Port Planning with InfraWorks

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The Ports – An Introduction

The Ports

- Who are they?
  - Private, Local, State, Federal Governments
- Who are the stakeholders?
  - Usually run by a Board of Governors led by prominent figures in various businesses
- What are their challenges?
  - To maintain efficient flow of transportation and logistics for imports and exports throughout the reaches of their customer base

Photo Credit: Georgia Ports Authority

Jargon & Equipment

TEU

- 20ft Equivalent Unit, The standard unit of measurement for Container Boxes. 1 TEU refers to a 20ft Container box. The typical box measures 8ft wide, 8ft high, and 20ft long.

  (Note: a High Cube container is the same length and width but with a 9.5ft height and is still referred to as a TEU)

2TEU

- A 40ft container is referred to as a 2TEU as its double the length. The width and the height is the same.

STS Crane

- Ship-To-Shore Crane. This type of crane us used to load and unload container ships. These machines are built specifically for the operating port

RMG Crane

- Rail Mounted Gantry Cranes are fixed into rail tracks and usually are the heavy duty lifters in a container yard.
- Used in Grounded Container Stacks and intermodal operations

RTG Crane

- Rubber Tire Gantry Cranes are more flexible when compared to RMGs as they can be moved throughout a terminal and work where they’re needed.
- While flexible enough to move throughout a port, their capacity is less than a RMG.

eRTG Crane

- Electrified Rubber Tire Gantry Cranes usually have the same capabilities as the standard RTGs but their drivetrain is powered by electricity rather than diesel or other fossil fuels making them the “green” alternative.

Reefer Containers and Racks

- Refrigerated Containers are containers with cooling systems used in transport of sensitive materials.
- Reefer Racks are the on-terminal storage and power delivery systems for the reefer container.

Intermodal Yards

- Intermodal yards involve the transition of freight containers using multiple modes of transportation such as ship, rail, and truck.

Ships

Consider this

"Savannah's containerized trade increased by 9.7% during Q1 2017. In fact, Savannah is the third fastest growing major port in the world…"

Savannah Morning News
"2017 Savannah Maritime"

…but why

The Panama Canal with new, wider locks in June 2016

“Since June 2016 the average size of the vessels calling on the Port of Savannah has increased by nearly 20%”

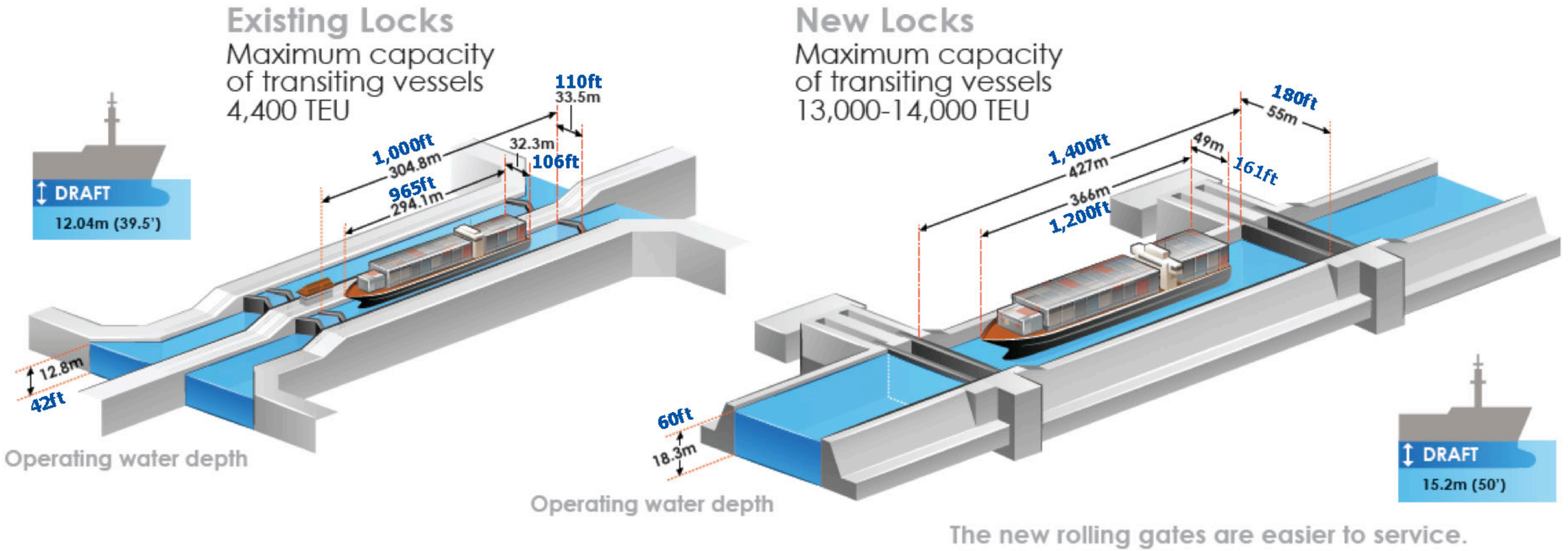
Photo Credit: dredgingtoday.com

The Panama Canal

- Panamax = Maximum ship size able to navigate the Panama Canal
- New Panamax = Maximum ship size able to navigate the Panama Canal after the completion of the new canal locks (2016)
- Post-Panamax = Ships too large to navigate through the canal

