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Do U.S. container terminals need more capacity? And if so, how can they achieve this?

Presented by: Vijay Agrawal, PE

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U.S. Southeast and Gulf Container Terminals Market Overview

– Market demand grew at 5.9% CAGR since 2009
– 2029 Demand may be between 20M to 26M TEU
– Potential to handle additional 6 to 12M TEU

	Estimated Study Area Population			Ports Throughput	
	Coastal	Non-Coastal	Total	TEU/year	TEU/1M People
Year 2010	80,310,739	41,854,895	122,165,634	9,341,240	76,464
Year 2018	88,522,771	42,836,329	131,359,100	14,142,663	107,664
% Growth	10.2%	2.3%	7.5%	51.4%	41%

Source: U.S. Census Data, Port Websites and News Articles

Coastal: North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas
Non-Coastal: Oklahoma, Missouri, Illinois, Indiana, Kentucky, Tennessee, New Mexico and growing…

2

Year 2018 Market Size was ~15M TEU, 2/3rd of it Handled by 3 Ports

		2018 Throughput (TEU)	Market Share
1	Charleston	2,316,256	**16%**
2	Savannah	4,351,976	**31%**
3	Jacksonville	1,270,480	9%
4	Port Everglades	1,108,465	8%
5	Port Miami	1,084,000	8%
6	Tampa	87,526	1%
7	Mobile	346,732	2%
8	Gulfport	201,942	1%
9	New Orleans	587,558	4%
10	Houston	2,699,850	**19%**
11	Freeport	87,878	1%
		14,142,663	100%

Source: Port Websites and News Articles

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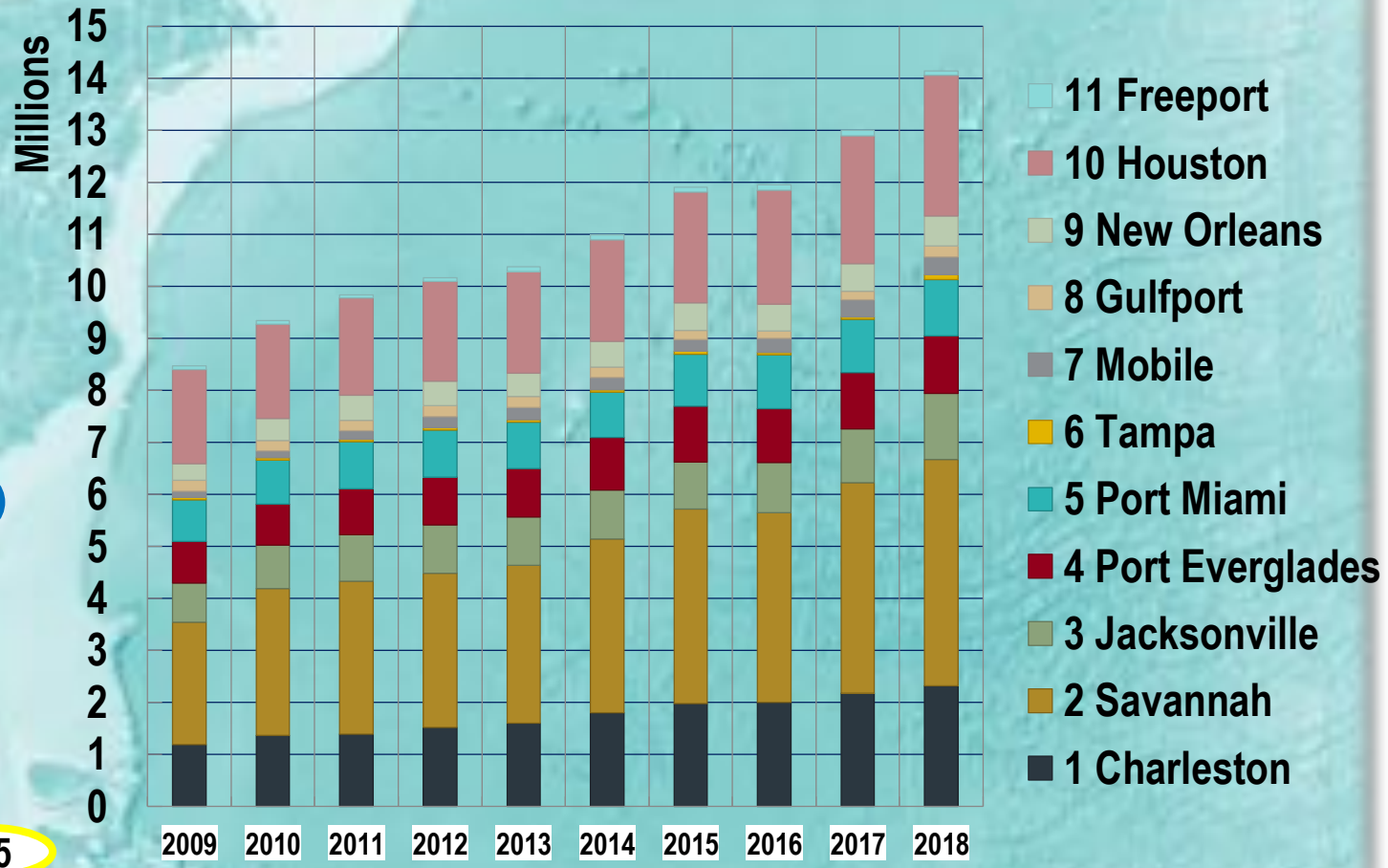
When the Market grows, Most Ports grow…Some more than others

Growth > 5.9% CAGR

- Charleston (7.8%)
- Savannah (7.1%)
- Jacksonville (6%)
- Tampa (6.7%)
- Mobile (13.5%)
- New Orleans (6.8%)

Growth < 5.9% CAGR

- Port Everglades (3.7%)
- Miami (3.3%)
- Gulfport (-0.3%)
- Houston (4.5%)
- Freeport (2.4%)



Source: Port Websites and News Articles

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Market Shifting towards Ports with Faster & Extended Reach to Customers

