

AAPA

Port Operations/Safety and Information Technology Seminar

4/24/-27, 2007 – Jacksonville, FL

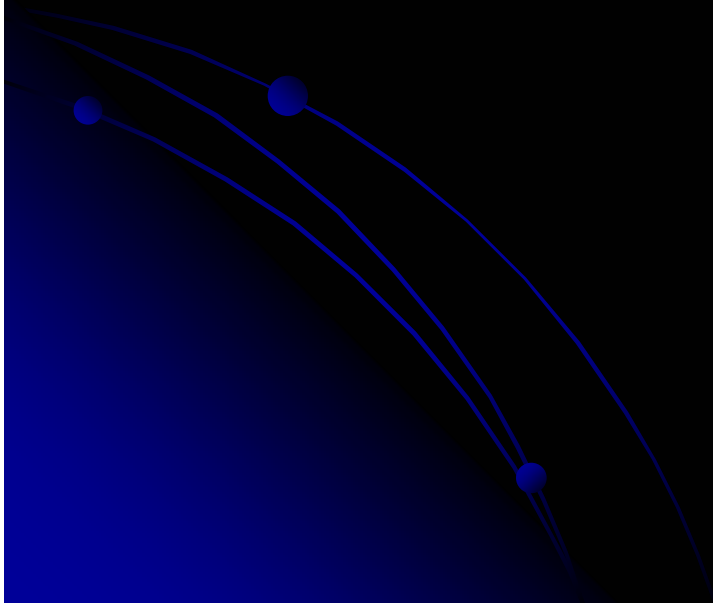
Innovation in Port Efficiency:

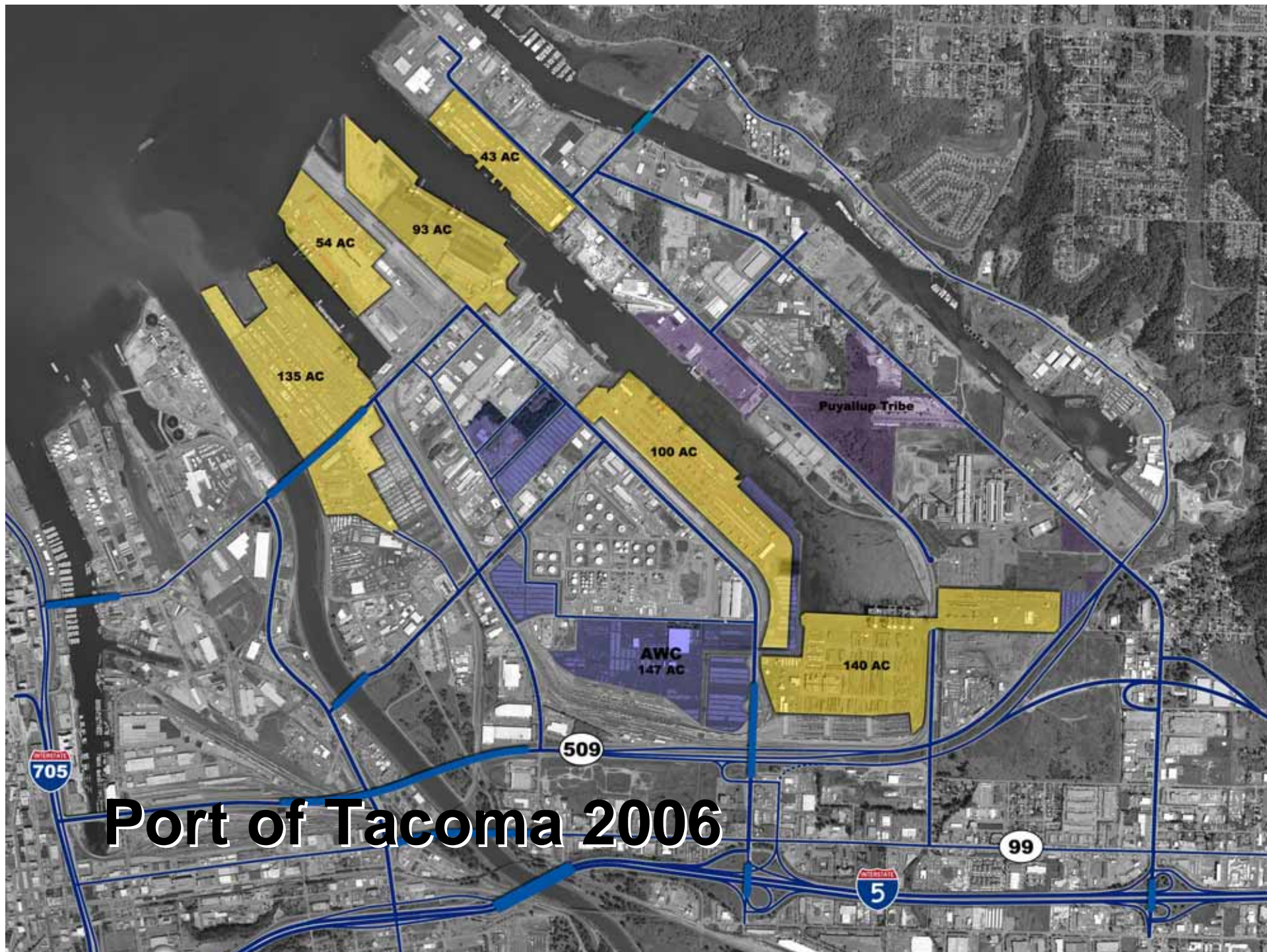
“Processes, Simulations and Modeling for better Terminal
Operations, Planning & Congestion Mitigation”