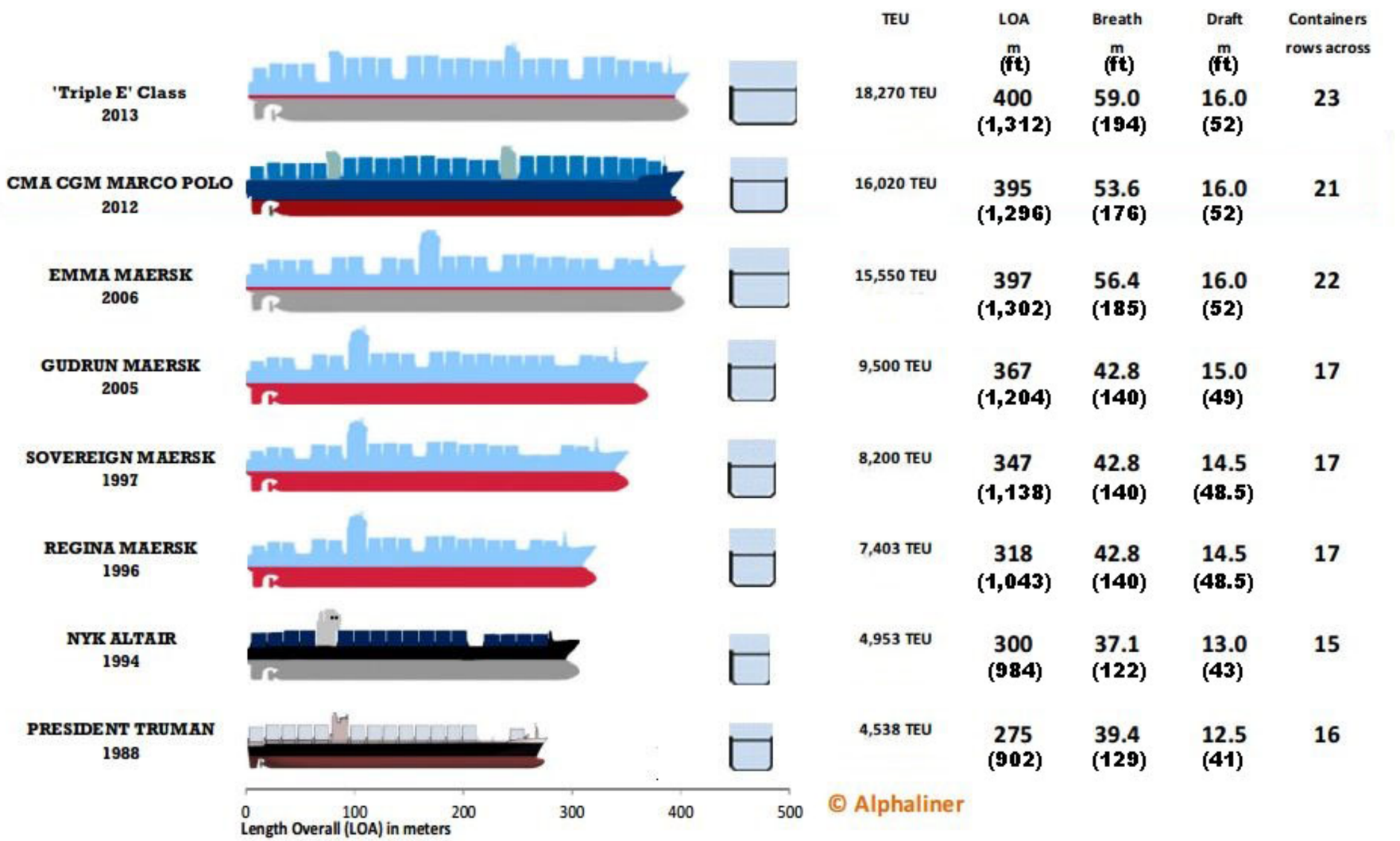
Panamax vs. New Panamax		
	Panamax (Pre-2016)	New Panamax (2016-)
Length	294.13 m (965 ft)	366 m (1,200 ft)
Width	32.31 m(106 ft)	49 m(161 ft)
Draught	12.04 m (41.2 ft)	15.2 m(50 ft)
TEU	5,000	13,000

The Panama Canal



Source: Panama Canal Authority (ACP)

Ship Evolution



	TEU	LOA m (ft)	Breath m (ft)	Draft m (ft)	Containers rows across
'Triple E' Class 2013	18,270 TEU	400 (1,312)	59.0 (194)	16.0 (52)	23
CMA CGM MARCO POLO 2012	16,020 TEU	395 (1,296)	53.6 (176)	16.0 (52)	21
EMMA MAERSK 2006	15,550 TEU	397 (1,302)	56.4 (185)	16.0 (52)	22
GUDRUN MAERSK 2005	9,500 TEU	367 (1,204)	42.8 (140)	15.0 (49)	17
SOVEREIGN MAERSK 1997	8,200 TEU	347 (1,138)	42.8 (140)	14.5 (48.5)	17
REGINA MAERSK 1996	7,403 TEU	318 (1,043)	42.8 (140)	14.5 (48.5)	17
NYK ALTAIR 1994	4,953 TEU	300 (984)	37.1 (122)	13.0 (43)	15
PRESIDENT TRUMAN 1988	4,538 TEU	275 (902)	39.4 (129)	12.5 (41)	16

10,000 TEU vessel

- Equivalent of 5,000 – 40ft containers
- 12,000 pairs of Nikes per container
- Equivalent of 60,000,000 pairs per vessel
- Value = $4.5 Billion @ $75/pair
- Transportation cost = $0.26/pair

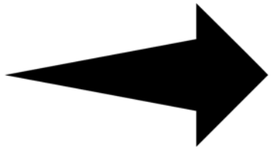
14,000 TEU vessel

- Equivalent of 7,000 – 40ft containers
- 12,000 pairs of Nikes per container
- Equivalent of 84,000,000 pairs per vessel
- Value = $6.3 Billion @ $75/pair
- Transportation cost = $0.26/pair

…and then there was LaVar

10,000 TEU vessel

- Equivalent of 5,000 – 40ft containers
- 12,000 pairs of Nikes per container
- Equivalent of 60,000,000 pairs per vessel
- Value = $4.5 Billion @ $75/pair
- Transportation cost = $0.26/pair



10,000 TEU vessel with Big Baller Shoes

- Equivalent of 5,000 – 40ft containers
- 12,000 pairs per container
- Equivalent of 60,000,000 pairs per vessel
- **Value = $29.7 Billion @ $495/pair**
- Transportation cost = $0.26/pair

14,000 TEU vessel

- Equivalent of 7,000 – 40ft containers
- 12,000 pairs of Nikes per container
- Equivalent of 84,000,000 pairs per vessel
- Value = $6.3 Billion @ $75/pair
- Transportation cost = $0.26/pair

14,000 TEU vessel with Big Baller Shoes

- Equivalent of 7,000 – 40ft containers
- 12,000 pairs per container
- Equivalent of 84,000,000 pairs per vessel
- **Value = $41.6 Billion @ $495/pair**
- Transportation cost = $0.26/pair

