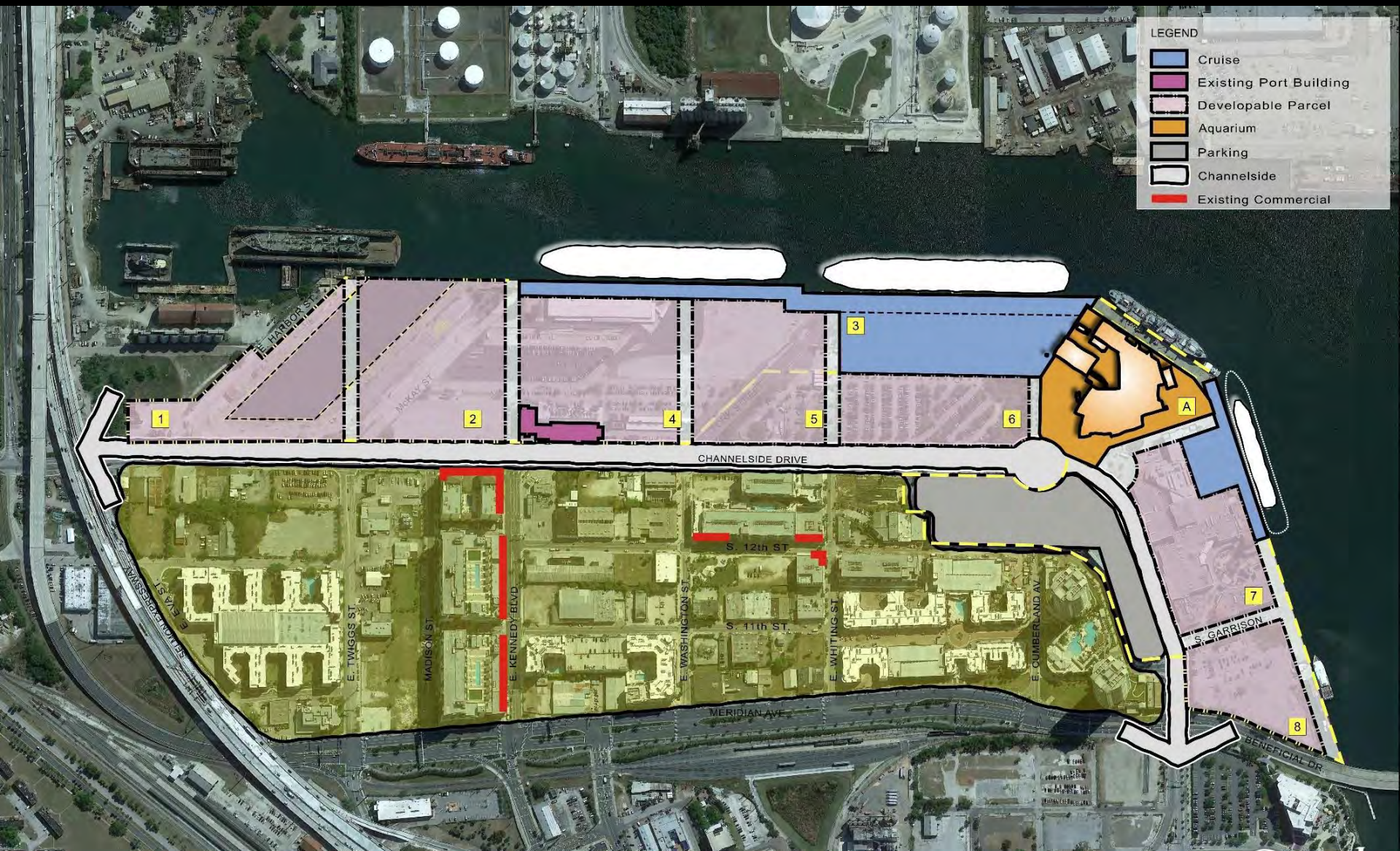
EXISTING CRUISE TERMINALS
Graphic Scale
FEBRUARY 13, 2014