Udo Mehlberg – Port of Tacoma

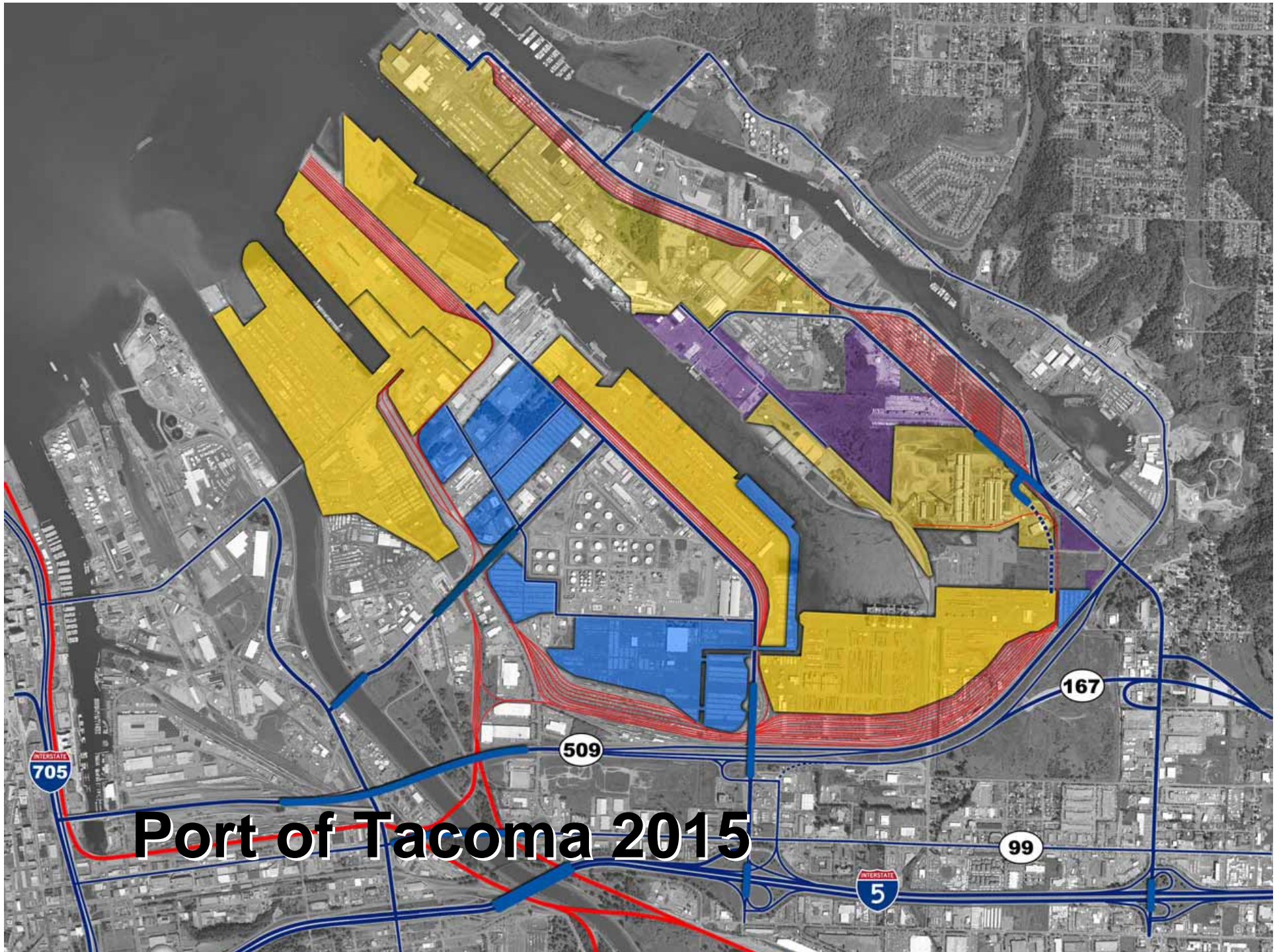


Terminal Operations and Capacity Simulations





Port of Tacoma 2006

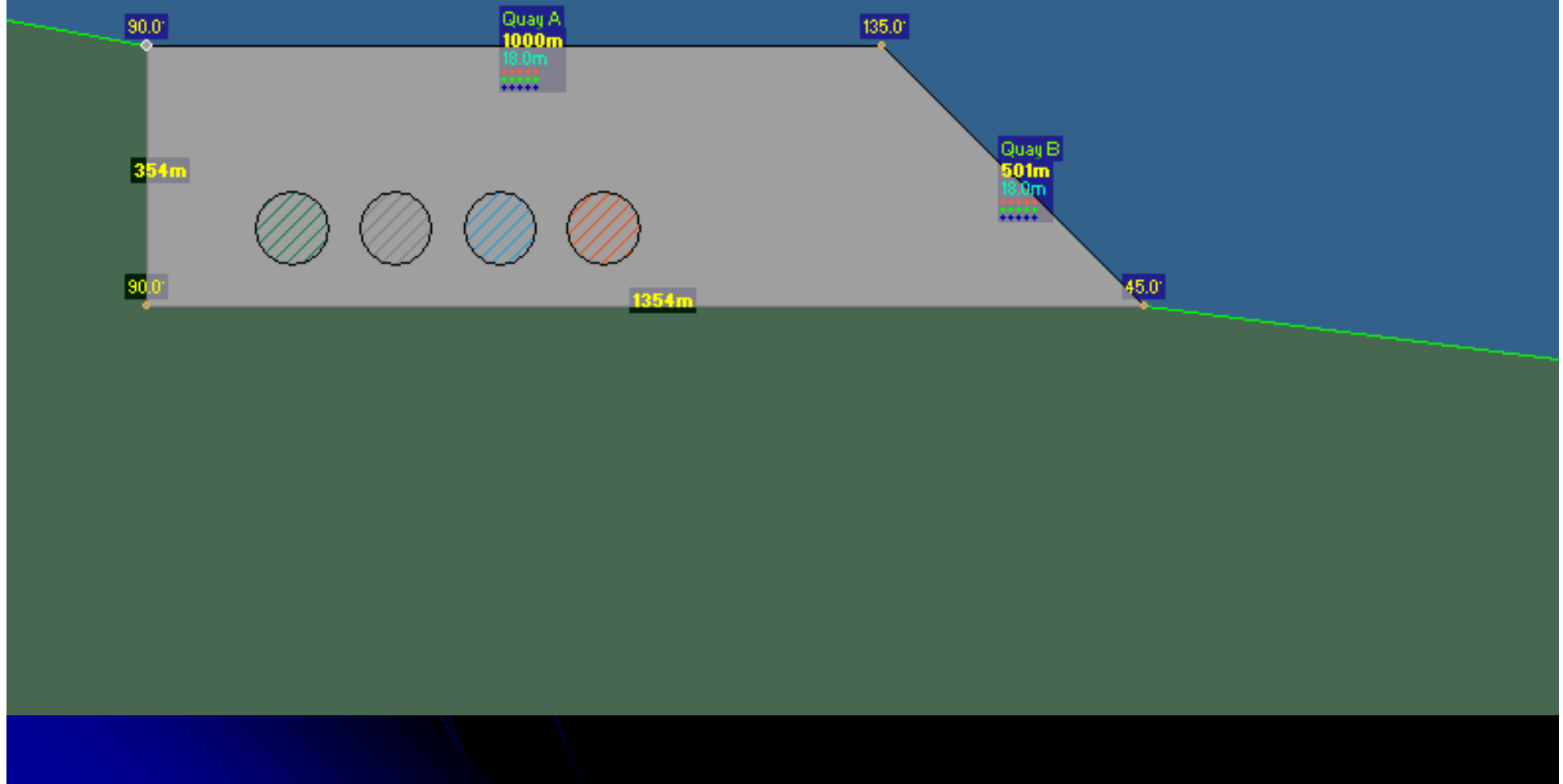


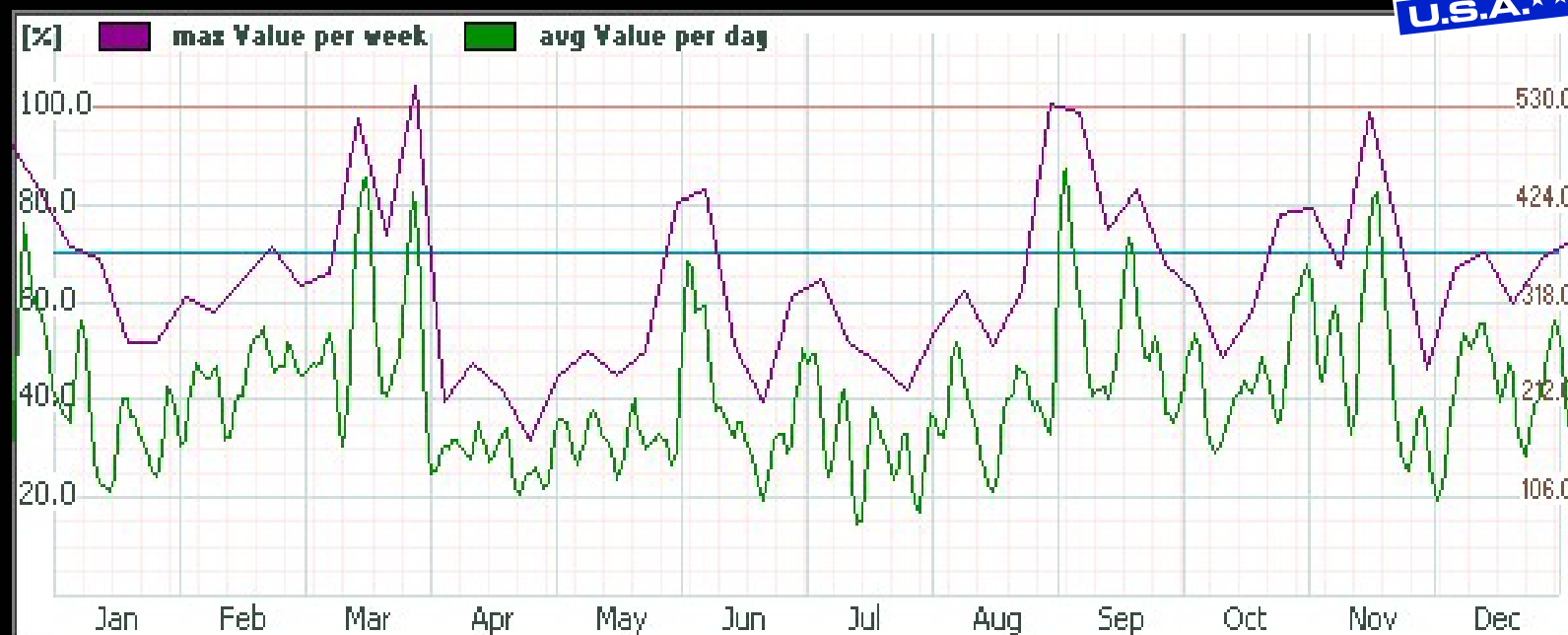
Port of Tacoma 2015

Simulation Projects

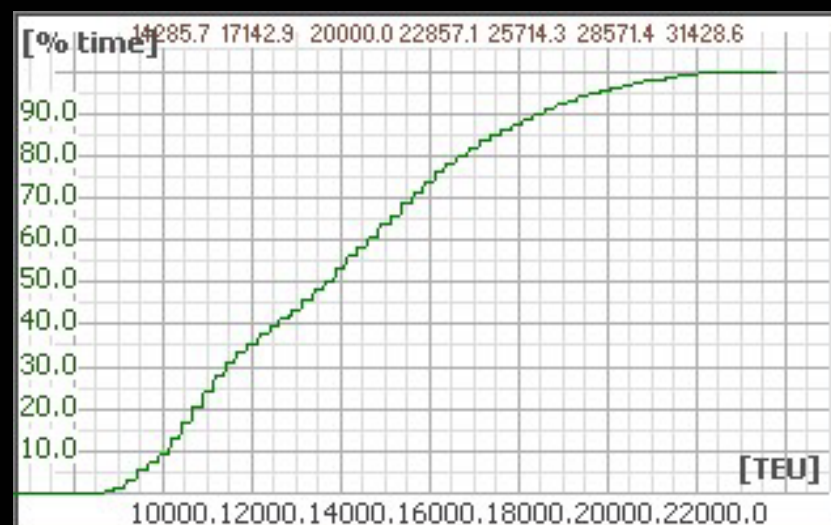


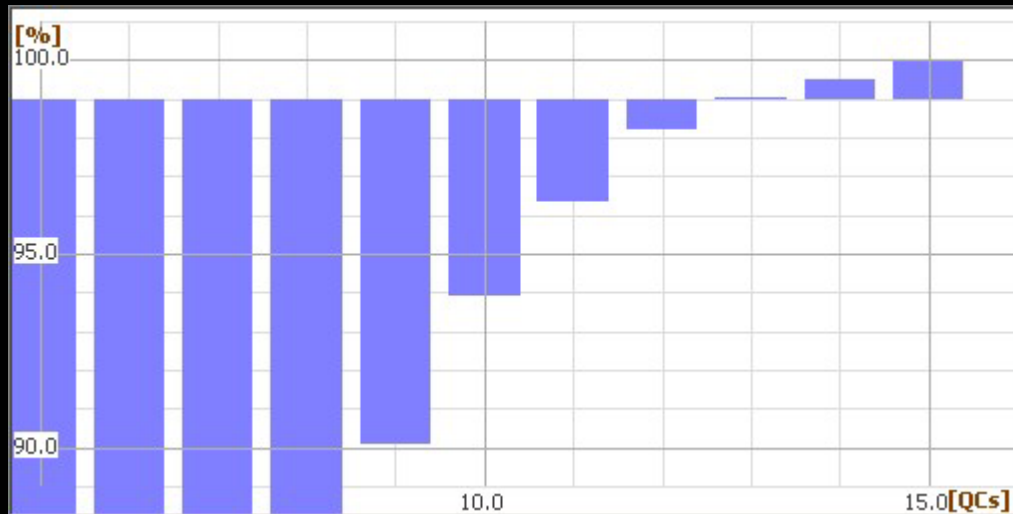
- 1994 First simulation project
 - Intermodal Yard – NIM & SIM throughput Capacity
 - Port Intermodal Infrastructure Planning
 - Used consultant for project
- 2004 Acquired simulation software from ISL
 - (ISL = Institute of Shipping Economics and Logistics)*
 - SCUSY – Simulation of Container Unit Handling systems
 - CAPS – Capacity Planning System
- 2005 Joint development with ISL
 - IYCAPS – Intermodal Yard Capacity Planning System





