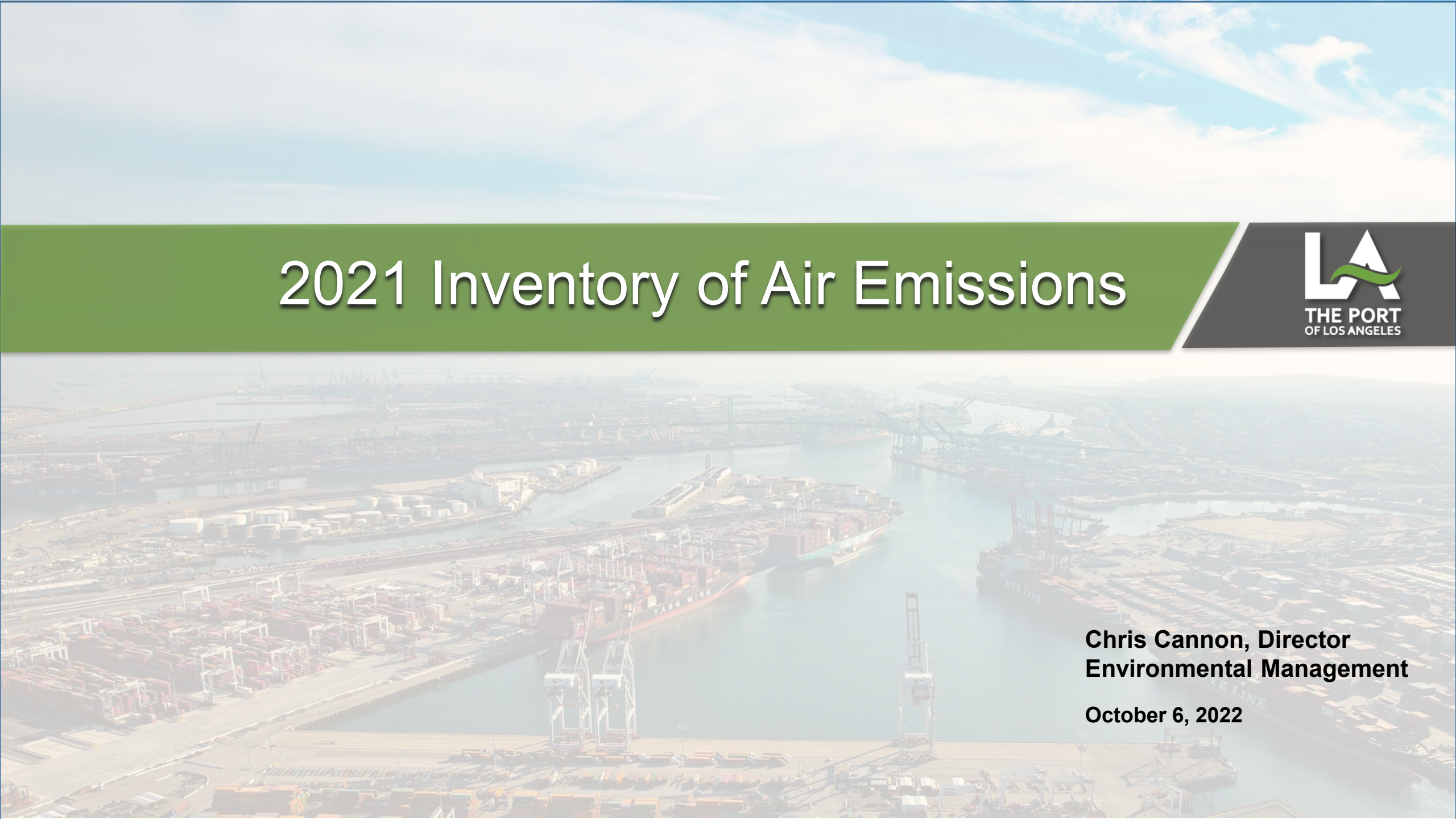
2021 Inventory of Air Emissions

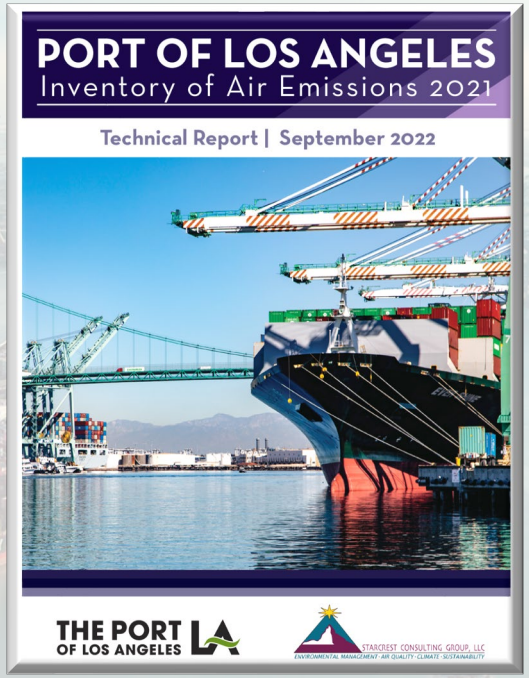


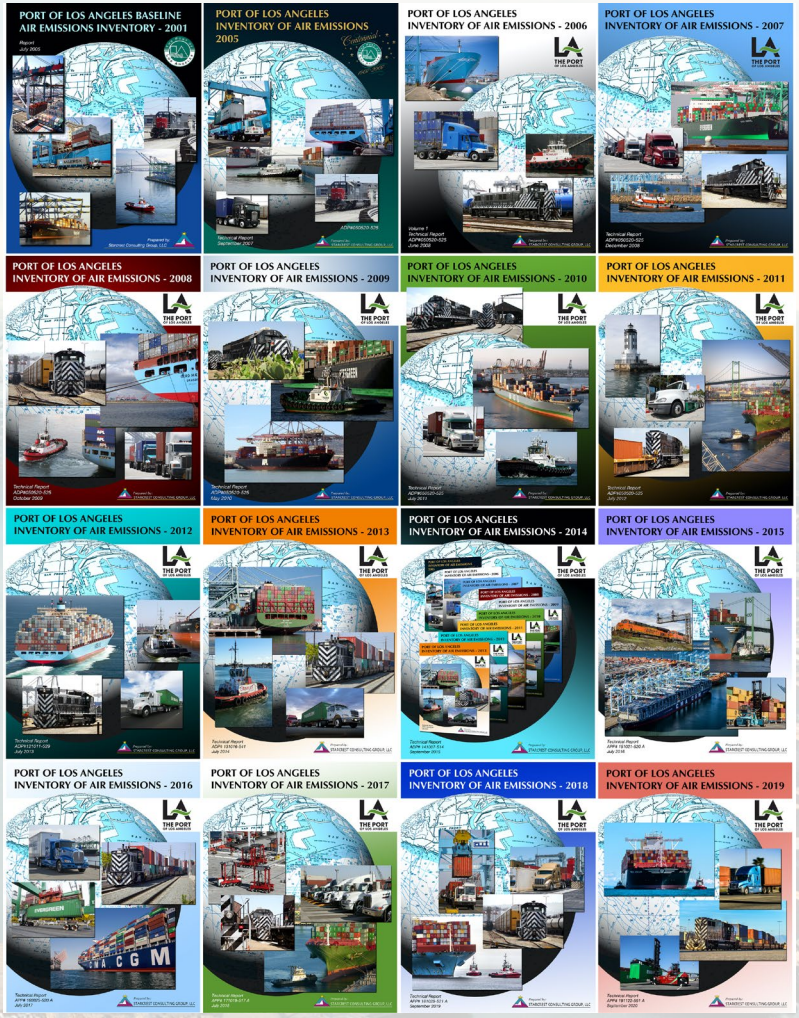
Chris Cannon, Director
Environmental Management

October 6, 2022

Emissions Inventory Background

- Annual activity-based
  - 2001, 2005 – 2021
- Source categories
  - Ships • harbor craft • cargo handling equipment • trucks • locomotives
- Pollutants
  - PM • PM_{10} • $PM_{2.5}$ • DPM • NO_x • SO_x • HC • CO
- Greenhouse gases
  - CO_2 • CH_4 • N_2O • CO_2e