Alternative A - Individual terminals

Alternative B - New central terminal

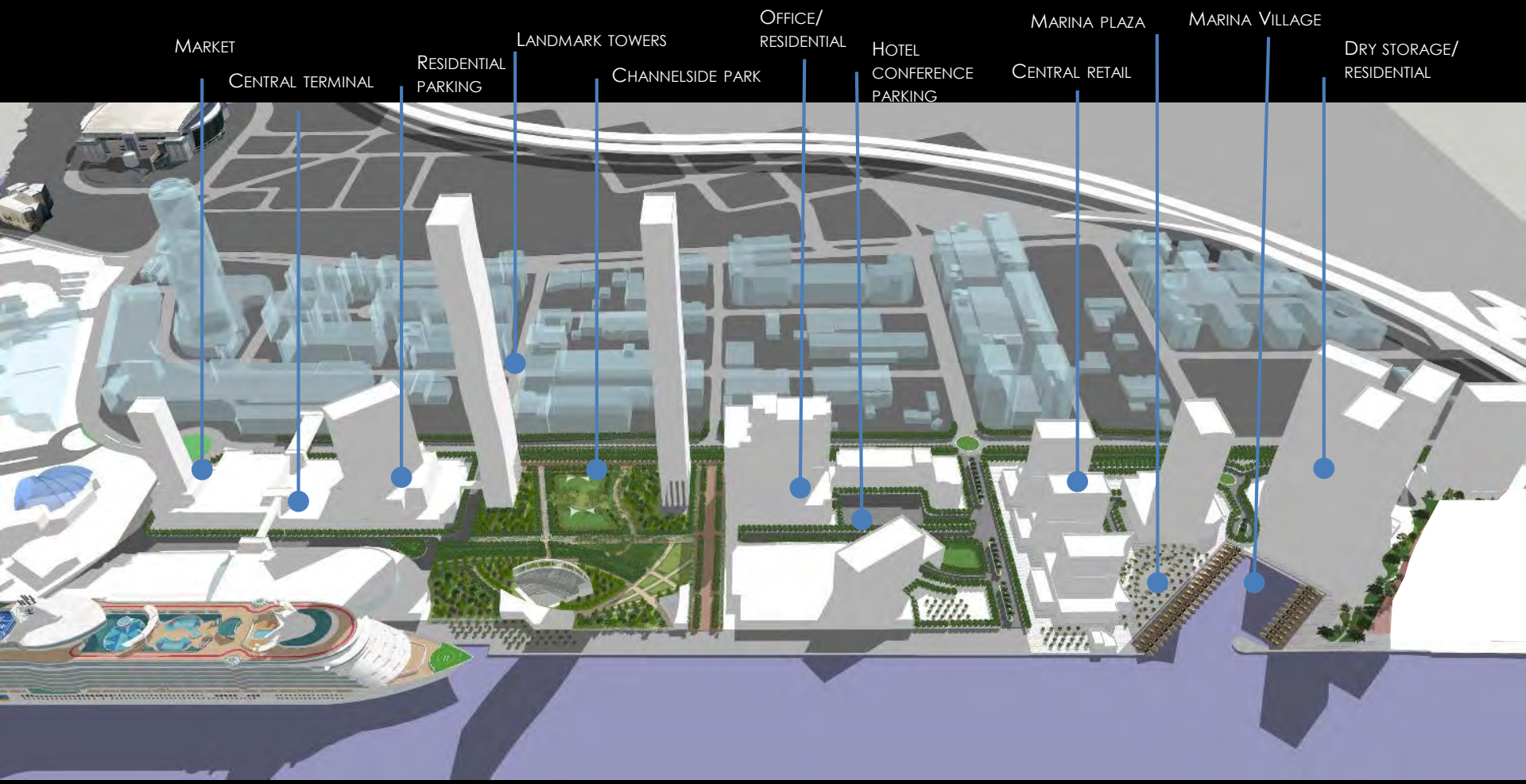
Alternative C - Joint terminal