COSCO Guangzhou – 9,500 TEU

COSCO Development – 13,000 TEU

CMA CGM Roosevelt– 14,414 TEU

Port Planning

The Tools

Autodesk AutoCAD Civil 3D

Autodesk 3DS Max Design

SketchUp

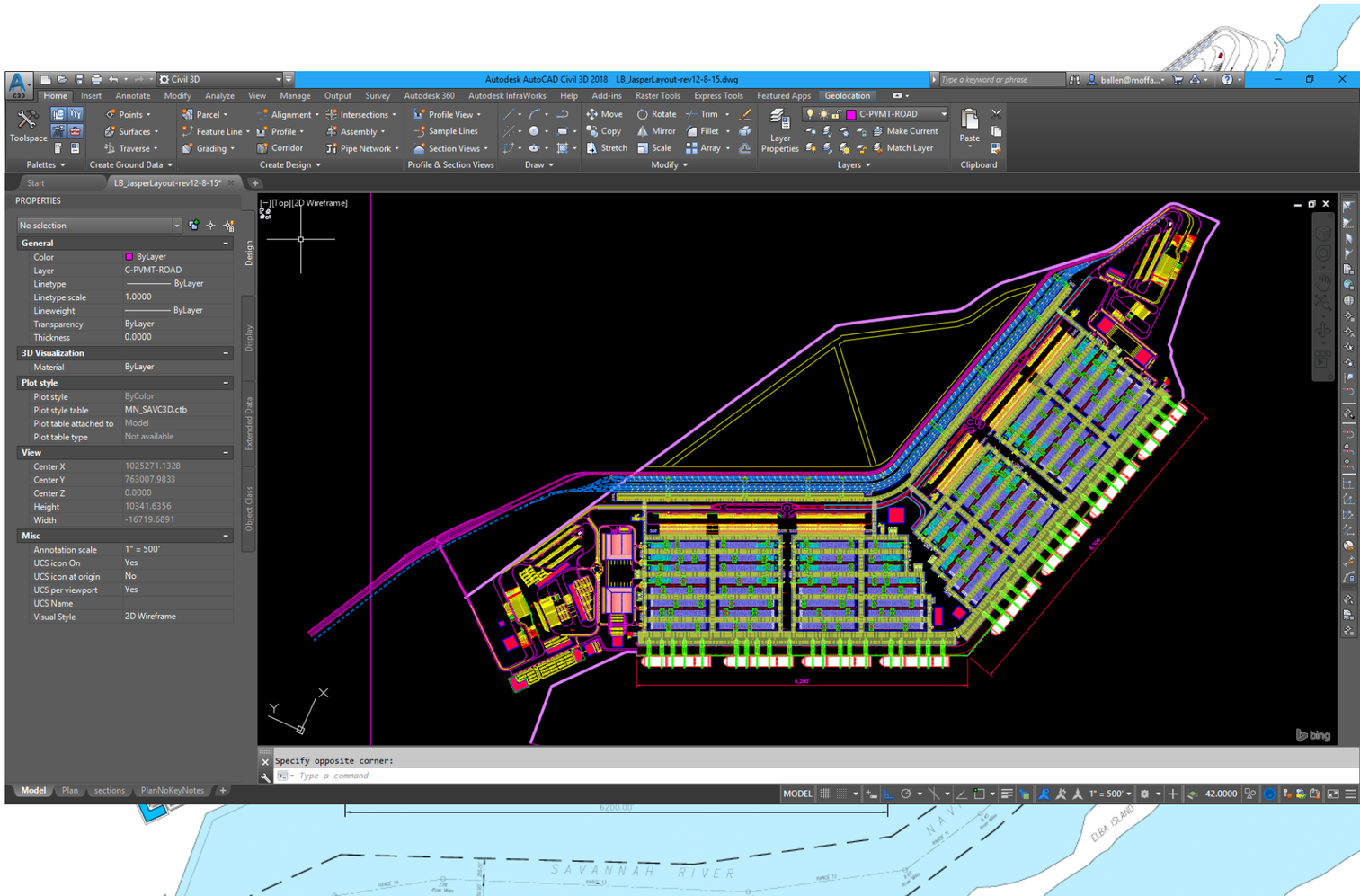
Autodesk InfraWorks

Adobe After Effects

Camtasia Studio

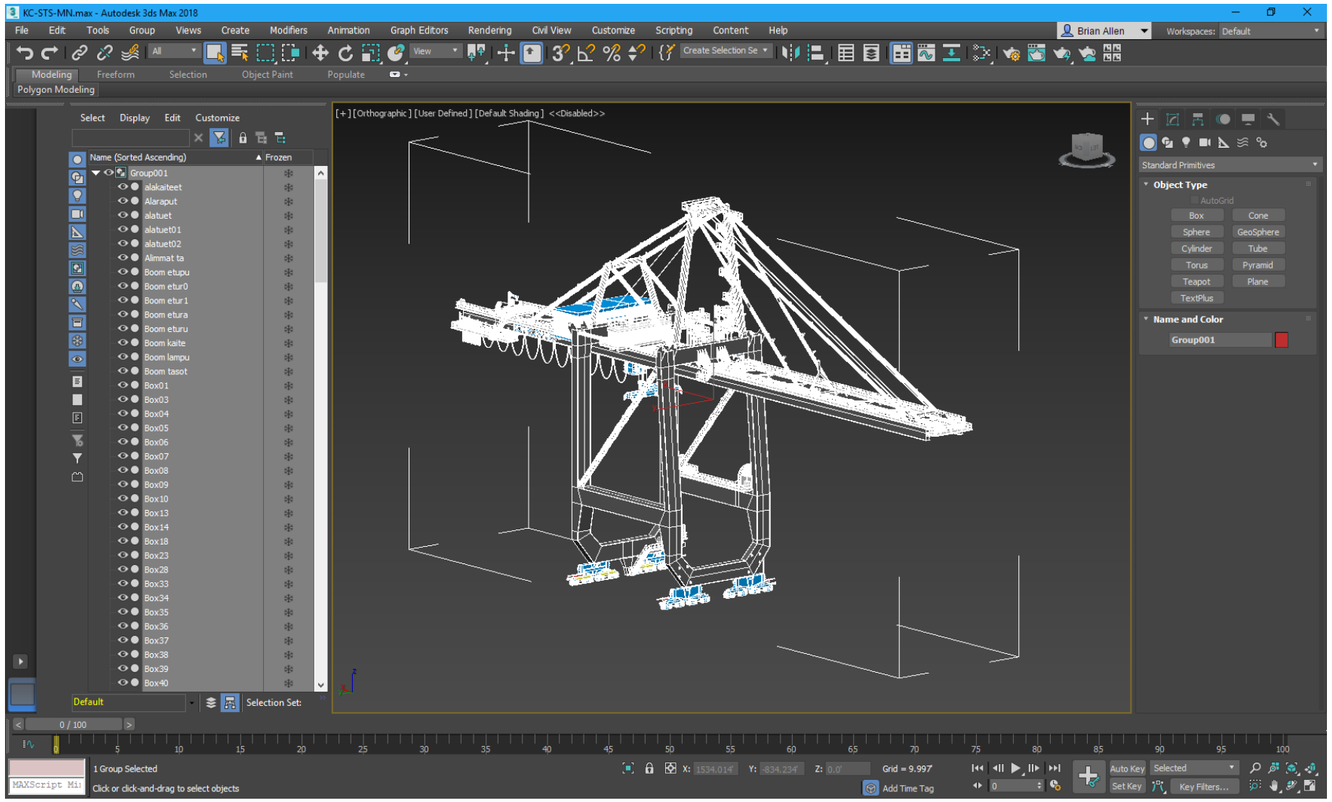
AutoCAD / Civil 3D / Plant 3D Uses

- Layout & Equipment Modeling (AutoCAD)
  - Conceptual Site Planning, Crane Modeling
- 3D Civil/Structural Planning & Design (Civil 3D & Plant 3D)
  - Corridor/Grading Scenarios
  - Platform Modeling
- GIS Input/Outputs for InfraWorks modeling (Civil 3D)