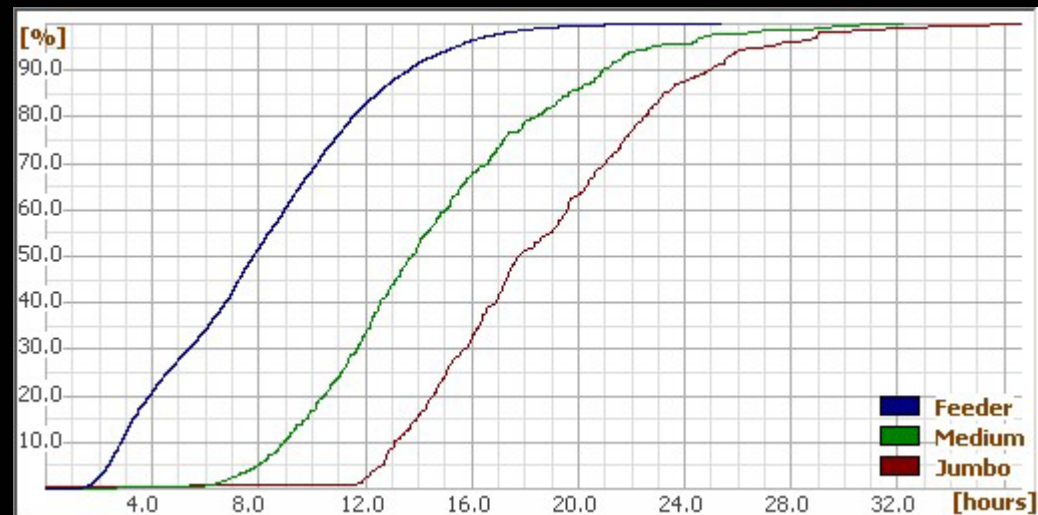
Yard Space Utilization

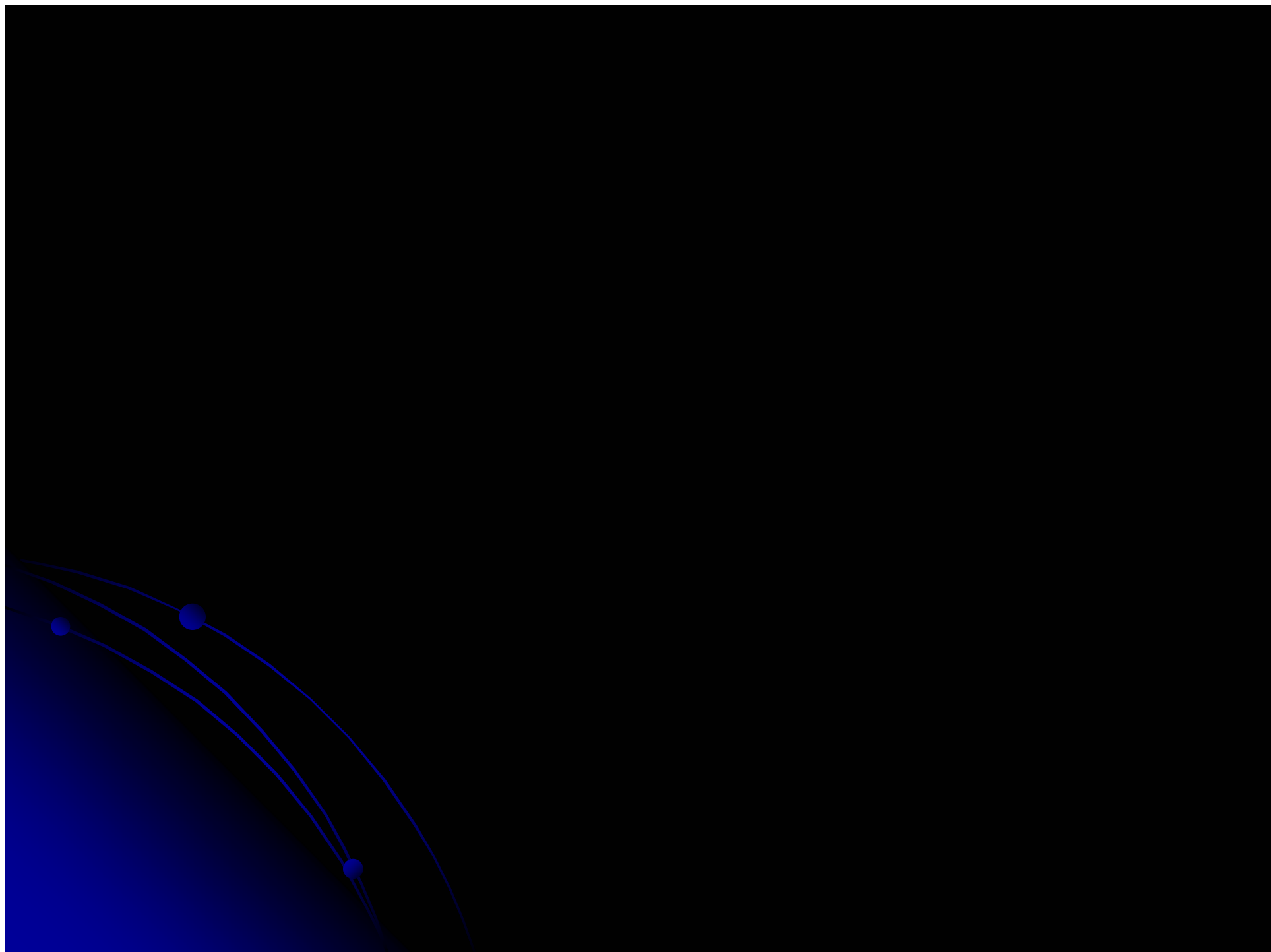




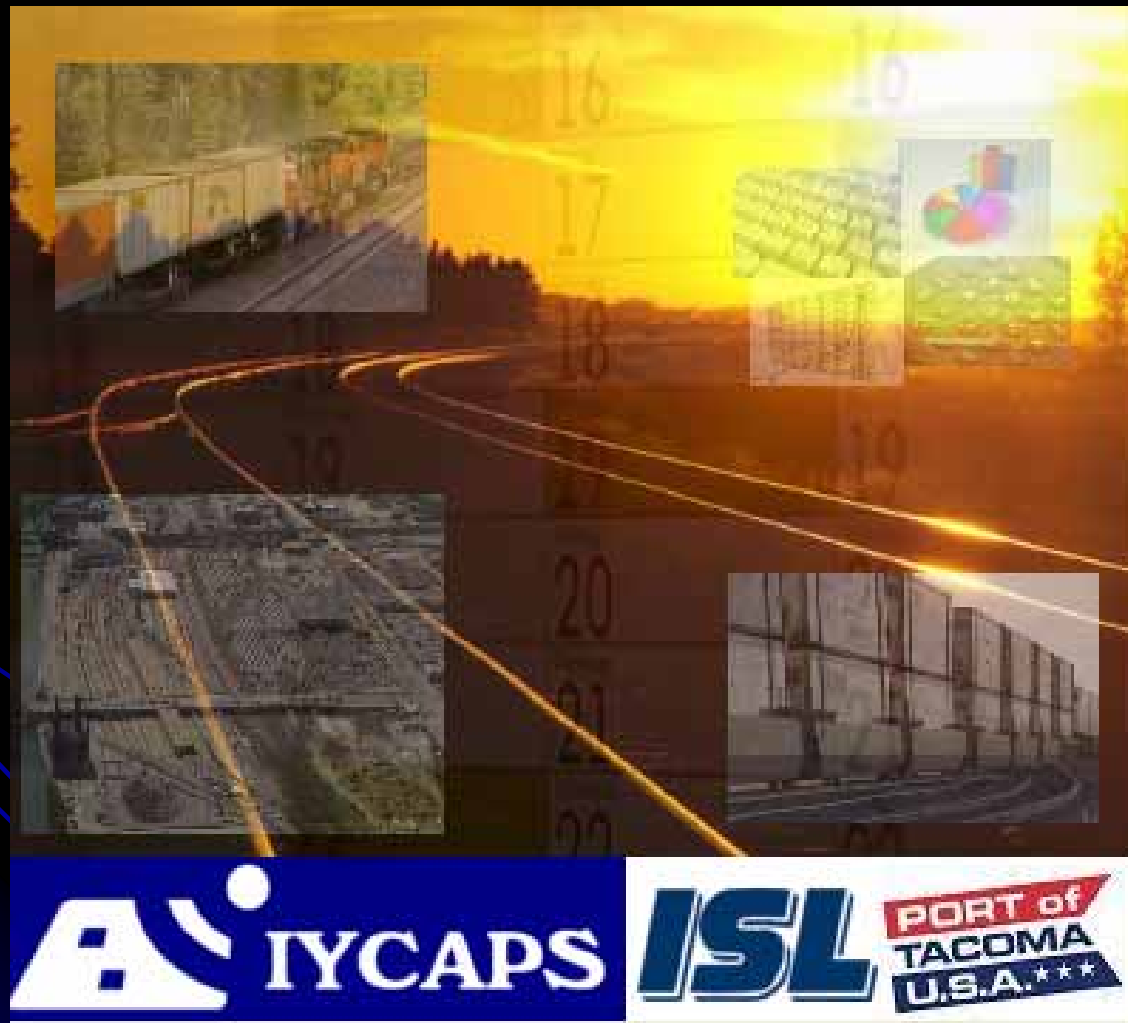
Crane Requirements –
Utilization

Berthing Times





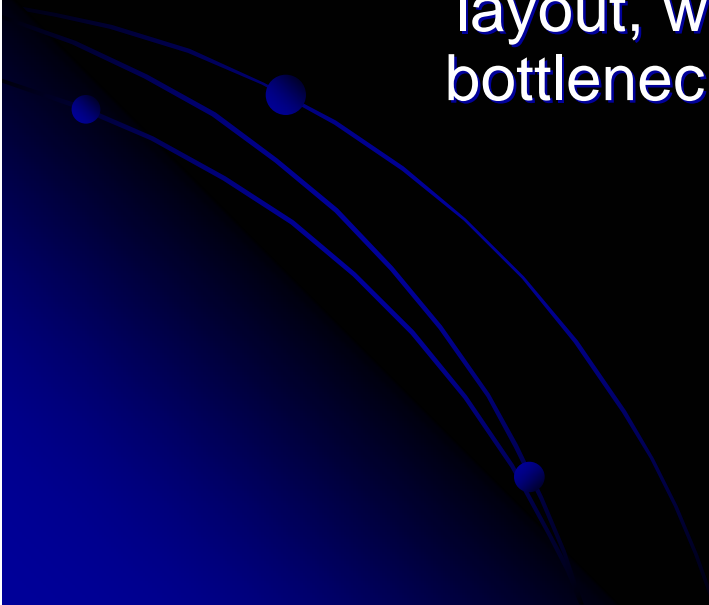
Intermodal Yard Capacity Planning System



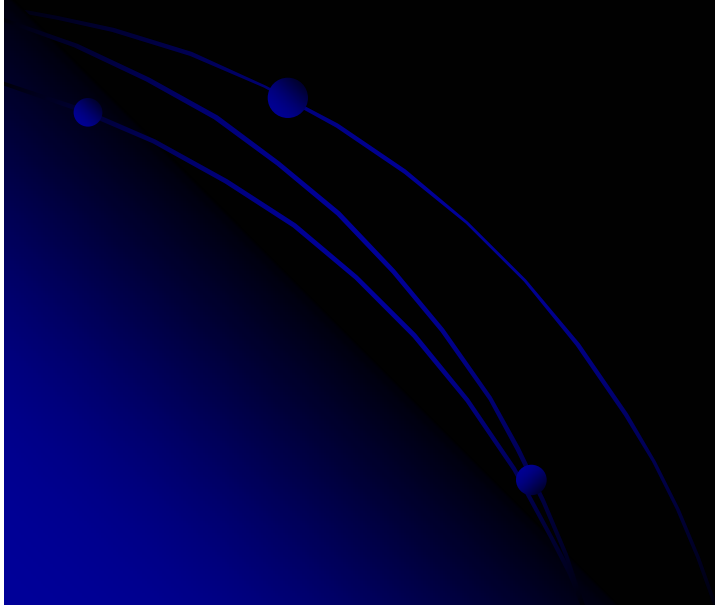
IYCAPS

Problem:

Given a demand forecast and a conceptual IY layout, what are the efficiencies and bottlenecks for the proposed facility?

In the bottom left corner, there are three blue dots connected by curved lines, creating a decorative graphic element.

No Programming is required in order to run a Simulation
and achieve Results



IYCAPS Data Requirements

- REU Types
- Train Types
