Title: Calculating and Communicating the ROI on Digital Solutions

Presented By: Matthew Prumm, Seaport OPX
Zac Canody, The Port of Virginia
DYNAMIC MOORING ANALYSIS

THE PORT OF VIRGINIA

CONNECTING THE COMMONWEALTH TO THE GLOBAL MARKET

Zac Canody, P.E., BCEE
VPA Director, Engineering
February 5th, 2019

Matthew Prumm
B.Eng (hons) Civil, MSc, CPEng
SeaportOPX
Positioned To Move The Country’s Cargo

Our location and primary market size positions us perfectly to serve the American Heartland.

Source: Colliers, population categories defined by R.K. Johns
We are handling more than 400,000 TEUs more than we did in FY2015 – a 15% increase driven by our infrastructure investments.

<table>
<thead>
<tr>
<th>Year</th>
<th>TEUs</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 2015</td>
<td>2.54</td>
</tr>
<tr>
<td>FY 2016</td>
<td>2.65</td>
</tr>
<tr>
<td>FY 2017</td>
<td>2.76</td>
</tr>
<tr>
<td>FY 2018</td>
<td>2.82</td>
</tr>
<tr>
<td>FY 2019</td>
<td>2.97</td>
</tr>
<tr>
<td>FY 2020 (Projected)</td>
<td>3.25</td>
</tr>
</tbody>
</table>
BUILDING THE CAPACITY FOR GREATNESS

- 55’ Deepening Project ($330M)
- VIG Phase 2 Expansion ($325M)
- NIT Optimization ($350M)
- NIT CRY Expansion ($20M)
- VIP BUILD ($26.5M)
- 6-Year Capital Outlay ($1.6B)
Virginia International Gateway

Completed Fall 2019
• 1.2 million container capacity (annually)
• Extended rail operation
• Extended berth
• Expanded truck gates
• 4 new ship-to-shore cranes
By Fall 2020:
• 1.2 million annual container capacity at NIT South (+46%)
• 26 lane truck gate at NIT North, 16 lanes at NIT South
• Direct connectivity to I-564
• 2 new additional ship-to-shore cranes
Norfolk Harbor Channels Navigation Improvements

WIDER
DEEPER
SAFER
2020
EAST COAST PORT DEPTHS

By 2025, The Port of Virginia will be the only port of the US East Coast with a 55+’ channel depth.

NOV ’17
The governor-elect’s proposed budget includes the cost for the dredging project’s preliminary engineering and design.

MAY ’18
The Virginia Legislature approves $350 million for the project’s engineering, design, and construction.

JUN ’18
The U.S. Army Corps of Engineers gives its final approval for it to move ahead.

EARLY ’20
Construction on deepening the channel to 55 feet and widening in certain areas begins.

EARLY ’25
The dredging work is complete, and Virginia is home to the deepest port on the U.S. East Coast.

*Proposed schedule.

Stewards of Tomorrow
Norfolk Harbor Navigation Improvements

- Completed the GRR 6 Months Ahead of Schedule
- Chief’s Report Signed (June 2018)
- Preconstruction Engineering and Design (PED) – Complete in June 2019
- Construction Start – 2020

We’re doing this faster than any other navigation project EVER!
Our Challenge

- Larger Ships = Longer Calls
- Longer Calls = More Susceptibility to Adverse Weather Conditions
- As weather condition changes, you must make decisions that have costly implications
Doing Something About it

Capacity Through Optimized Decision Making
A Smarter Way

The world’s most advanced physics based decision support system for ports

- HYDRODYNAMICS
- WAVES (LONG WAVES)
- WIND
- SEDIMENT TRANSPORT

- UNDERKEEL CLEARANCE
- MANEUVERABILITY
- MOORING ANALYSIS
- SWINGING

- AIS/VTS
- WAVE BUOYS
- TIDE GAUGES
- REGIONAL FORECASTS
- VESSEL DATABASE
The Past

Reactive Criteria?

Bespoke Consultant Analysis?

DIY?
The Next Normal

Proactive | Objective | Automated | Quantitative | Efficient | Accurate

Reactive Criteria?

Bespoke Consultant Analysis?

DIY?
## Vessel Specification

**Vessel Name**: APL California

<table>
<thead>
<tr>
<th>IMO No</th>
<th>Hatch Height Above Main Deck [ft]</th>
</tr>
</thead>
<tbody>
<tr>
<td>9350044</td>
<td>4.63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LOA [ft]</th>
<th>Beam [ft]</th>
<th>Bridge To Bow [ft]</th>
</tr>
</thead>
<tbody>
<tr>
<td>962</td>
<td>131</td>
<td>839</td>
</tr>
</tbody>
</table>

**GM [ft]**

<table>
<thead>
<tr>
<th></th>
<th>Moulded Depth [ft]</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>64</td>
</tr>
</tbody>
</table>

**Vessel Draft**

- **Draft Value**
  - Fore Draft [ft]: 35
  - Mid Draft [ft]: 35
  - Aft Draft [ft]: 35

**Displacement [tonnes]**

- 77588.25732

**Scenario Id**

- (Click the clip to copy)
Configure Berth

[Image of a berth configuration interface]

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Stewards of Tomorrow

[Logos of The Port of Virginia and Seaport OPX]
Environmental Forcing

Stewards of Tomorrow

Seaport OPX

Digital operational services for ports
Results

### Vessel

<table>
<thead>
<tr>
<th>Arrival/Departure</th>
<th>Arrival</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vessel Name</td>
<td>APL California</td>
</tr>
<tr>
<td>Port</td>
<td>Port of Virginia</td>
</tr>
<tr>
<td>Terminal</td>
<td>NIT Berth 2</td>
</tr>
<tr>
<td>DWT</td>
<td>72912</td>
</tr>
<tr>
<td>LOA (ft)</td>
<td>962</td>
</tr>
<tr>
<td>Beam (ft)</td>
<td>131</td>
</tr>
<tr>
<td>Longitudinal Windage Area (m²)</td>
<td>6500</td>
</tr>
<tr>
<td>Lateral Windage Area (m²)</td>
<td>1000</td>
</tr>
<tr>
<td>Draft (ft)</td>
<td>35</td>
</tr>
</tbody>
</table>

### Analysis Summary

<table>
<thead>
<tr>
<th>Mooring Lines</th>
<th>50% MBL</th>
<th>Suspend</th>
<th>Fender Failure</th>
<th>Bollard Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>S</td>
<td>L</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>M</td>
<td>B</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Maximum P2P Vessel Motions

<table>
<thead>
<tr>
<th>Surge (m)</th>
<th>Sway (m)</th>
<th>Roll (°)</th>
<th>Pitch (°)</th>
<th>Heave (m)</th>
<th>Yaw (°)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>0.2</td>
<td>0.2</td>
<td>0.1</td>
<td>0.2</td>
<td>0.3</td>
</tr>
</tbody>
</table>

### Environmental Conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Wind speed (kn)</td>
<td>30</td>
</tr>
<tr>
<td>Wind direction (deg)</td>
<td>010</td>
</tr>
<tr>
<td>Current speed (kn)</td>
<td>0.5</td>
</tr>
<tr>
<td>Current direction (deg)</td>
<td>020</td>
</tr>
<tr>
<td>Wave height (m)</td>
<td>-</td>
</tr>
<tr>
<td>Wave period (s)</td>
<td>-</td>
</tr>
<tr>
<td>Wave direction (deg)</td>
<td>-</td>
</tr>
</tbody>
</table>

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**Stewards of Tomorrow**

**Seaport OPX**
Digital operational services for ports
Results
Questions?