Alternative C compact

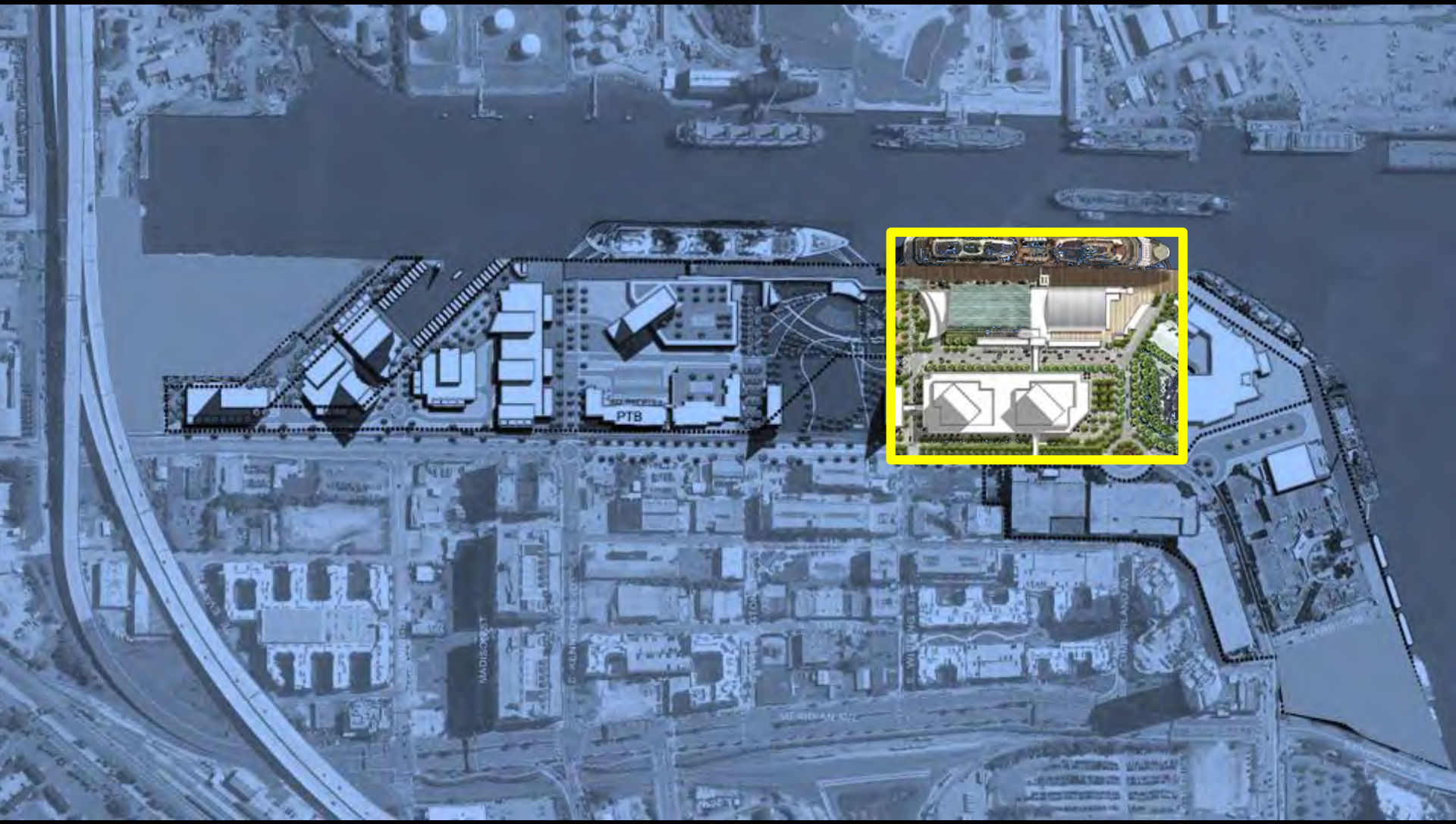


Channelside waterfront

Channelside waterfront

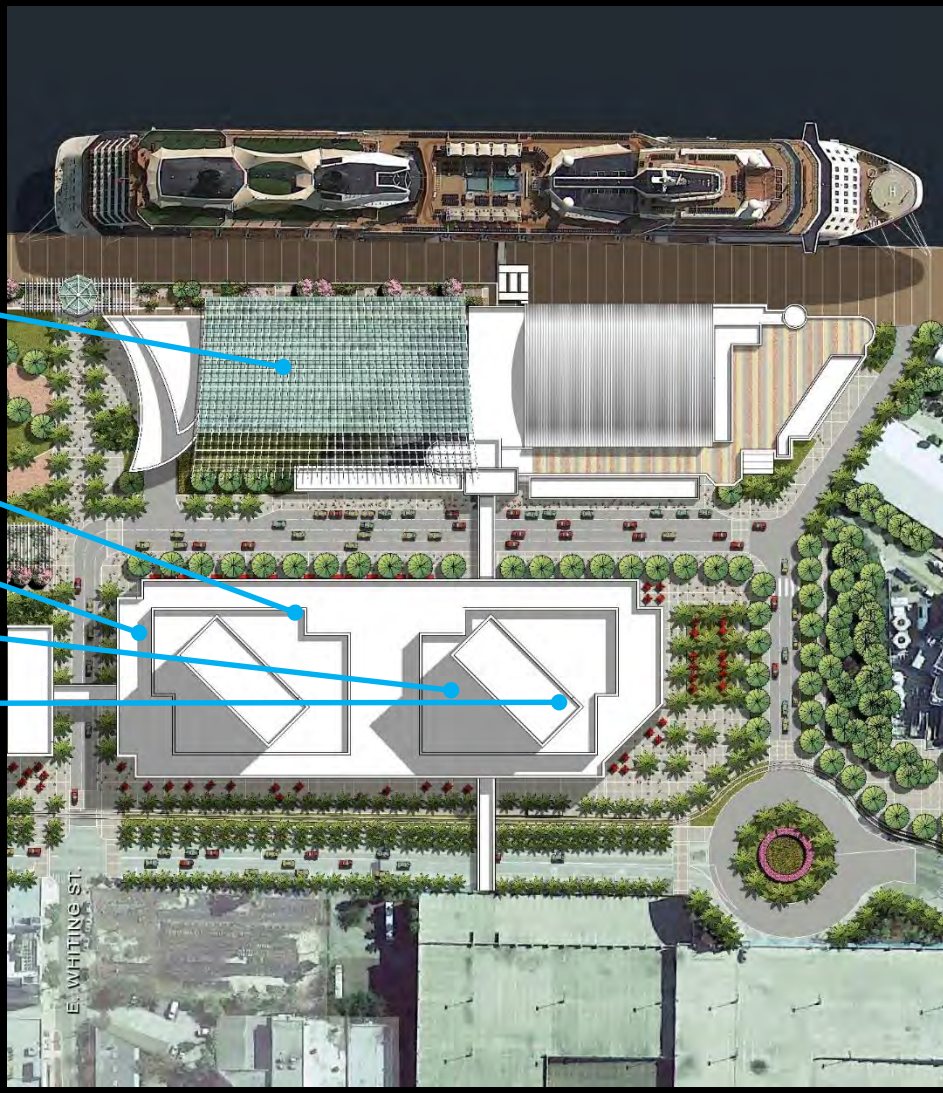


Cruise district



Cruise district

- Expanded terminal
  - Multi purpose
- Expanded parking
- Residential tower
- Hotel / commercial
- Mercado