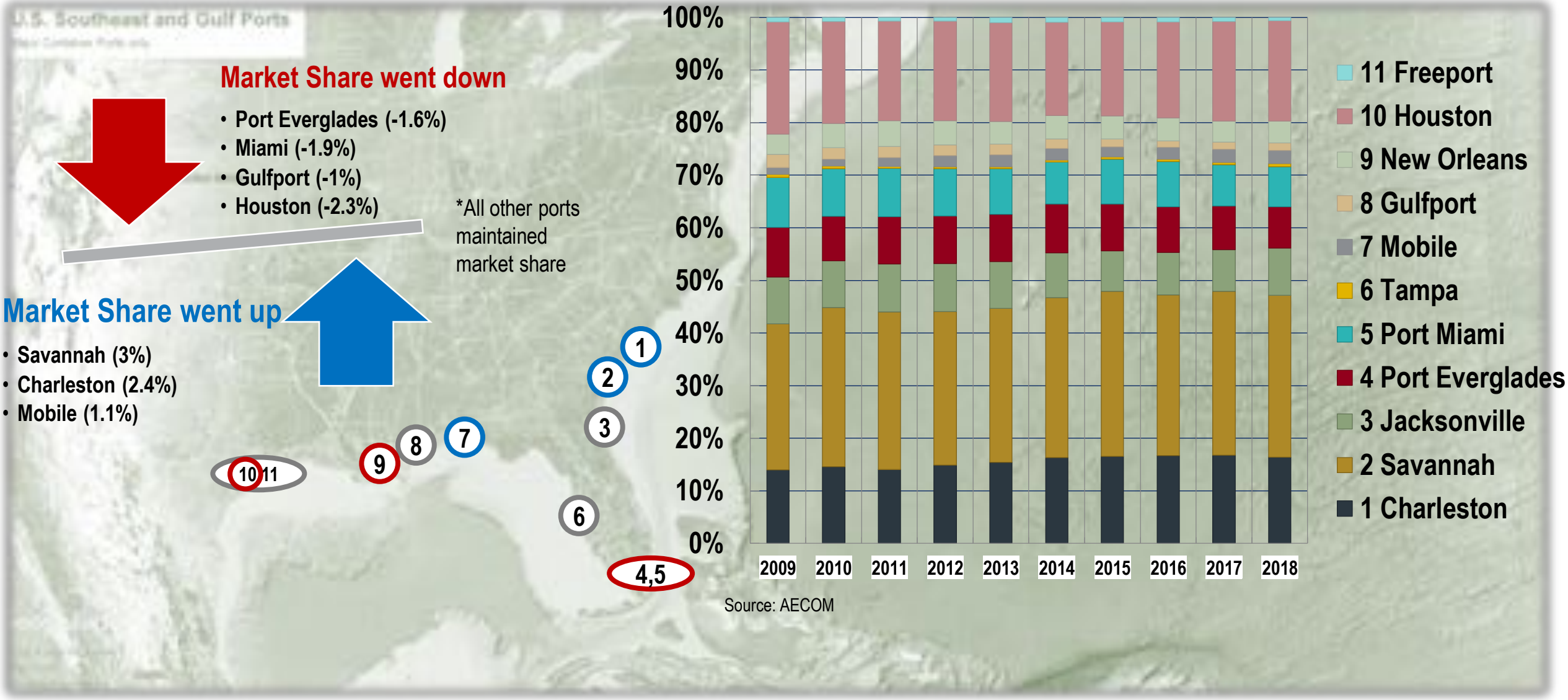
Market Share went down

- Port Everglades (-1.6%)
- Miami (-1.9%)
- Gulfport (-1%)
- Houston (-2.3%)

*All other ports maintained market share

Market Share went up

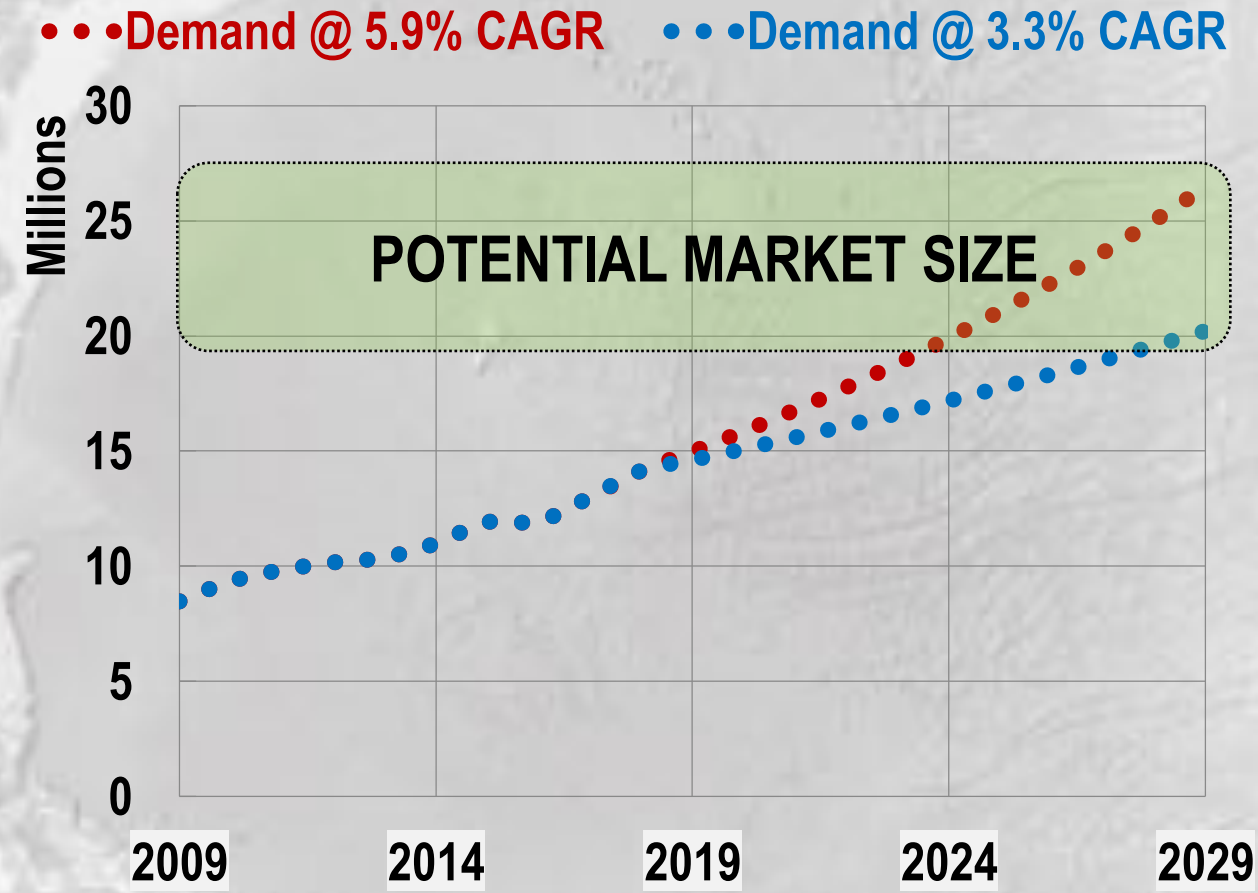
- Savannah (3%)
- Charleston (2.4%)
- Mobile (1.1%)



Source: AECOM

Year 2029: Potential 20M to 26M Annual TEU Market

- Additional 6M to 12M TEU Demand
- Likely Demand @ 5.9% CAGR of 26M*
- Low Demand @ 3.3% CAGR of 20M*, accounts for
  - Similar population growth
  - 140,000 TEU / 1M Population (National Avg)



Source: AECOM

* Disclaimer: this forecast should not be used for financing or construction of any Project

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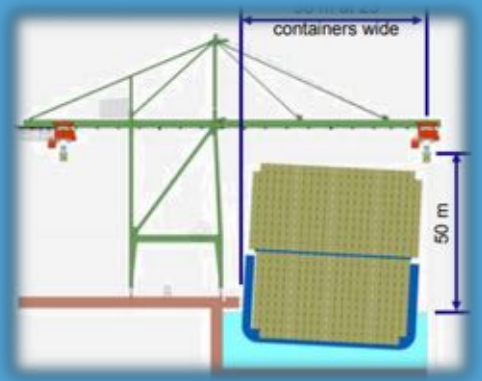
Capacity Depends on Several Factors, Some in Your Control, Some not

1. Ships & Berths

- Ship Sizes
- Ship Schedules
- Berth Length
- Soil Conditions
- Berth Design

2. Quay Cranes

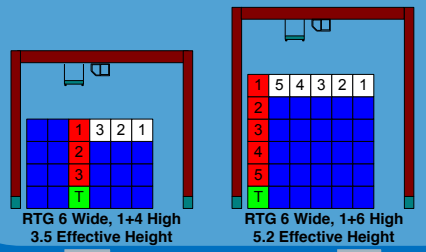


- Number of Cranes
- Cranes Height
- Outreach
- Load Capacity
- Crane Speeds

6. TOS

3. Container Yard

- Storage Mode
- Number of Yard Cranes
- Dwell Times
- Stacking Heights



- Arrival Patterns
- Number of Gate Lanes
- Gate Processing Rate
- Depot Empty Moves
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- Number of Rail Tracks
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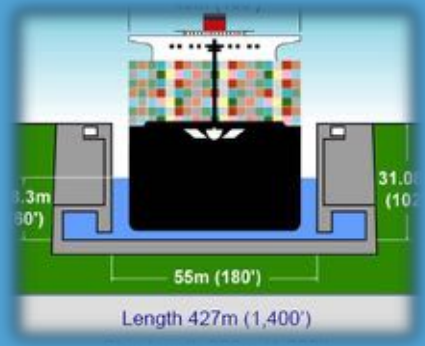
- Operating Hours