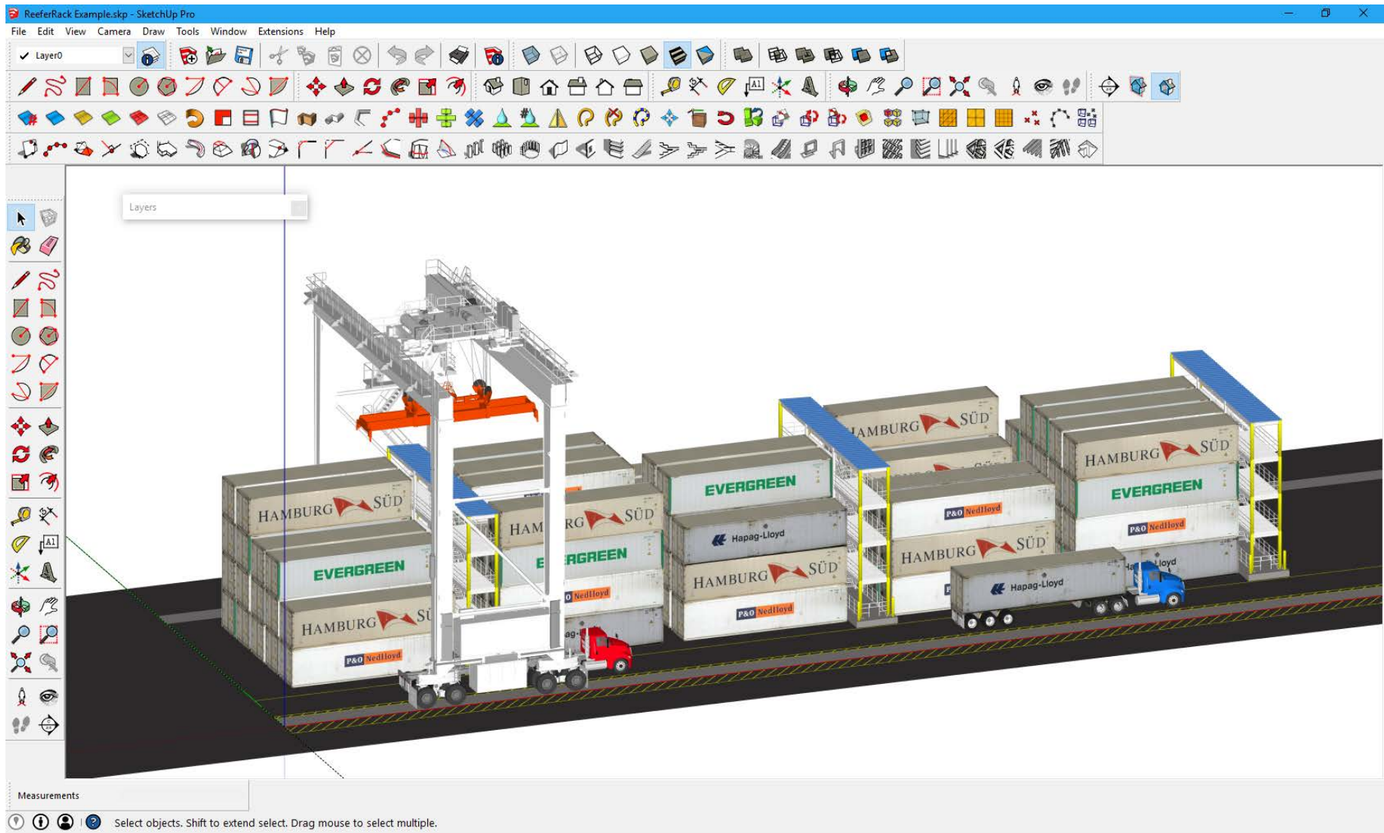
3DS Max Design

- Creating Machines & Equipment
  - Ships
  - Cranes
  - Vehicles
- Converting Models for InfraWorks
  - .FBX
  - .DAE



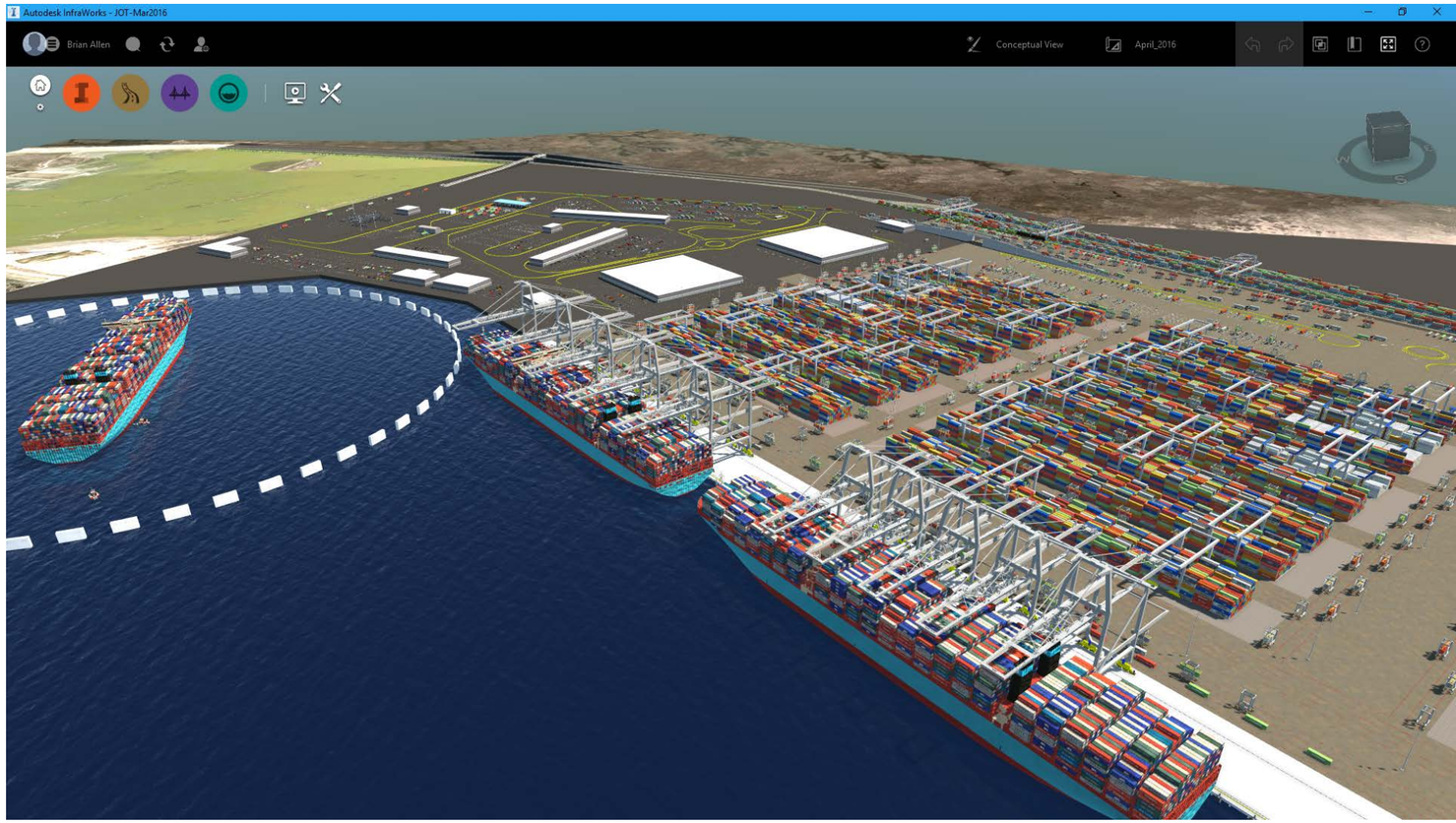
SketchUp

- Creating Machines & Equipment
  - Ships
  - Cranes
  - Vehicles
- Converting Models for InfraWorks
  - .DAE
- Utilizing the vast catalog from the Trimble Warehouse for potential model use to save time.