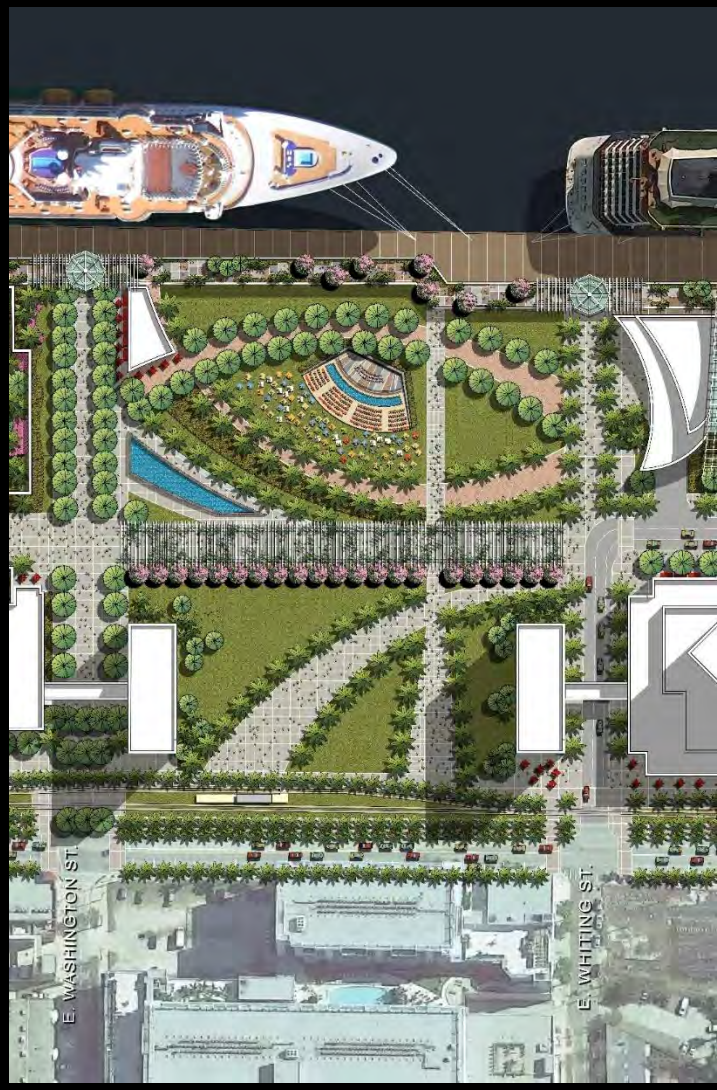
Cruise district

- Expanded parking
- Hotel / commercial
- Mercado
- Residential tower
- Expanded terminal
  - Multi purpose