- Authorized Depth
- Tides
- Channel Width
- One-way or Two-way
- Passing Lanes
- Air Draft Restrictions

4. Landside Gate and Rail

5. Waterway Capacity

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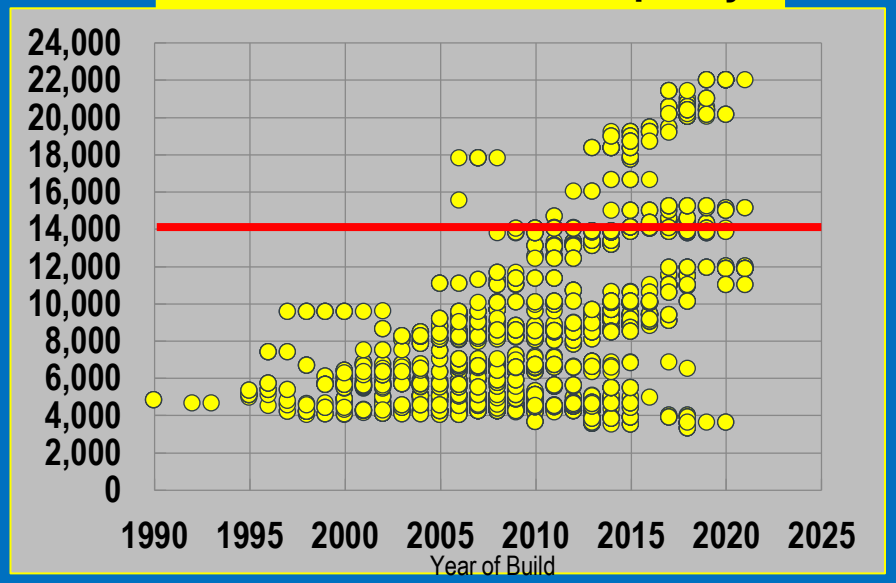
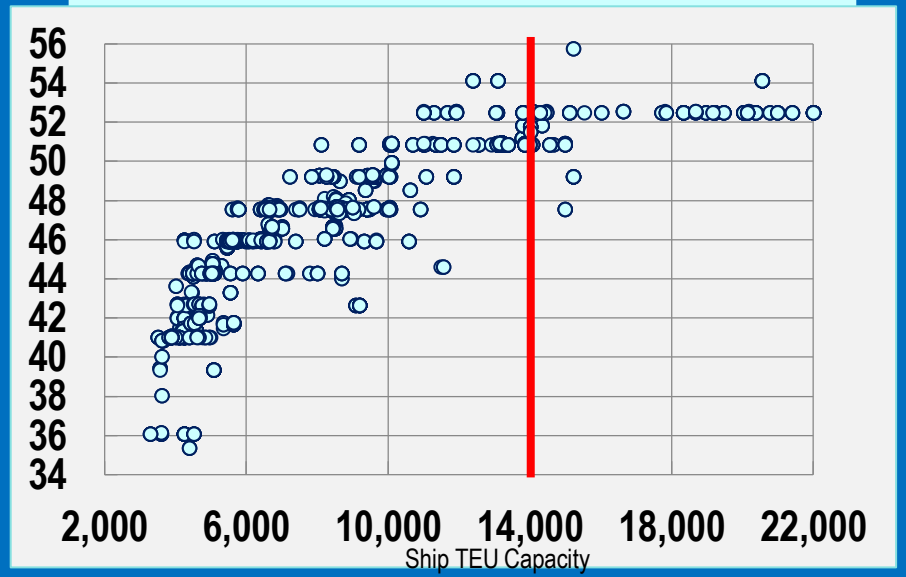
MIGHTY SHIPS

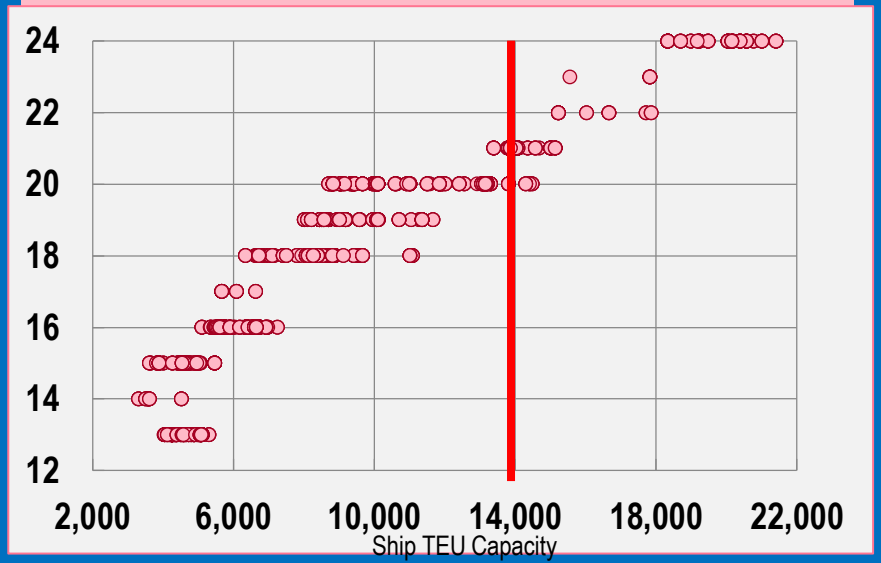
Year of Build vs. TEU Capacity



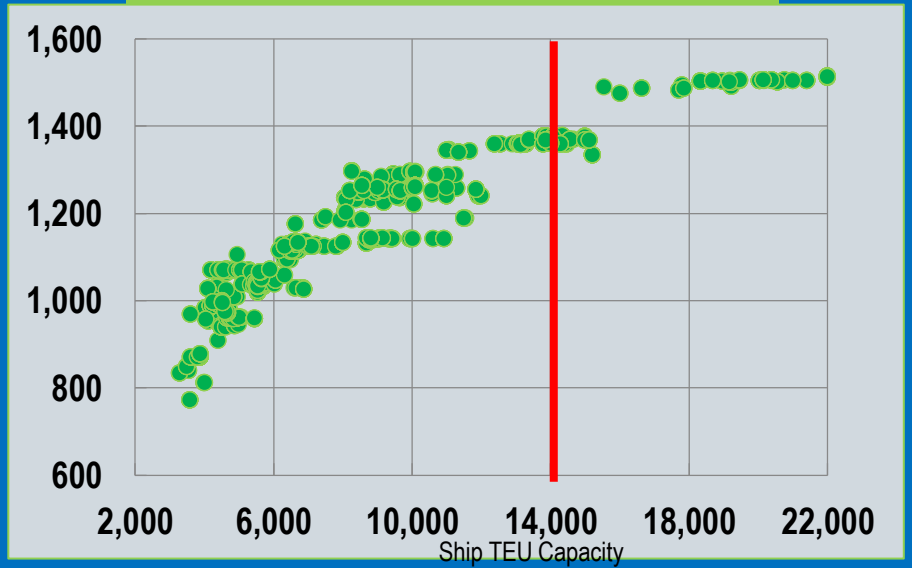
TEU Capacity vs. Fully Loaded Draft (ft)