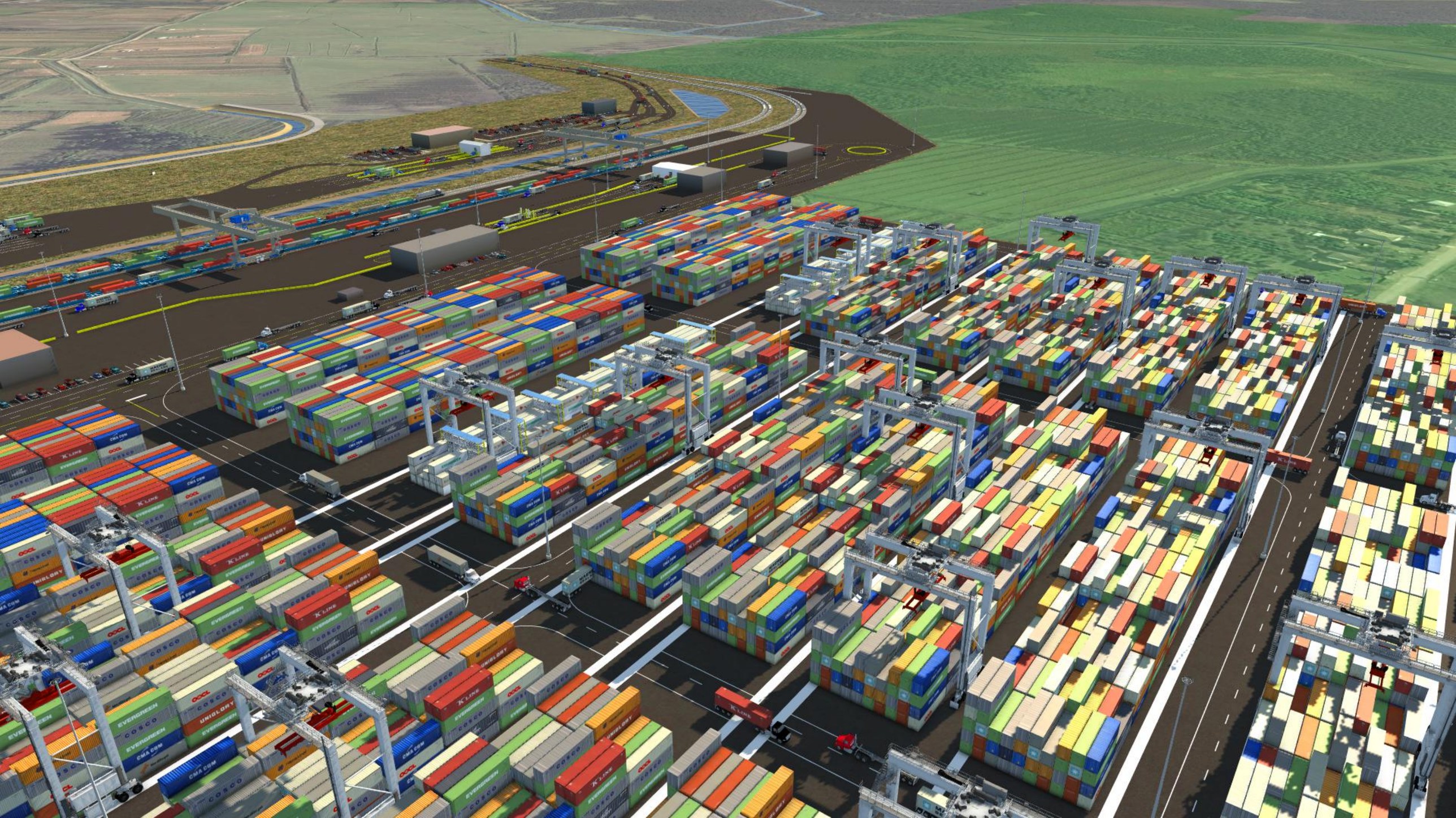
InfraWorks

- Project / Site Modeling
  - Consumes other CAD files for modeling
    - AutoCAD, Civil 3D, Revit
    - GIS (shp,sdf)
    - 3D Models (skp, dae, fbx)
- RAW Video Production
- Snapshots (still shots)