A multi purpose cruise and conference center

Park district

Channelside maritime park



Channelside Park

Channelside Park

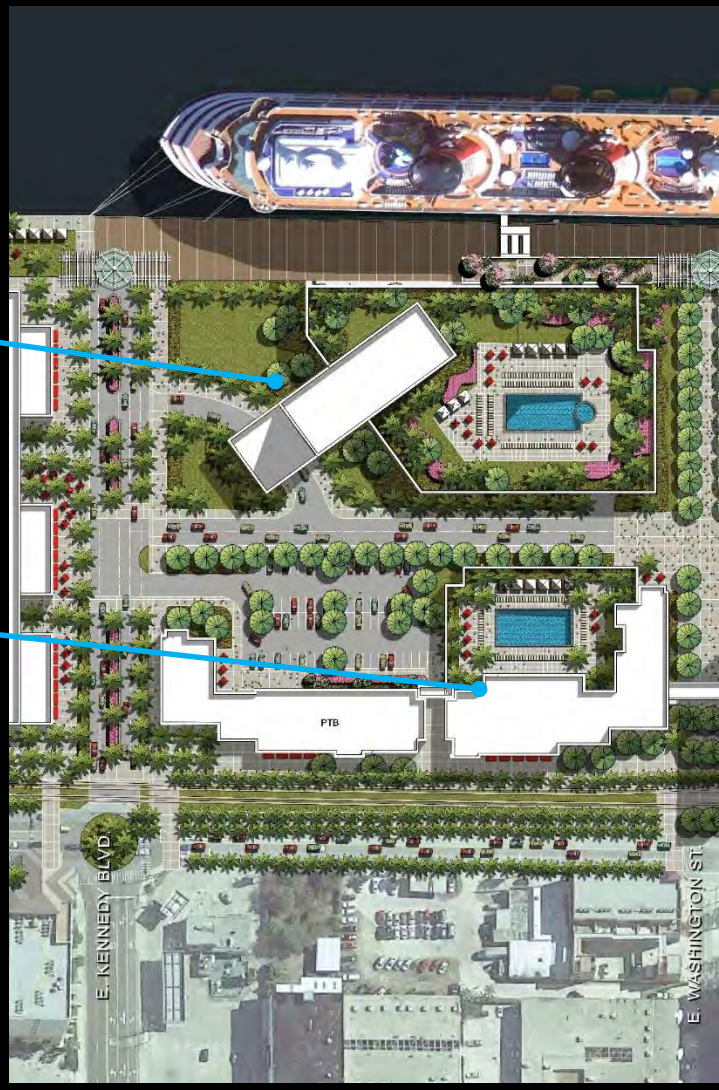
An urban/working waterfront

Multipurpose waterfront

Central waterfront

Central waterfront

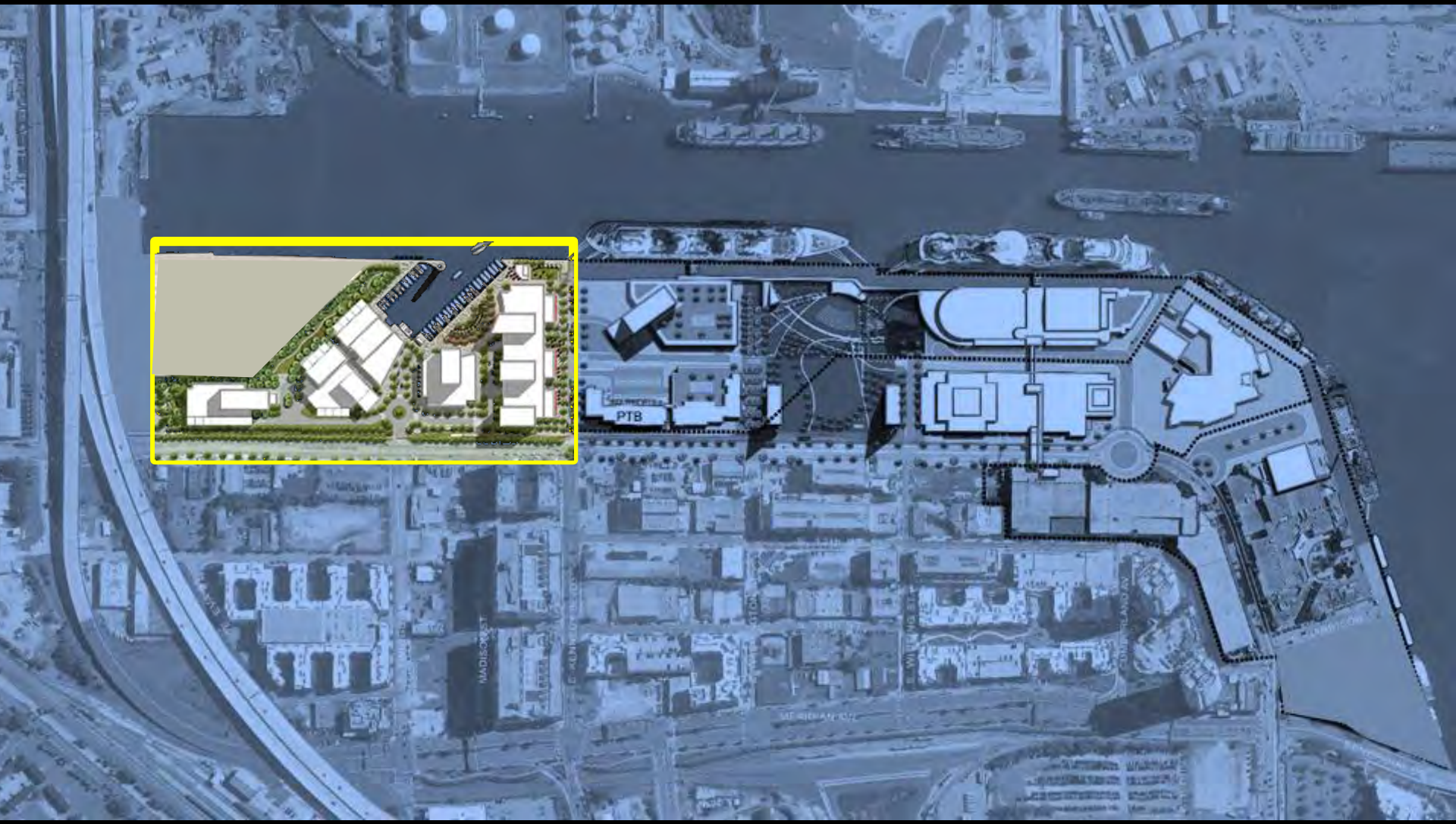
- Hotel / Commercial
- Office / residential