TEU Capacity vs. Beam (Containers Wide)



TEU Capacity vs. LOA+Beam (ft)



Source: 2018 Fairplay Data

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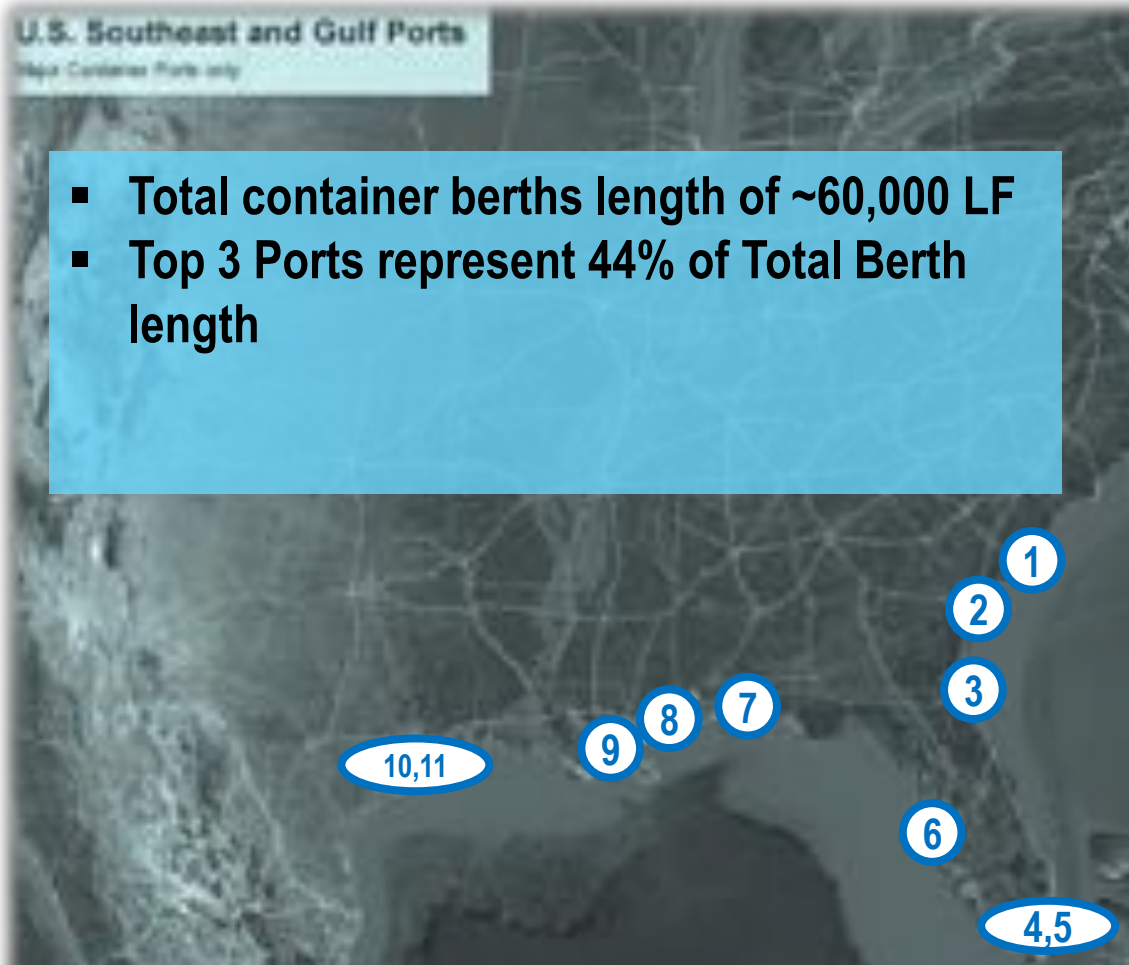
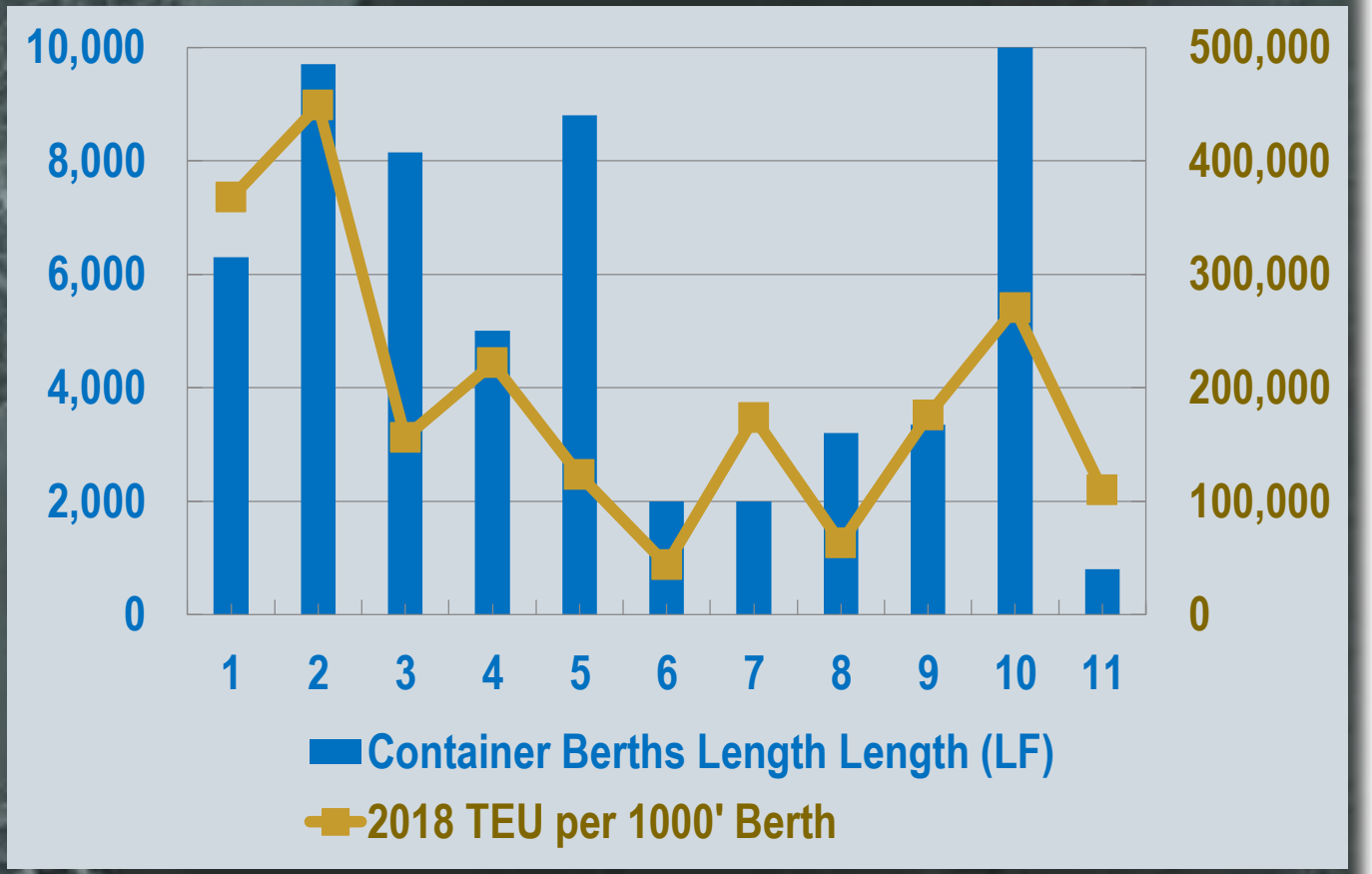
1. Container Berth Lengths and Average Throughput per 1000’ Berth