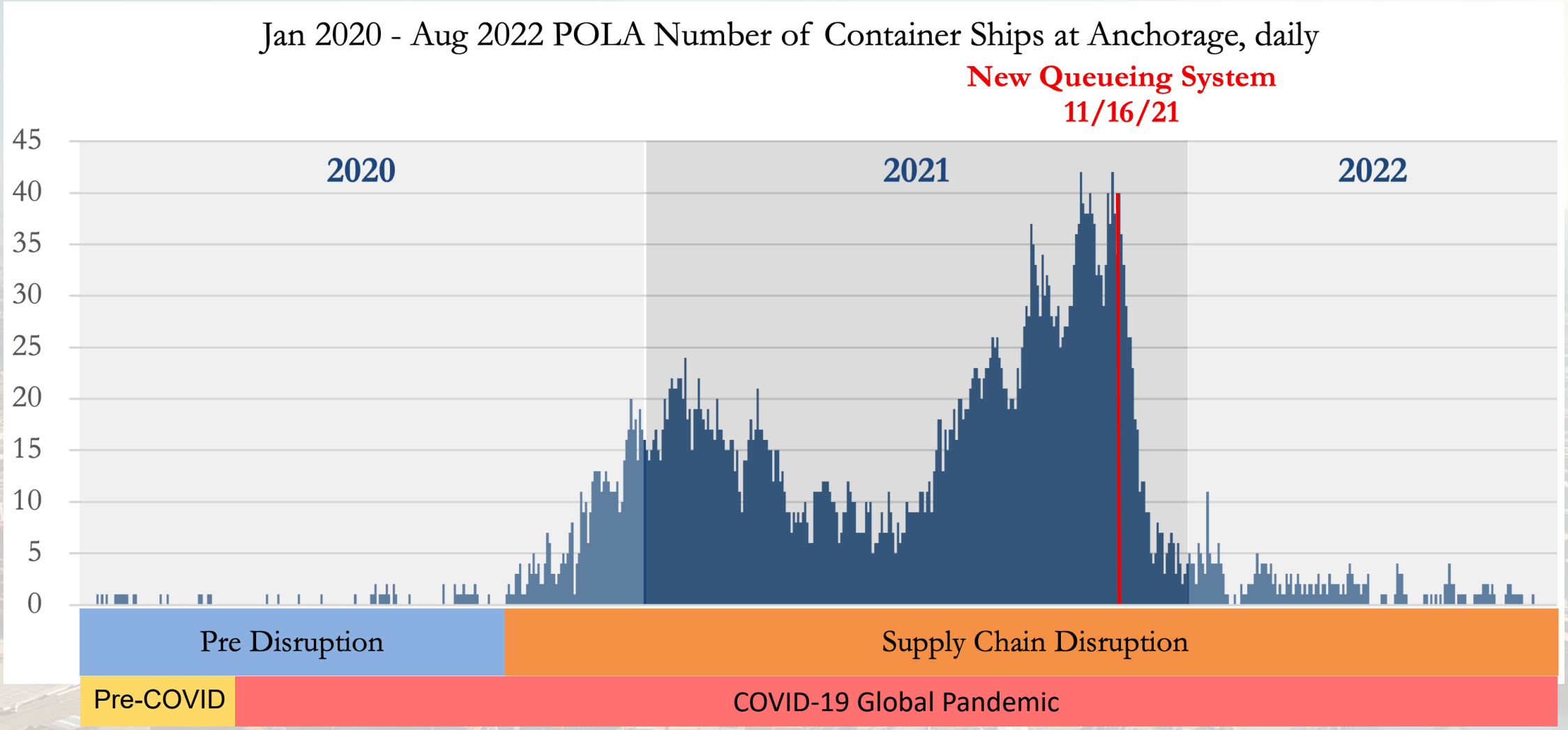
Emissions Inventory Background

- Annually coordinated with & peer-reviewed by:
  - EPA
  - CARB
  - South Coast AQMD

2021 – Hundred Year Pandemic

- Unprecedented consumer demand
- Supply chain challenges – backlogs and bottlenecks
- Unprecedented container ship emissions at coastal anchorages
- Emissions from all ship types went up
- Public and private stakeholder driven response – swift reduction in coastal anchorage emissions

POLA-related Container Anchorages

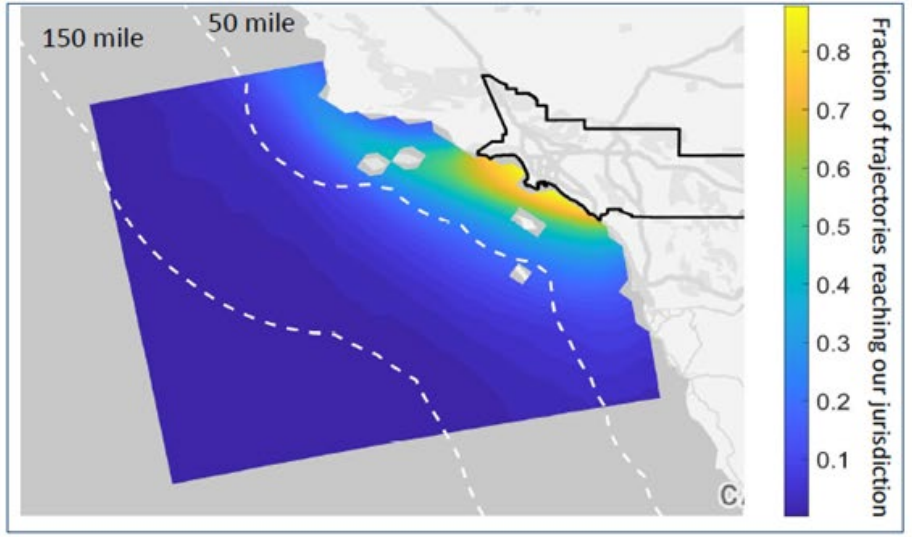


Reduced near shore container ship emissions

- Reduced near shore emissions are beneficial
- Confirmed by South Coast AQMD modeling

Are New Ship Queuing Procedures Effective For Improving Air Quality?