Central waterfront

- Office / residential
- Hotel / Commercial

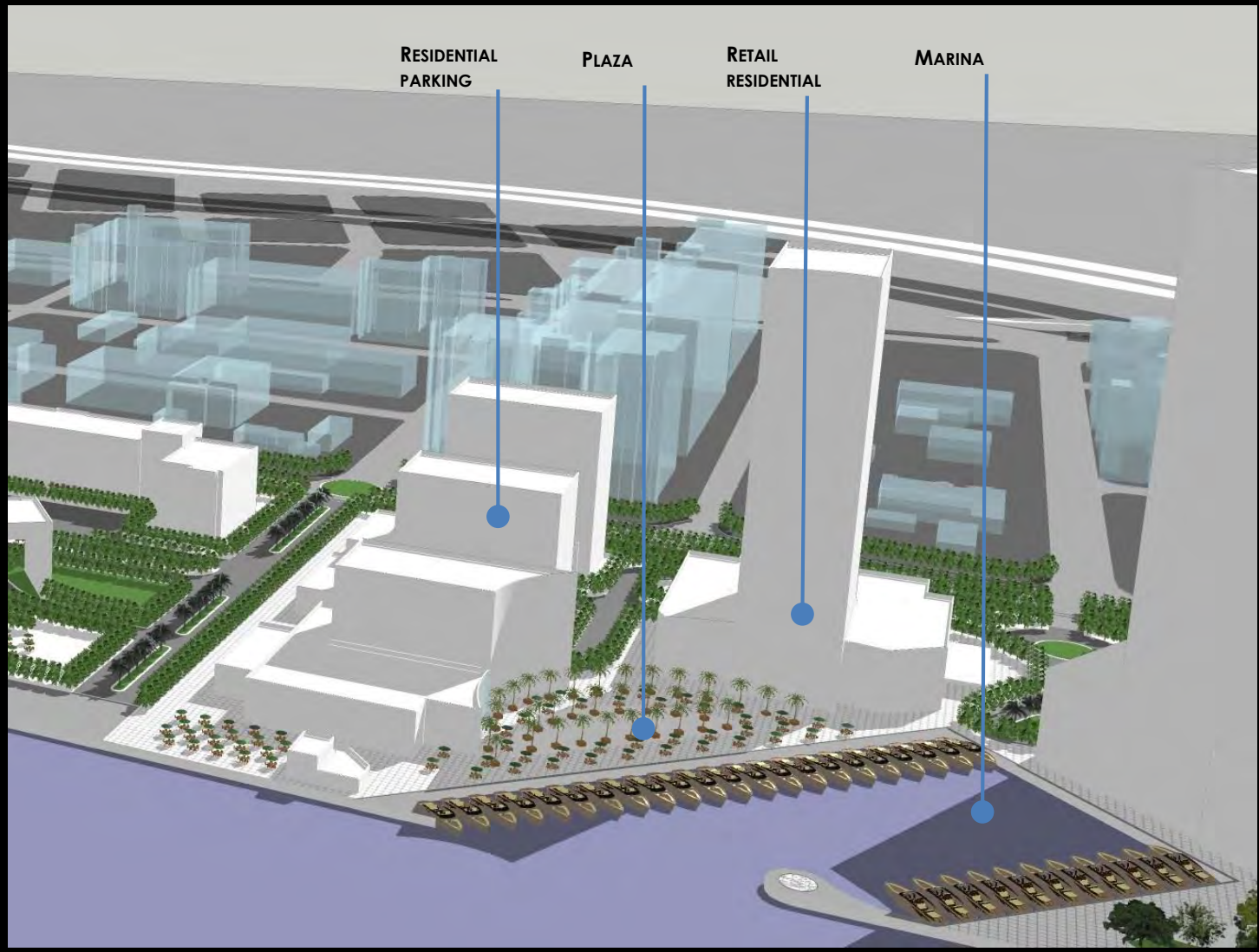
Marina district



Marina district

- Retail / residential
- Harbor Plaza
- Channelside harbor
- Marina / boatyard
- Retail