- Total container berths length of ~60,000 LF
- Top 3 Ports represent 44% of Total Berth length

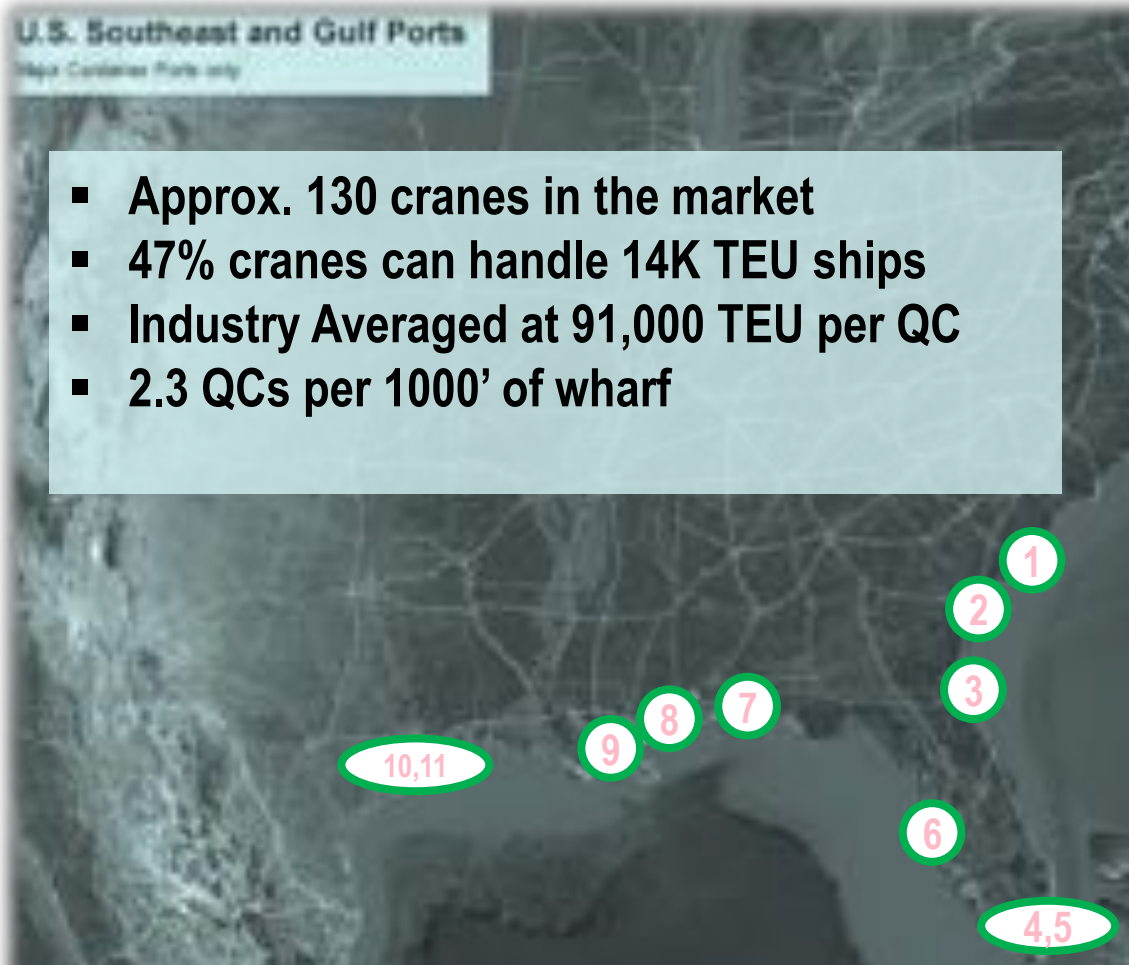


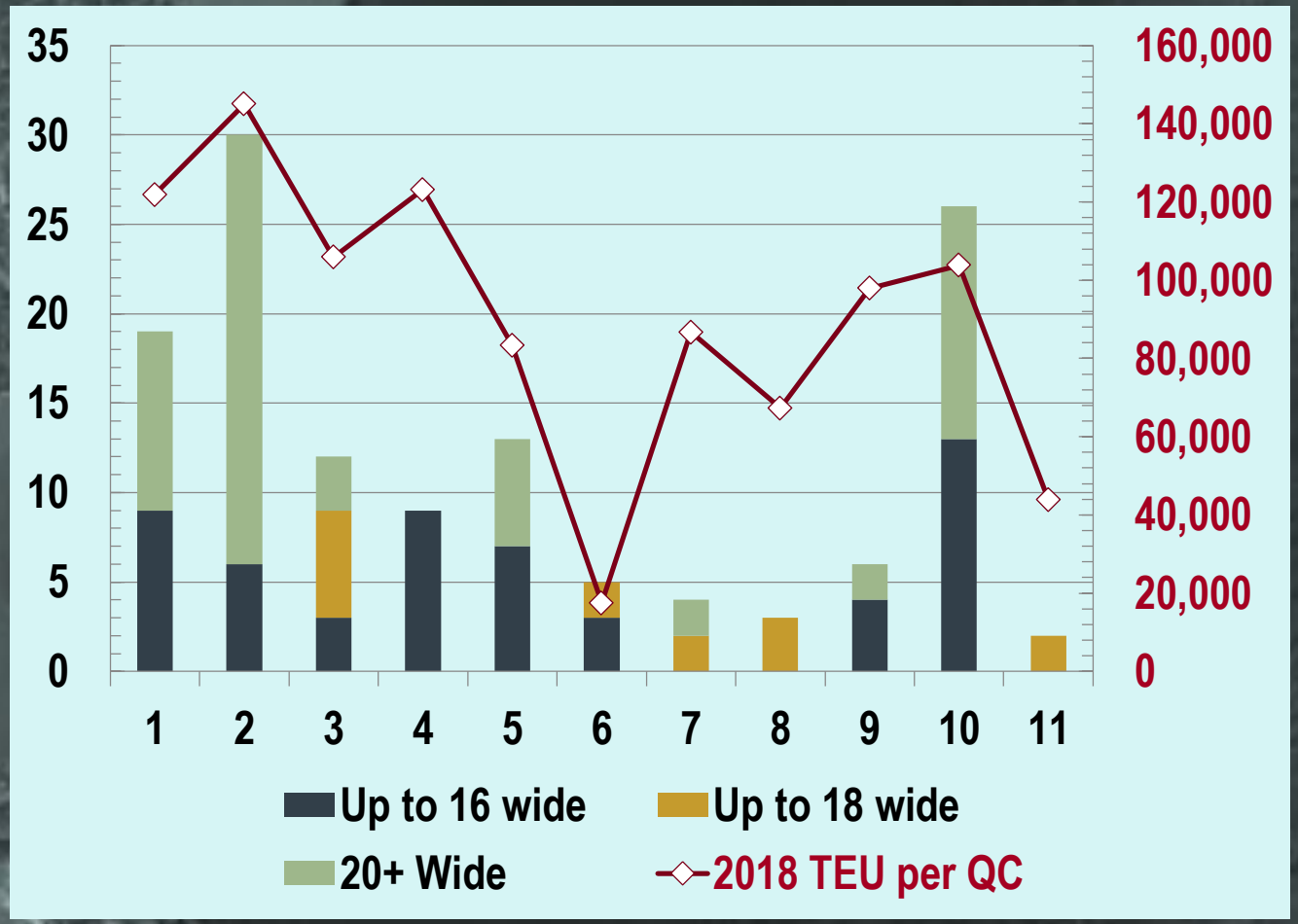


Source: Google Earth, Port Websites

2. Number of Quay Cranes and Average Throughput per Crane

- Approx. 130 cranes in the market
- 47% cranes can handle 14K TEU ships
- Industry Averaged at 91,000 TEU per QC
- 2.3 QCs per 1000' of wharf