- Processes
- Tracks
- Track Connections
- Productivity
- Options – Measurement (meter/feet)
- Input Distributions – annual, monthly, daily, hourly throughput, train types

Train Length - Determination

- Unknown types of cars per Train
- Three types of cars with varying length of each car
- Train length determined by adding up car length on per train basis at time of load planning
- While number of TEUs per train may be constant, train length varies greatly

Number of Configurations by Car Type

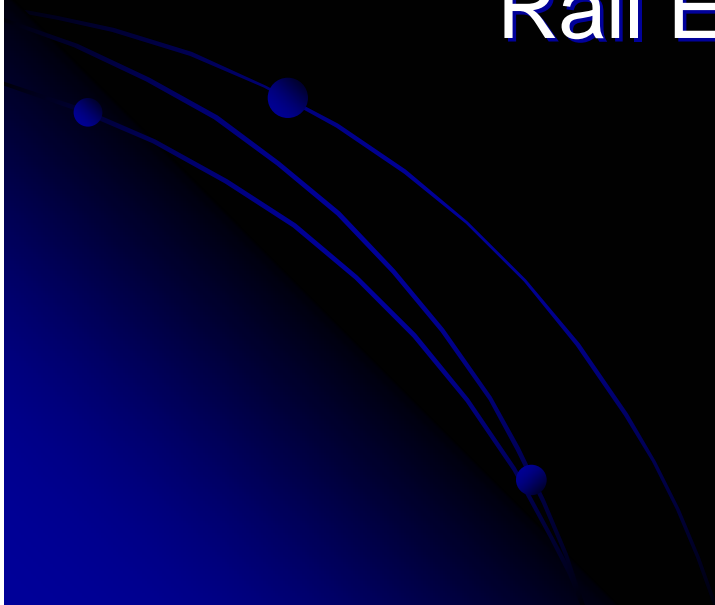
Type of Car	Number of Cars	Number of Types handled in 2006	Number of Car Configurations
Flat Car "P"	11,841	16	21
Spine Car "Q"	13,189	6	13
Stack Car "S"	50,940	38	43