InfraWorks Snapshots

COSCO
OOCL
EVERGREEN
MAERSK SEALAND
CMA CGM
Hamburg Süd
HAMBURG SÜD



84
KONECRANES
84
BROMMA
ZIM
MAERSK
Nedlloyd

MAERSK SEALAND
EVERGREEN
HAMBURG SÜD
Nedlloyd
HAMBURG

MAERSK
EVERGREEN
K LINE
MAERSK SEALAND
HAMBURG SÜD
UNIFEEDER

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STOP
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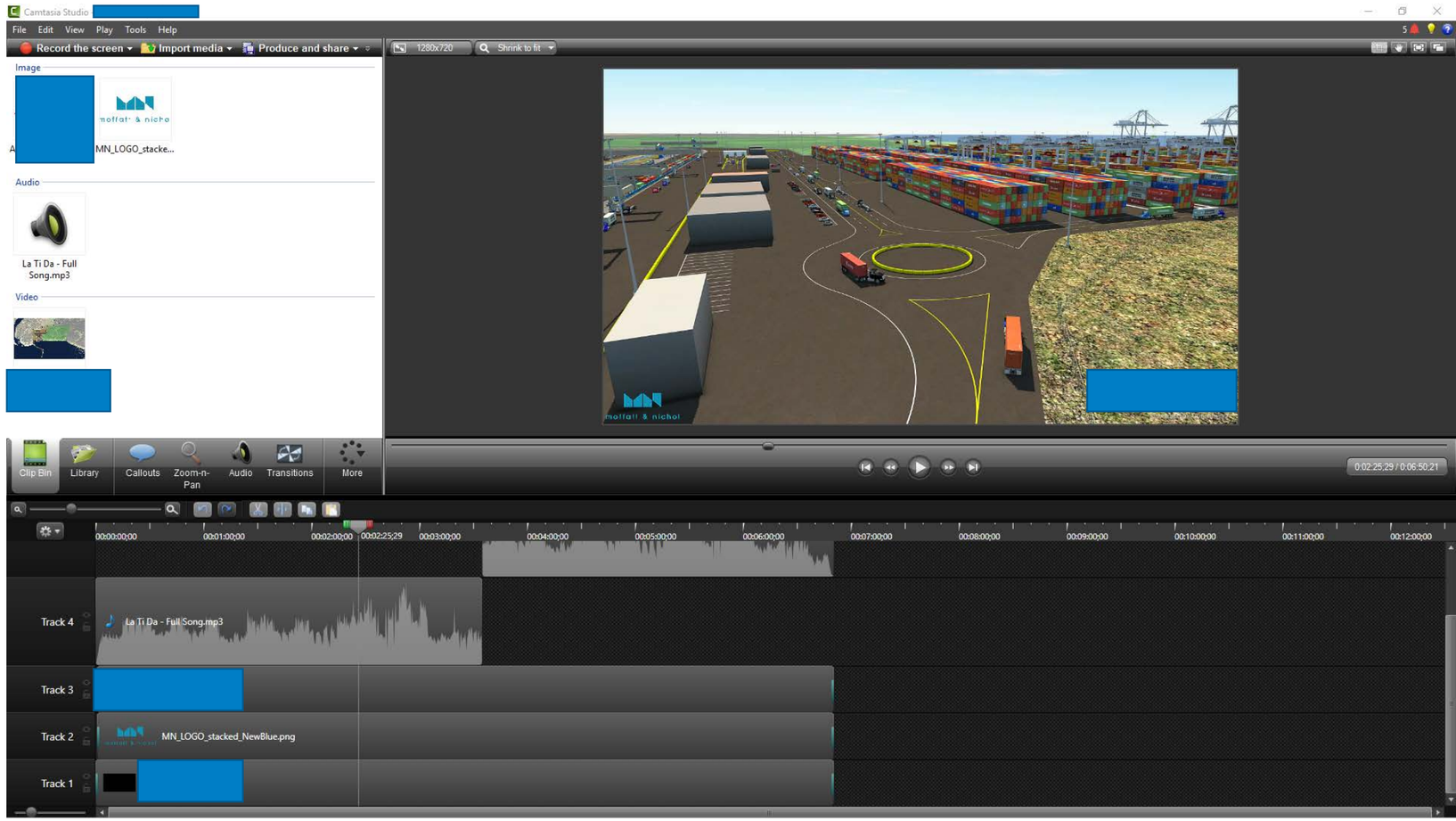
Video Production

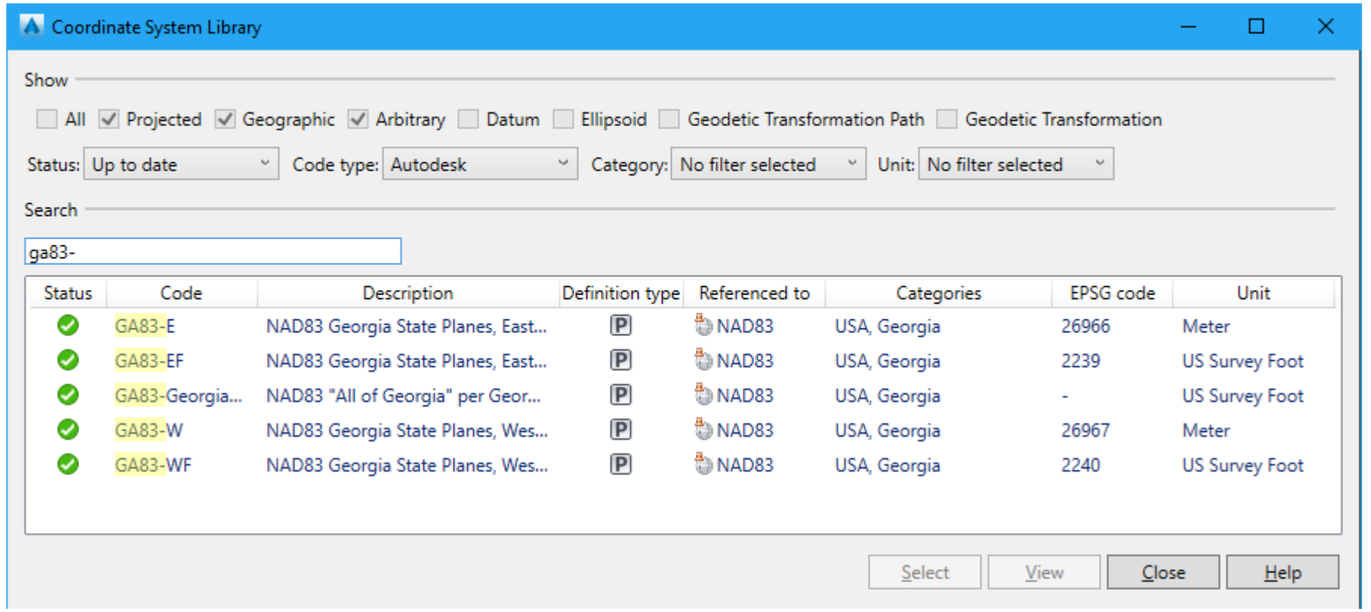
- Adobe After Effects
  - Video Motion Graphics
    - Callouts
- Camtasia
  - Final Video Production