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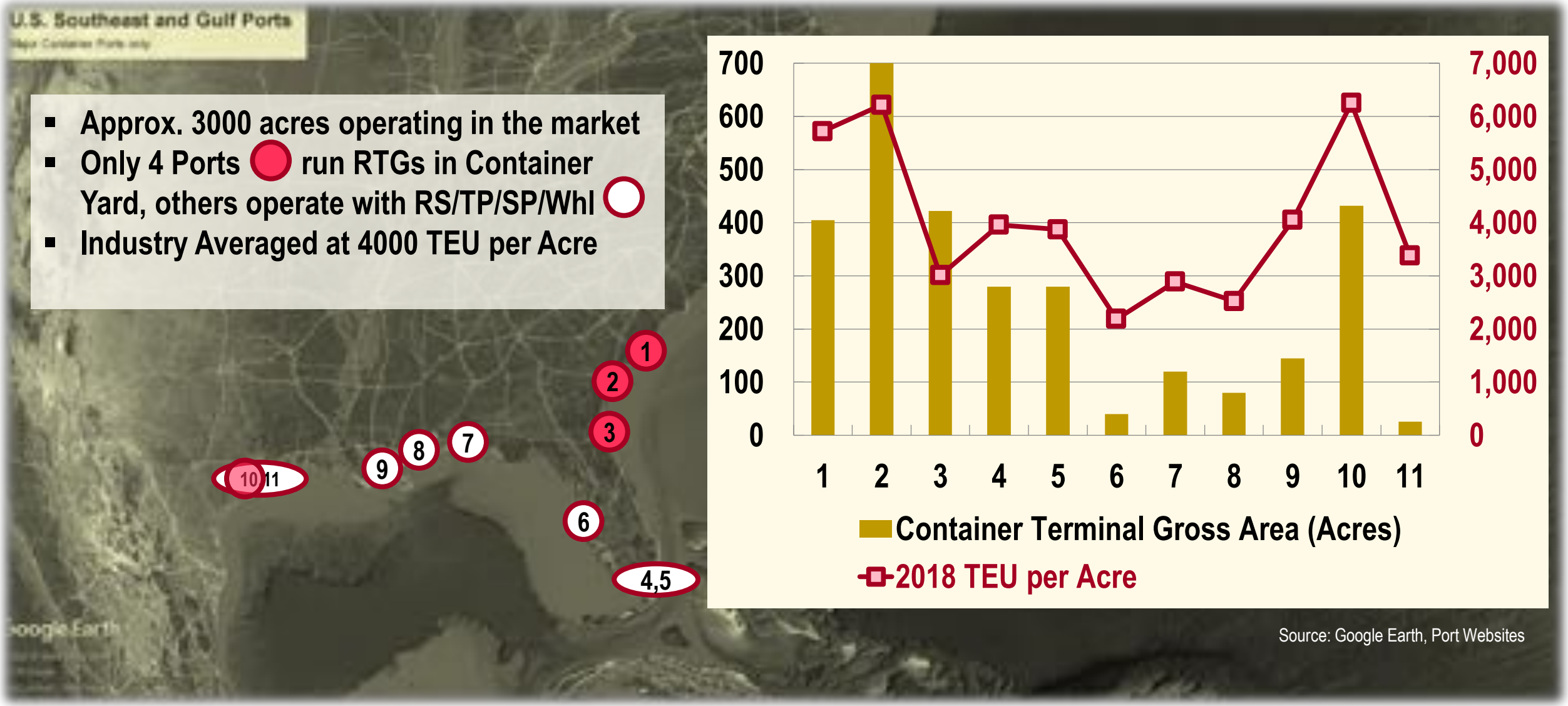
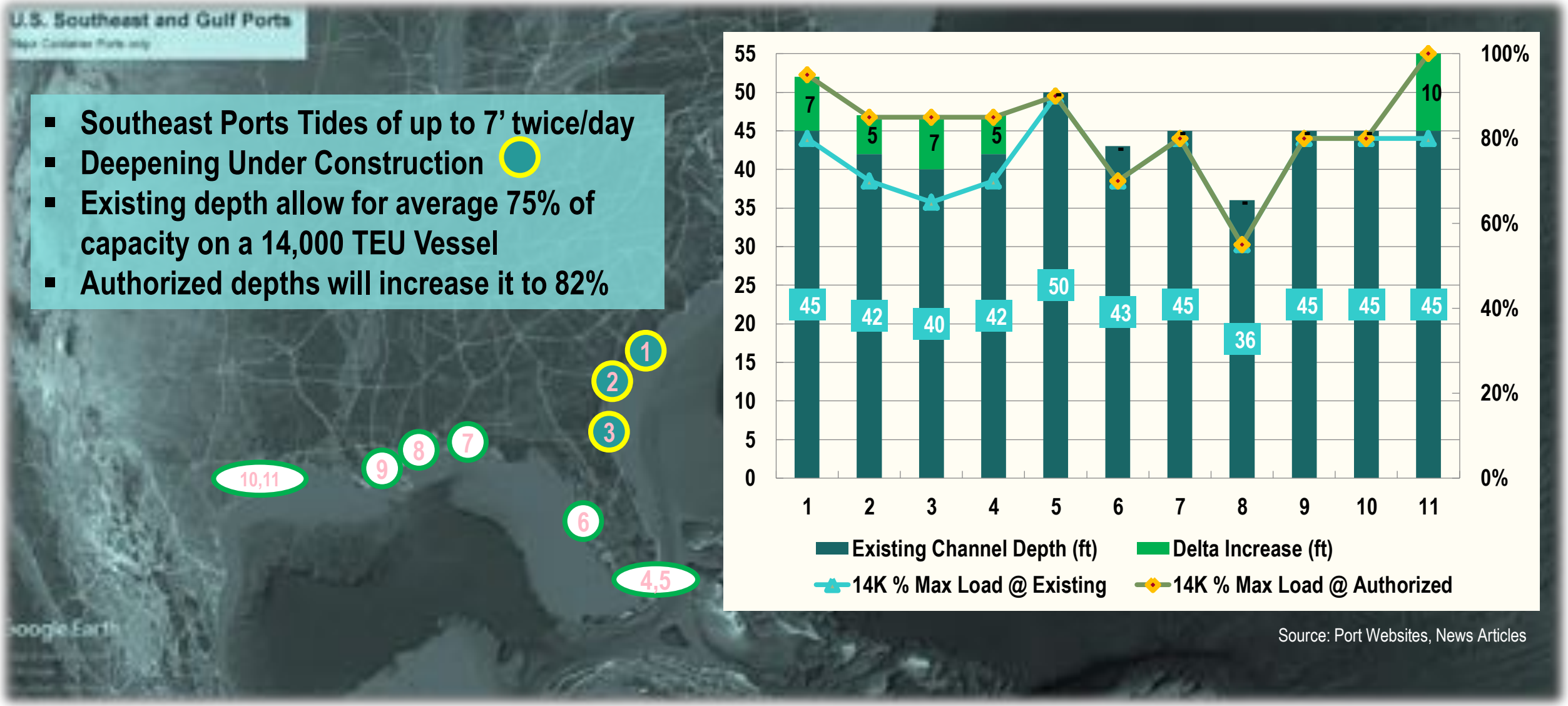
3. Container Terminal Gross Area and Throughput Per Acre



5. Existing and Authorized Channel Depth vs. 14000 TEU Vessel Max Load

- Southeast Ports Tides of up to 7' twice/day
- Deepening Under Construction
- Existing depth allow for average 75% of capacity on a 14,000 TEU Vessel
- Authorized depths will increase it to 82%