Train Length - Determination

- Create new unit which allows train length determination based on the number of TEU shipped:

R E U

Rail Equivalent Unit

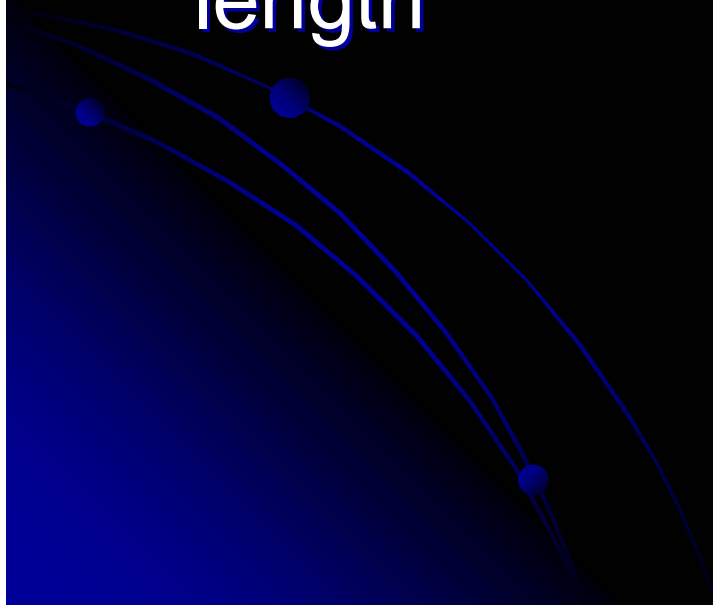


Train Length - Determination

- Establish total number of cars by type
- Establish total length of cars by type
- Establish total number of wells by type
- Establish average number of wells per car by type
- Establish average length of well per car by type
- Establish number of TEU per well by type of car
- Name this unit REU

Train Length - Determination

- Determine distribution of car types arriving/departing from intermodal yard
- Apply number of TEU shipped per train and let the system determine the train length



REU Determination

Type of Car *	No Cars	% of Total	Total length Feet	Avg. Car Length	Total No of REU	Avg. No REU/ Car	Avg. REU length	No TEU per REU	Total No of TEU
P	11,067	13.8	1,052,924	95.1	21,232	1.92	46.6	2	42,464
Q	17,283	21.7	3,298,030	190.8	56,116	3.25	58.8	2	112,232
S	51,447	64.5	10,079,286	195.9	146,814	2.85	68.7	4	587,256
Total	79,797	100	14,430,240		224,162				741,952

*Car Type Data and No of Cars from UMLER file of 2/1/2007

Stack Cars – single well on one platform



Single platform = 1 REU
Average REU length = 64.7 Ft
Average TEU per REU = 4

Spine Car

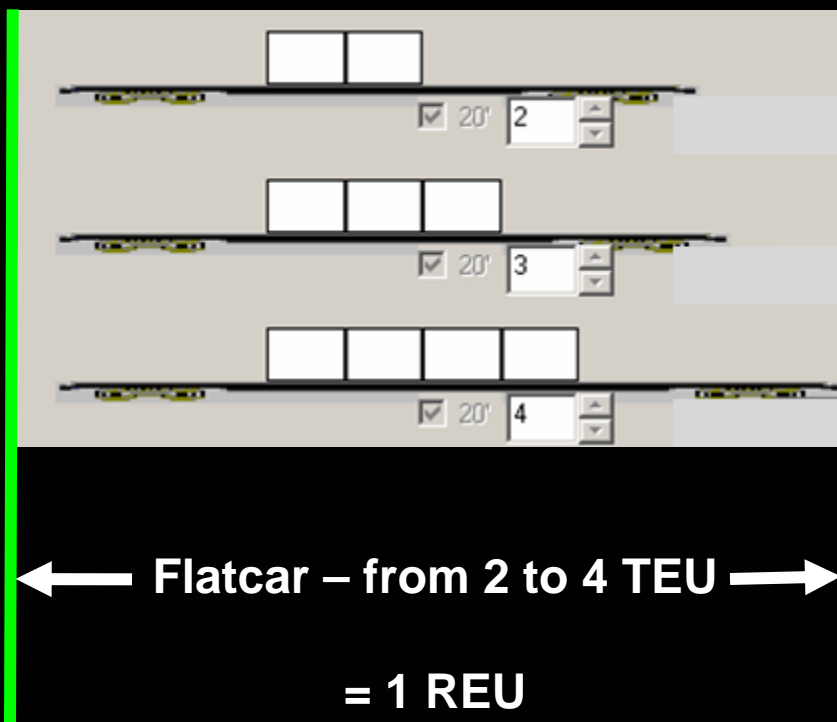


← Spine Car Platform = 1 REU →

Average REU length = 58.7 Ft
Average TEU per REU = 2



Flat Car Types



Average REU Length = 47 Ft
Average TEU per REU = 2

IYCAPS Results Reporting

- Productivity Analysis
 - Equipment type and number
 - Shifts
 - Safety rules for adjacent working tracks