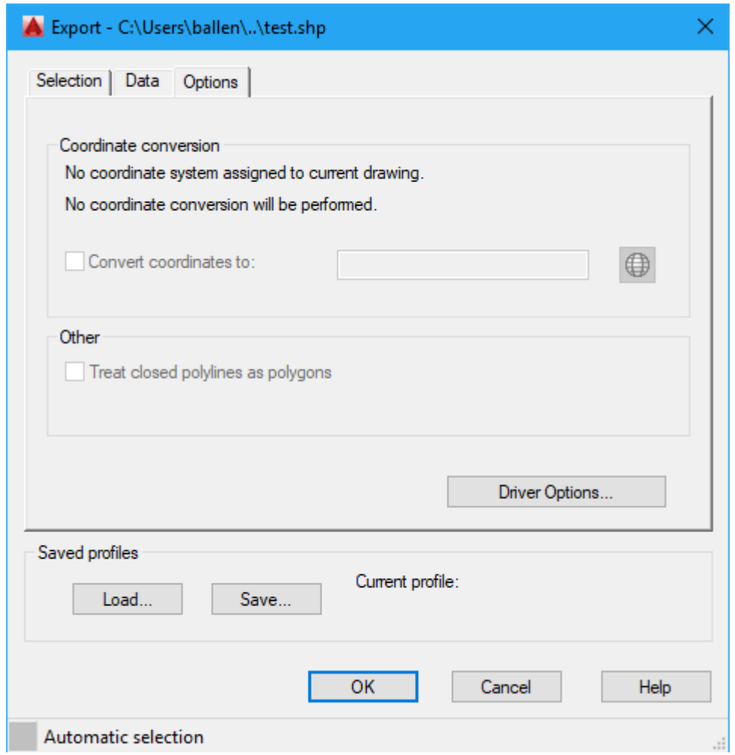


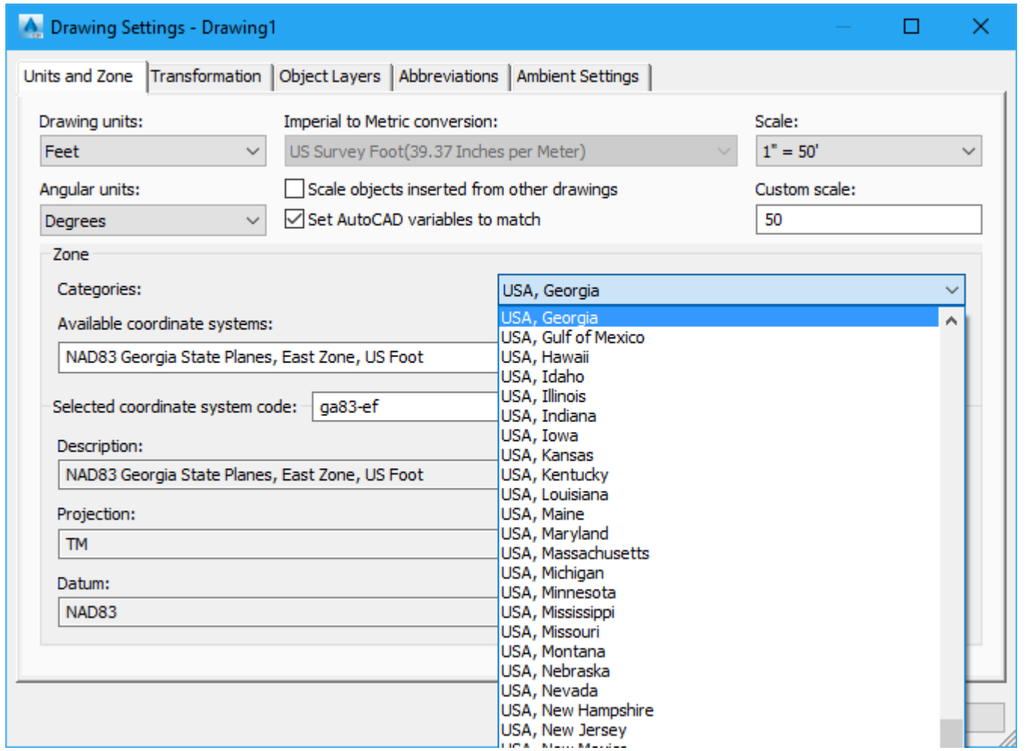
Tips & Tricks

AutoCAD to InfraWorks

- Set project coordinates in CAD. It's part of the software, use it!
- Export CAD data to .shp or .sdf for use with InfraWorks. Be sure to check output coordinate system.
  - 'mapexport'