Source: Port Websites, News Articles

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Terminal Capacity keeps Changing due to Several Factors

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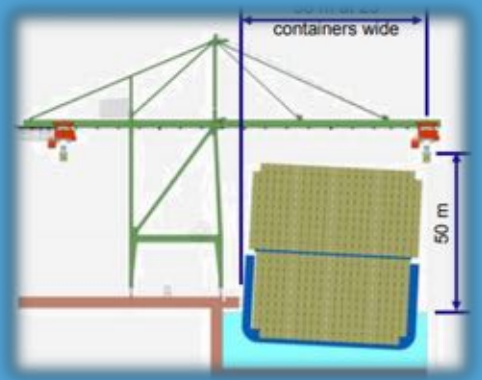
- Ship Schedules
- Berth Length
- Soil Conditions
- Berth Design

2. Quay Cranes



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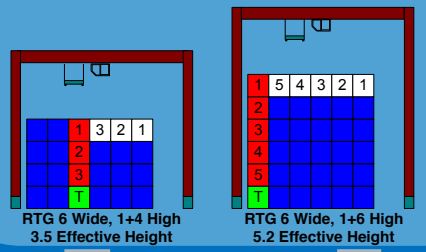

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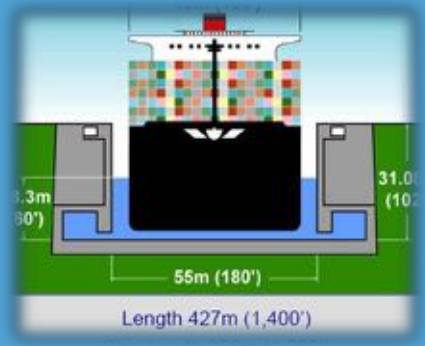

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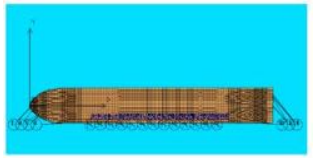
AECOM Port Planning & Capacity Analysis Tools

https://www.aecom.com/services/seaports-rail-simulation-models/

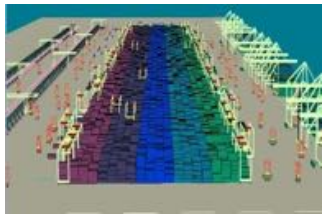
Real-time and Fast-time Ship Simulations. For channel navigation and harbor optimization

Coastal Resiliency Modeling. State of the Art model to analyze coastal storm and urban drainage

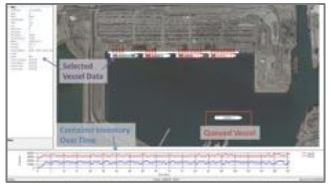
HarborSym and VNM. Analysis of channel capacity and evaluation of NED benefits of dredging projects.



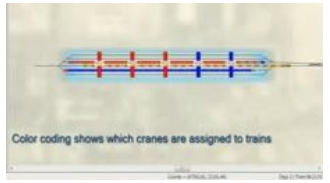
Static & Dynamic Mooring Analysis. Optimize wharf and bulkheads design.



GMTS. Simulates full container terminal including vessel, yard, gate, rail and truck activities.



BERTHA. Long term capacity model to analyze terminal capacity and sensitivity of dock operations.



RailOps. Evaluates network capacity of rail systems and intermodal yard and inland Ports.

VISSIM. Simulates trucks on public street networks and at terminal gates, including roundabouts.

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Container Terminal Capacity Calculation Method

Berth Capacity per Unit Berth

- Calculate unit berth capacity by vessel group
- Apply unit berth capacities to each terminal at each Port based on 2018 berth lengths
- Assume Ports will buy new cranes to handle demand and strengthen existing berths

Large	Medium	Small	Very Small	
14,000	**9,000**	**5,000**	**2,000**	**TEU vessel**
52	49	46	39	Max vessel draft fully loaded
1,400	1,300	1,100	780	Berth length required (ft), inc. gap
1.75	1.75	1.75	1.75	TEU to lifts factor
8,000	5,143	2,857	1,143	max container lifts per vessel (one way)
16,000	10,286	5,714	2,286	max container lifts per vessel (two way)
75%	80%	80%	80%	Max vessel utilization factor
12,000	8,229	4,571	1,829	Practical max container lifts per vessel (two way)
25%	25%	20%	15%	Max average parcel size at one port
3,000	2,057	914	274	Max average parcel size at one port (container lifts)
5.0	4.0	3.0	2.0	Dock cranes assigned per vessel
30.0	30.0	28.0	20.0	Productivity per dock crane (mv/hr)
900,000.00	**710,000.00**	**460,000.00**	**190,000.00**	**Annual unit berth capacity (TEU)**

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Container Terminal Capacity Calculation Method

Container Yard Capacity Per Acre

- Calculate unit CY capacity by equip/operations type
- Apply unit CY capacities to container terminal gross area at each Port
- Assume terminal stays with existing operation and Port buys additional equipment as required

	RS/TP	RTG	Whl
TGS capacity per gross acre [a]	53	79	77
Mean storage height (containers) [b]	2.5	3.5	1.0
TEU static capacity [c=a*b]	131	276	77
Mean dwell time (days) [d]	7.0	7.0	7.0
Turnovers per year per TEU static capacity [e=365/d]	52.14	52.14	52.14
TEU capacity without peaking [f=c*e]	6,844	14,372	4,015
Seasonal throughput peak factor [g]	1.20	1.20	1.20
Weekly inventory peak factor [h]	1.15	1.20	1.20
Annual CY Capacity in TEUs [i=f/g/i]	**4,960**	**9,980**	**2,790**

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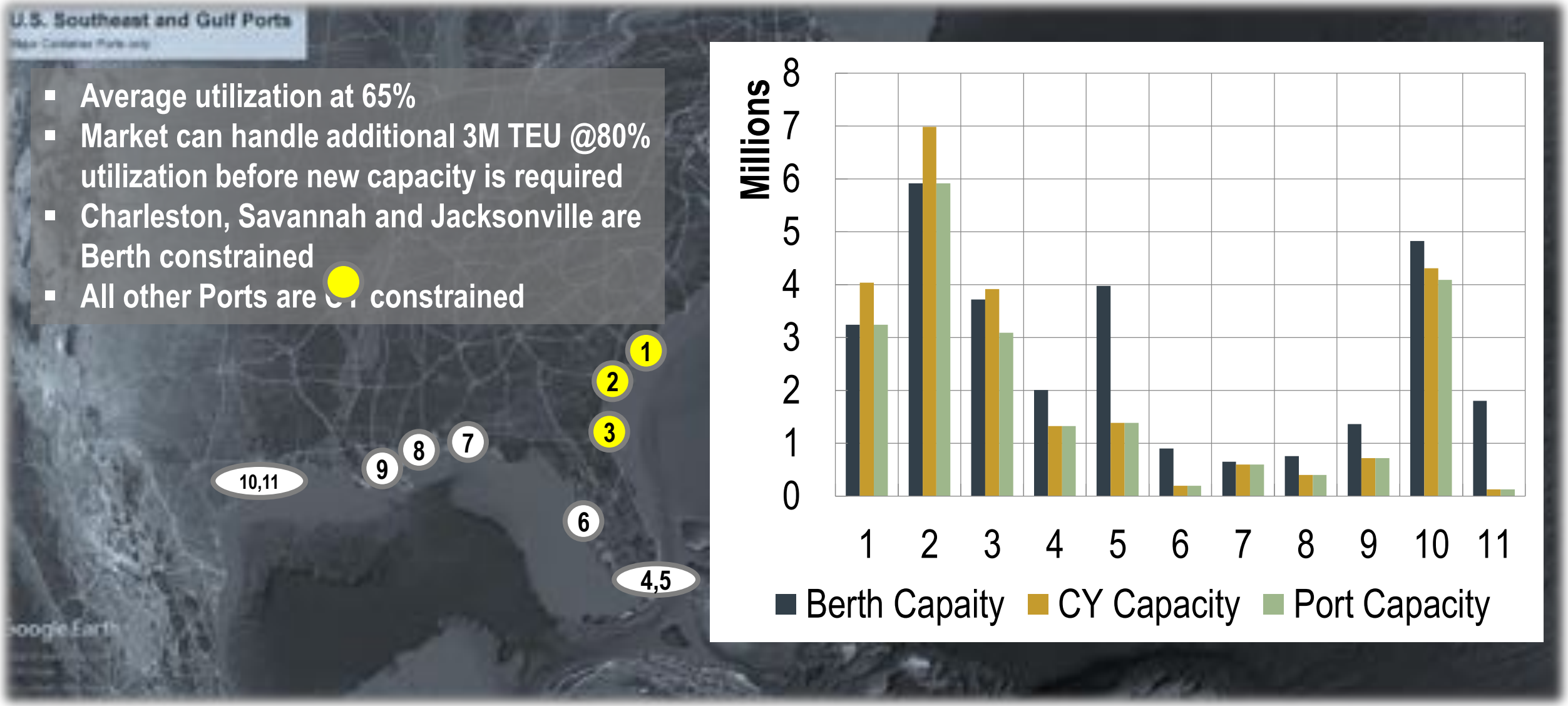
Estimated Existing Market Capacity is Approximately 21M TEU / Year