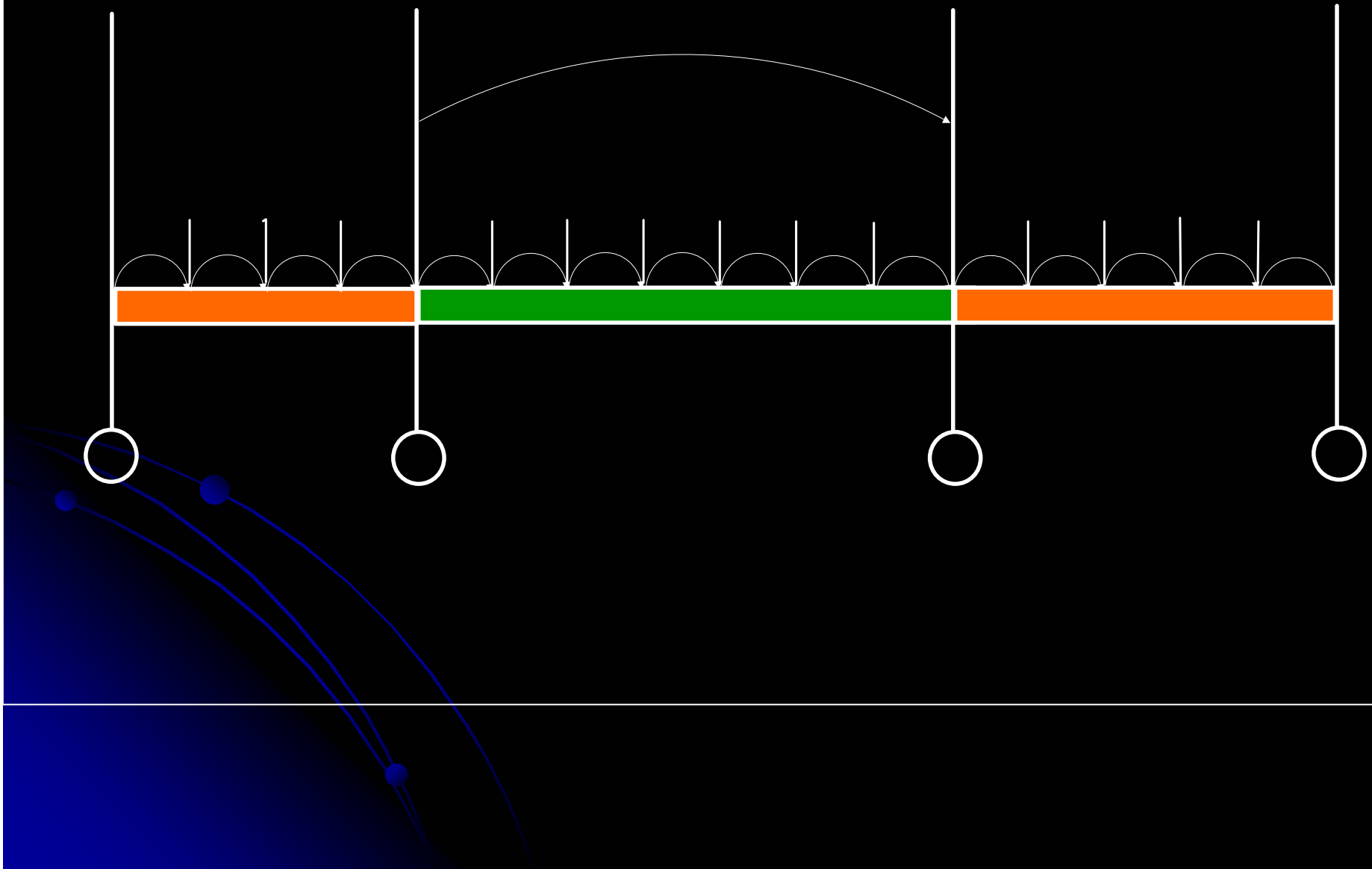
IYCAPS Results Reporting

- Throughput
 - Evaluation of container moves per train type
- Train Schedule
 - List of all train arrivals with among others – arrival and departure time, train length and container movements. Using the multiple runs function the last train schedule is listed
- Train schedule Parameters
 - Shows the seasonal arrival distribution and weekly peak times

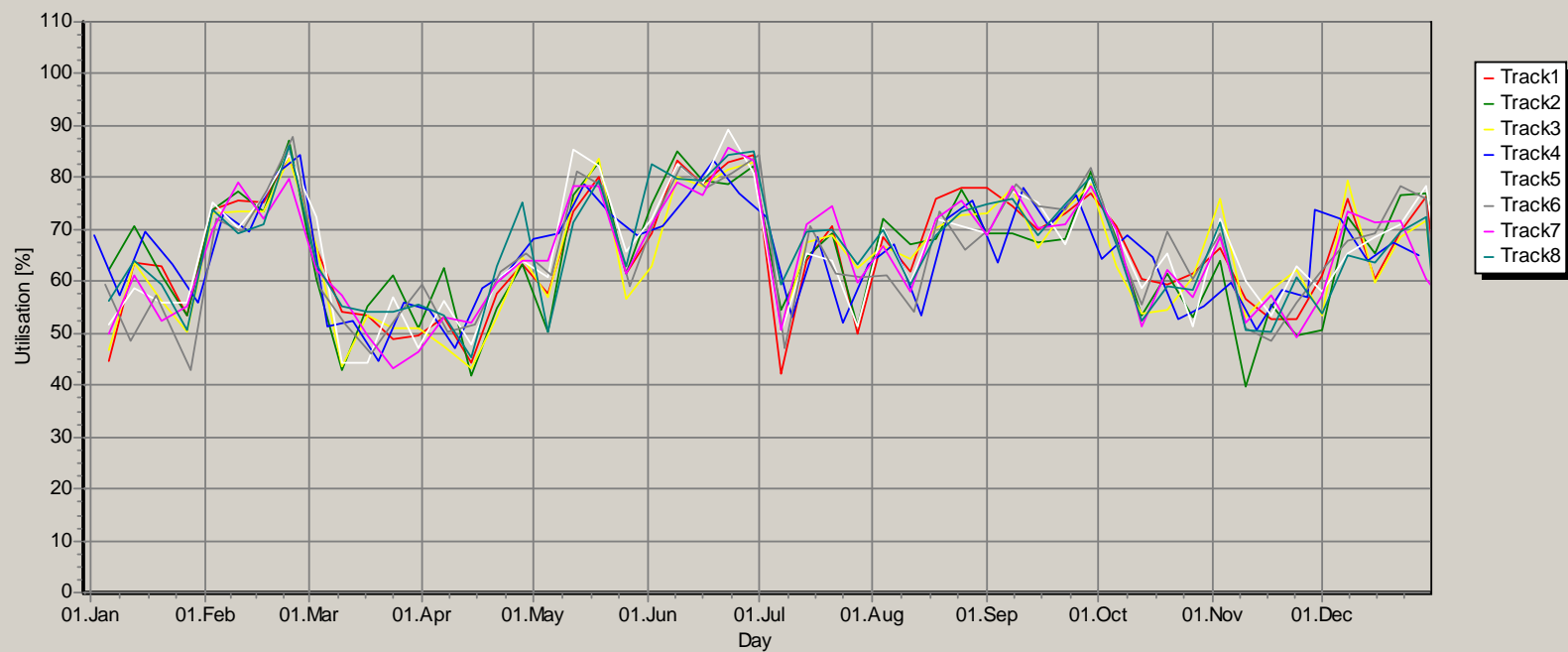
IYCAPS Results Reporting

- Train type evaluation
 - Overview of the time stamps a train passes through during its stay in the intermodal yard
- Track evaluation
 - Overview of the throughput, utilization and performance of operations regarding tracks
- Track utilization
 - Graphic evaluation of the track utilization over a one year period