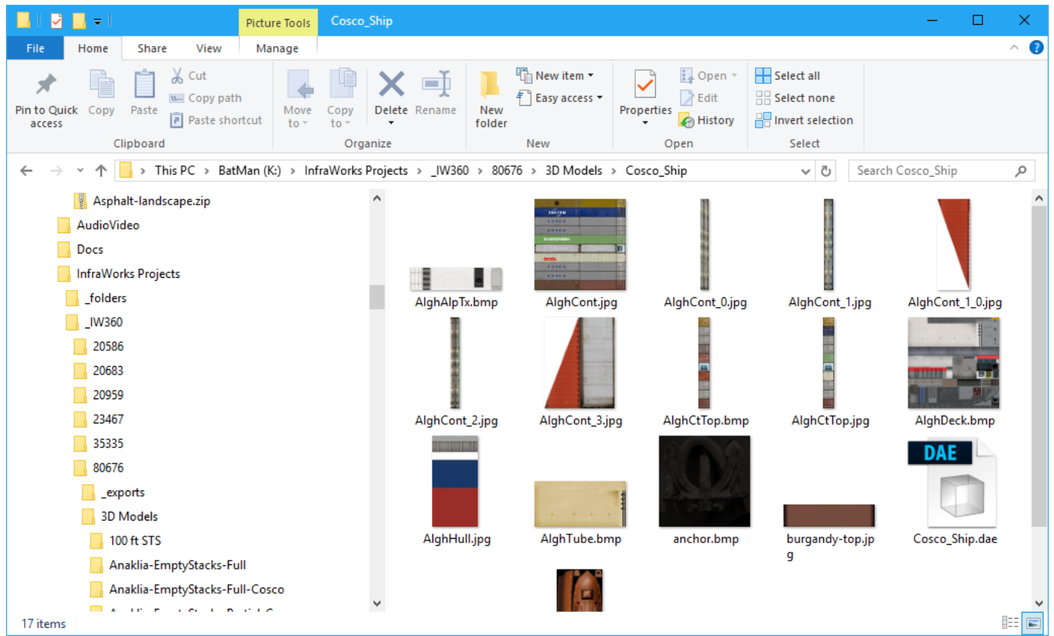


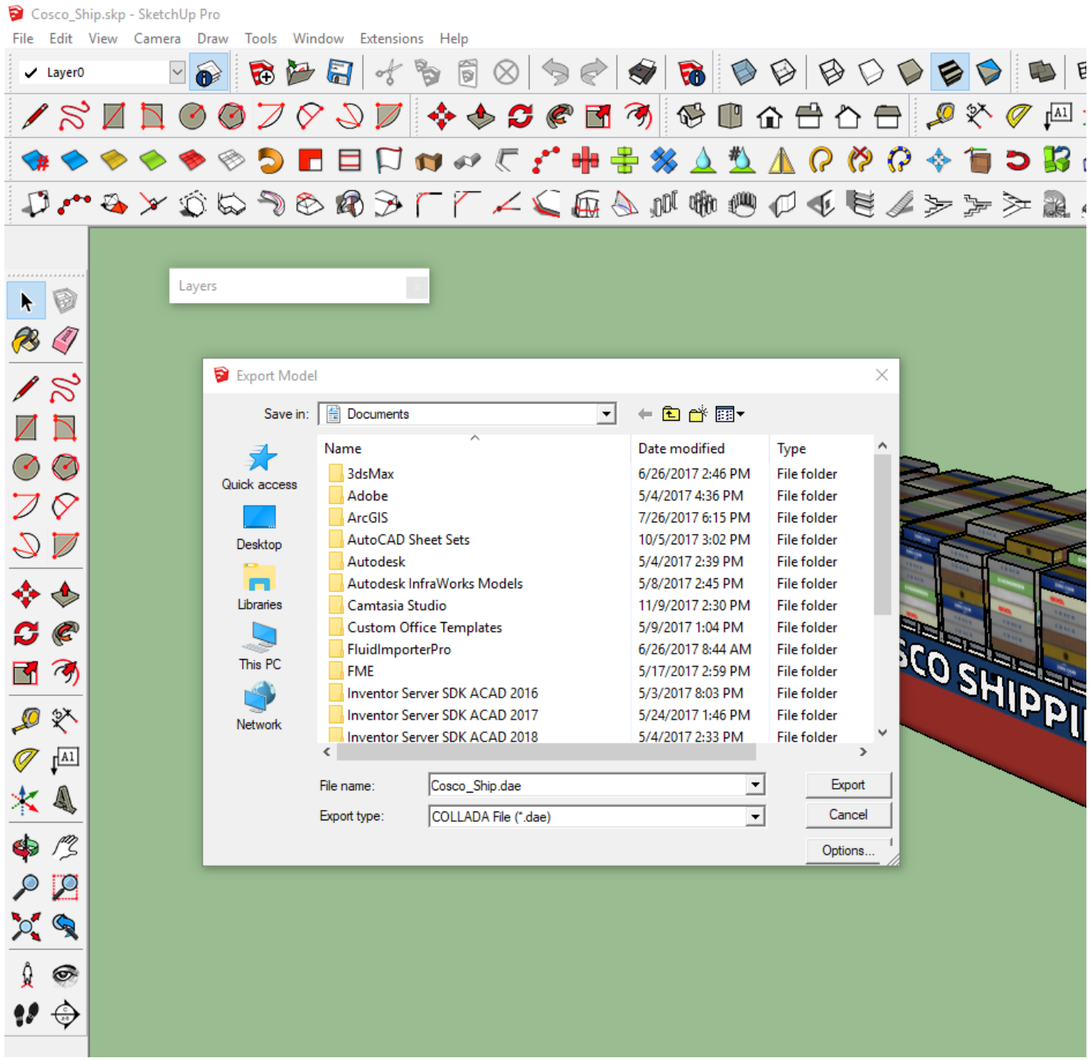
AutoCAD to InfraWorks Continued

- Exporting AutoCAD Models for use with InfraWorks generally work best when exported to the .fbx format. ‘fbxexport’
- Be mindful of units, scaling, and orientation

SketchUP to InfraWorks

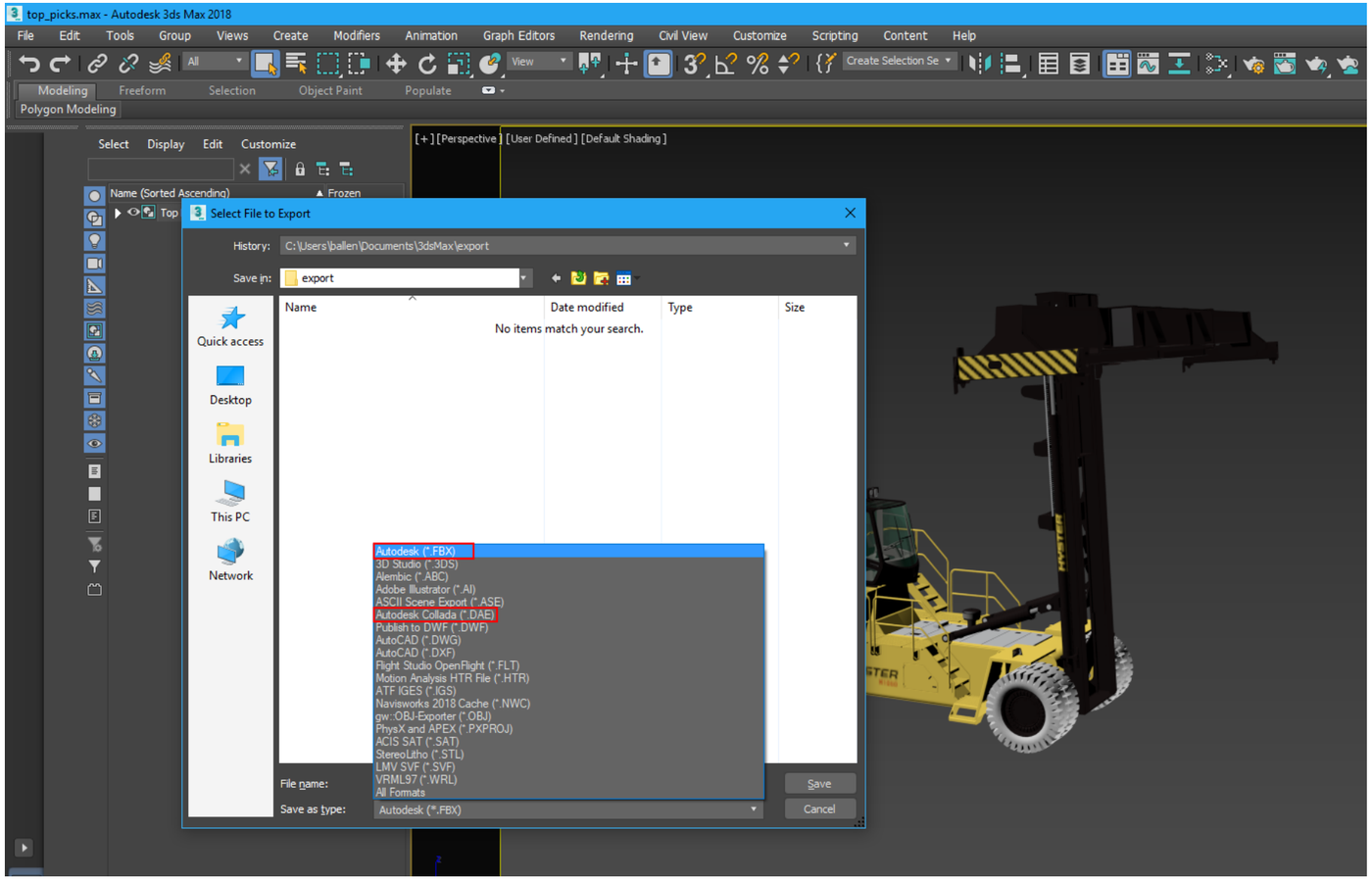
- Best Practice is to export to COLLADA file (.dae)
- Then move the .dae file into the materials folder for optimal outcome for InfraWorks





3DS Max to InfraWorks

- Best Practice is to export to COLLADA file (.dae)…but sometimes .fbx works well too
- Then move the .dae file into the materials folder for optimal outcome for InfraWorks



InfraWorks

- Set a standard folder structure for IW Modeling
- Set 3D Models (furniture) rotation for each project in style properties.
- Be careful of copying/pasting too many complex models – creates issues with image outputs

- Tips and Tricks Live…

Model Sourcing

- Vendors/Manufacturers
- Sites:
  - https://www.turbosquid.com/
  - https://www.3dcadbrowser.com/
  - https://grabcad.com/
  - https://3dwarehouse.sketchup.com/

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