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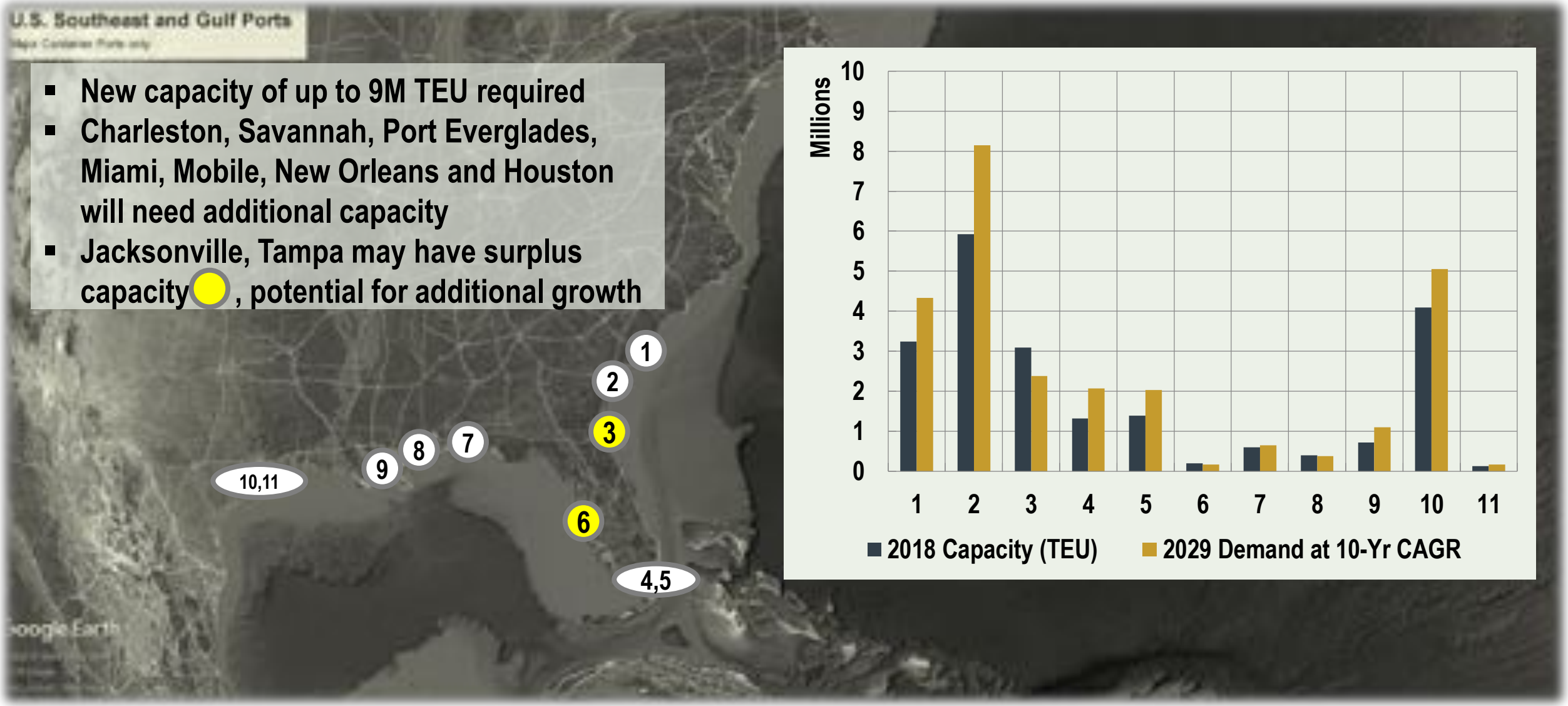
Net 6M TEU Capacity Required to meet 2029 Demand at 10-Yr CAGR



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Market Added Approximately 4M TEU Capacity since 2009

- Excessive capacity was available since the 2008 downturn

– Most of the capacity gain is incremental and AS-NEEDED basis

- Charleston: added capacity at Wando Welch Terminal but converted Columbus Street Terminal, with net loss of approximately 2500 ft berth, 43 acres and 2 QCs
- Savannah added 100+ acres of container yard and added 7+ new QCs and retrofitted berths
- Jacksonville added 75+ acres and 4 QCs
- Miami added 65+ acres and 1 QC
- Mobile, new capacity became available
- New Orleans added 45+ acres and upgraded the berth
- Houston added 2000+ ft of Berth, 60+ acres of container yard and added new 8 QCs and retrofitted berths
- Freeport, new capacity became available

7M TEU of New Container Terminal Capacity by 2029

– Additional new capacity of 2M TEU required to meet 10-Yr CAGR growth trend

– 7M TEU of publicly known planned new capacity by 2029

- Charleston HLT Terminal: 2.4M TEU
- Savannah: Plans to expand to 8M TEU, additional 2M TEU
- Port Everglades Southport Turning Notch: 1M TEU
- Port Miami conversion to RTGs: 200k TEU
- Port of New Orleans Nashville Ave Upgrades: 700k TEU
- Bayport Wharf Upgrades: 400k TEU
- Port Canaveral: 200k TEU
- Port Manatee: 200k TEU

<u>Additional Capacity Post 2029:</u>

– Jasper County Terminal (SC+GA): 1500 Acres, 6.2M TEU Capacity

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Concluding Remarks

- Market demand grew at 5.9% CAGR since 2009 and added 5M TEU business
- All Ports have grown in annual container throughput operating at average 65% utilization, with some Ports operating at up to 85% of existing capacity
- Trend in ship size and capacity continues to grow and 14,000 TEU ships will need to be handled on a regular basis with ability to serve up to 22,000 TEU ships
- New capacity of up to 9M TEU is required to handle 10-Year CAGR growth
- Ports need to invest in NEW CAPACITY to service larger ships and cargo growth requiring berth and quay crane upgrades, shifting to higher density stacking and equipment in container yard, and adding gate and rail capacity

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