Time Stamps of a Train's Stay in the Intermodal Yard



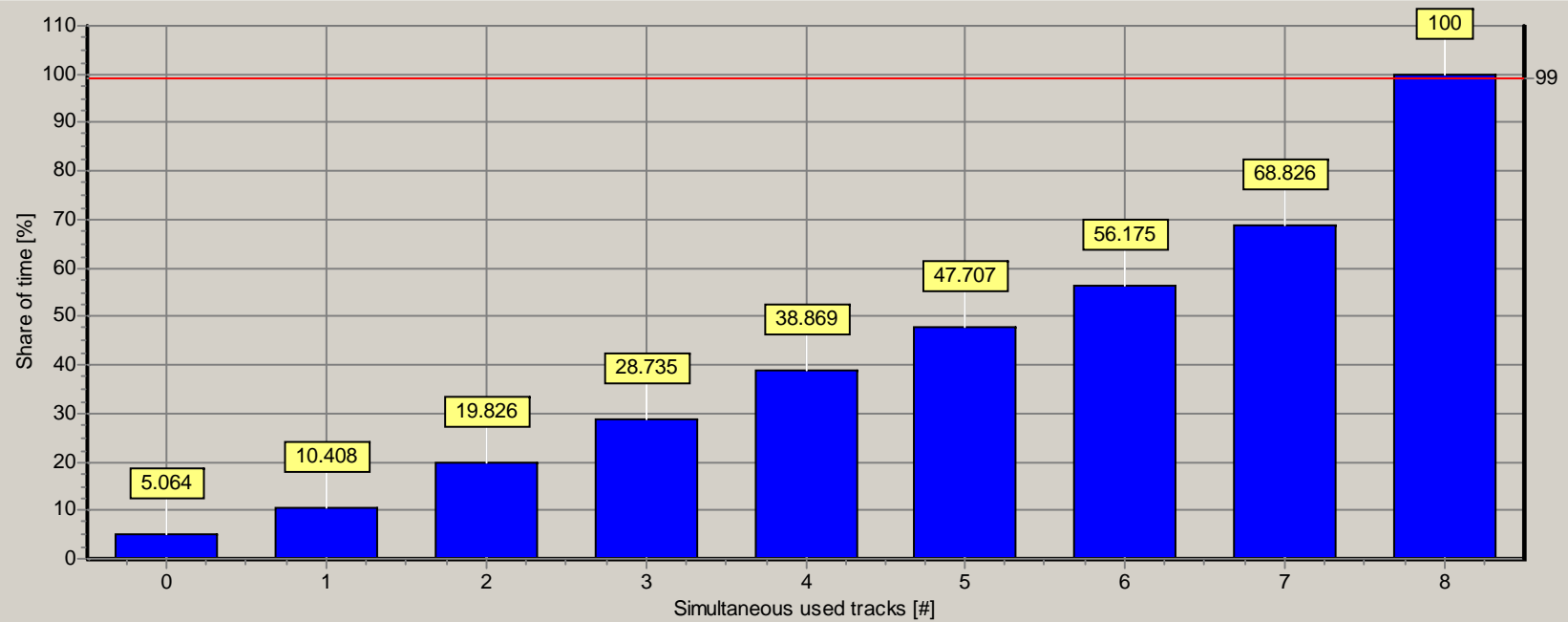
Track Utilization over a one Year Period



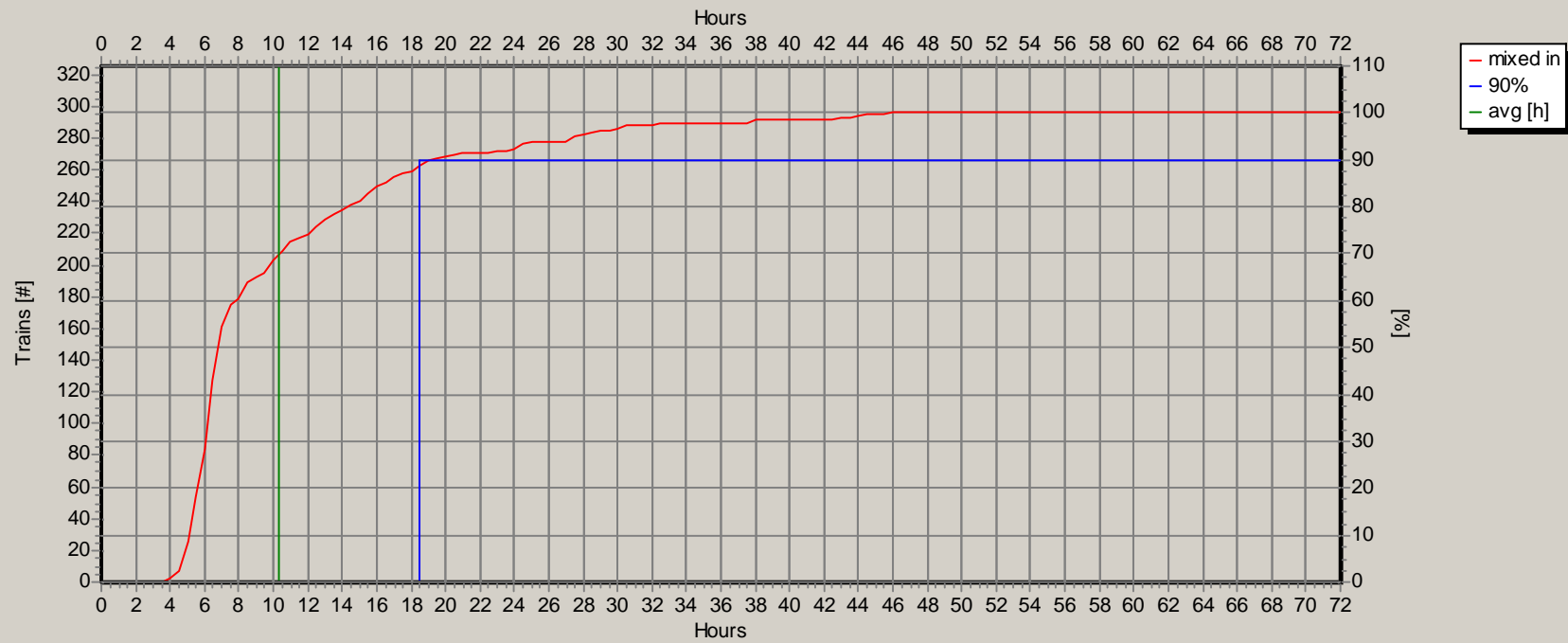
IYCAPS Results Reporting

- Simultaneous utilization of tracks
 - Track allocation regarding their proportional availability for the trains
- Connection Point evaluation
 - Information about bottlenecks in regards to track allocation
- Train Dwell/Delay
 - Graphic evaluation of the length of stay for each train type

Simultaneously used Tracks



Average Hours in IY



IYCAPS Results Reporting

- Productivity Analysis
 - Equipment type and number
 - Shifts
 - Safety rules for adjacent working tracks

IYCAPS is an evaluation tool. It will not give you the answer if you have no clue what you are doing.



For further information about IYCAPS please contact:

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www.isl.org



Thank You

May I answer any questions?