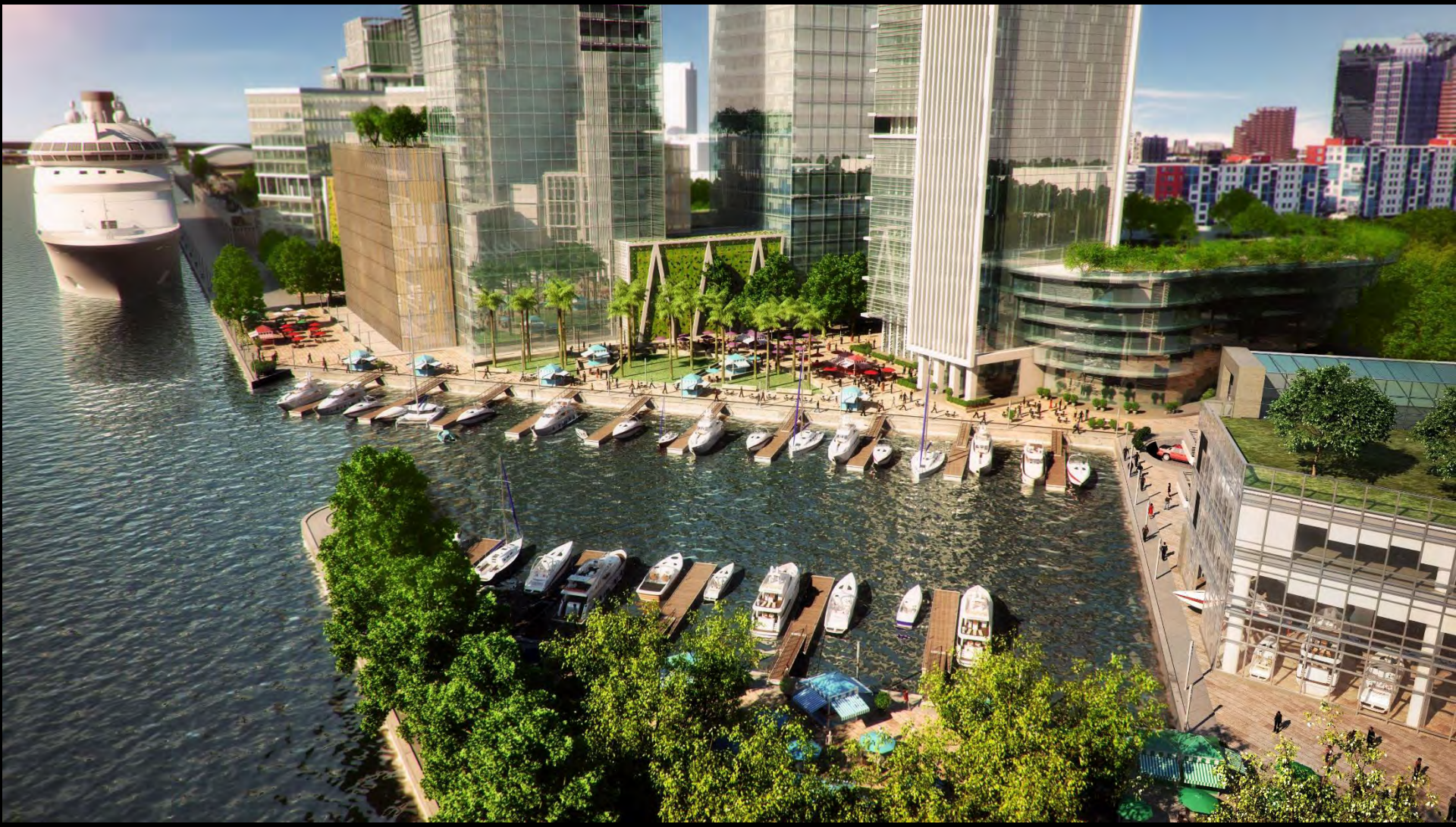
Marina district



Marina district

- Retail / residential
- Plaza
- Channelside harbor
- Retail
- Marina / boatyard

Channel harbor



Channelside waterfront


ba
Bermello Ajamil & Partners

Conclusions

- Think strategically
  - Community issues
  - Port's mission
  - Short – term solutions without a strategic plan will be short lived and more expensive
- Think financially
  - How to finance the project
  - Stay competitive with the industry
  - Not considering pricing in design will create problems
- Think functionally
  - Listen to your users and stakeholders
- Think globally
  - Don't just compare your port against your neighbor – this is a global business
- Focus on all parts of the business
  - Operations
  - Third party costs to the lines

American Association of Port Authorities

MARINE TERMINAL MANAGEMENT TRAINING PROGRAM

TRENDS IN THE DESIGN AND OPERATION OF CRUISE TERMINALS

September 2015

Luis Ajamil

Bermello, Ajamil & Partners