- New vessel queuing system (PacMMS) keeping container vessels >150 miles off the coast began phasing in mid-Nov. 2021

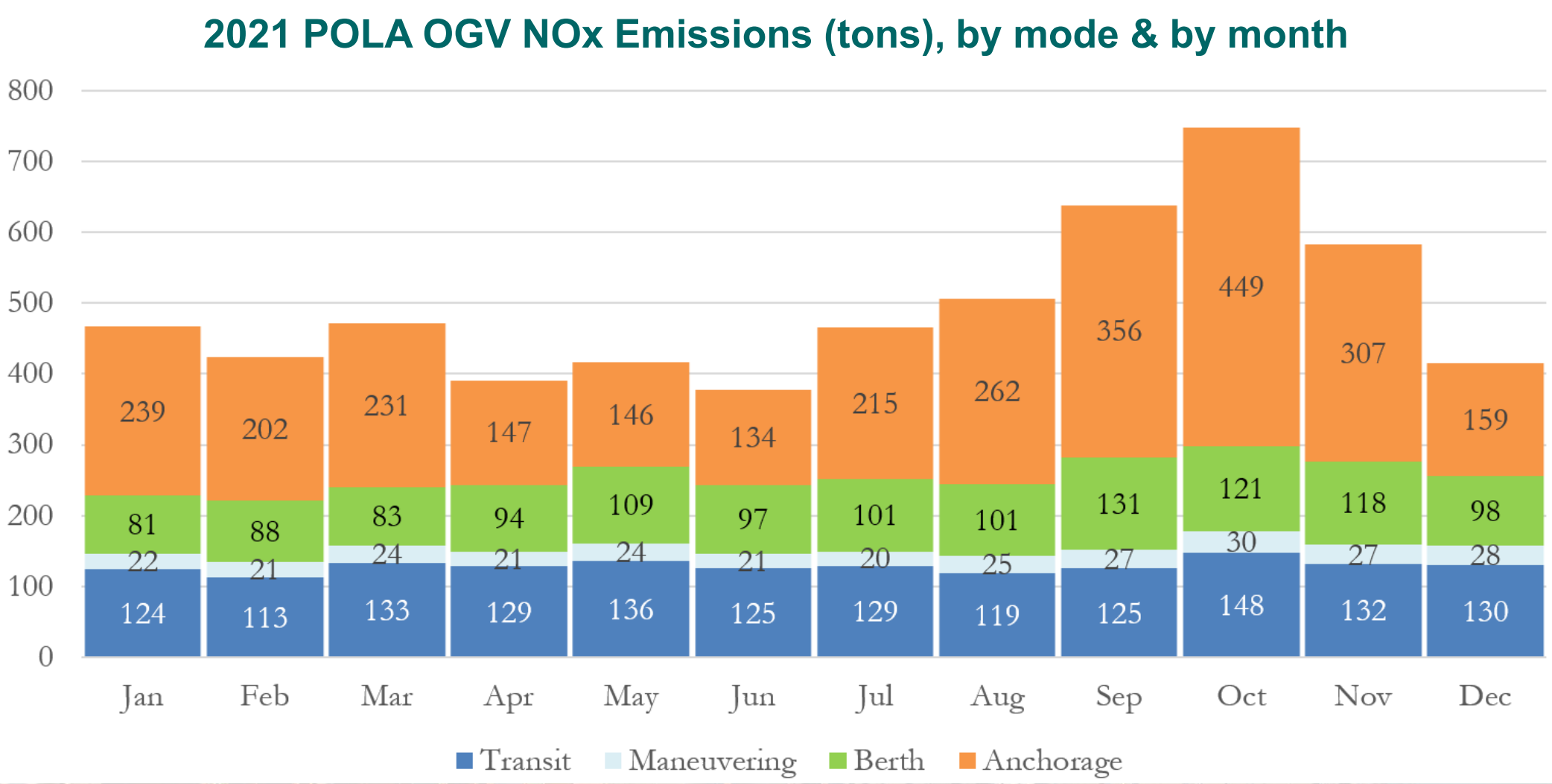


- Modeling shows that ships closest to shore have greater impact on air quality than those farther away. Minimal impact of emissions >150 miles off the coast.

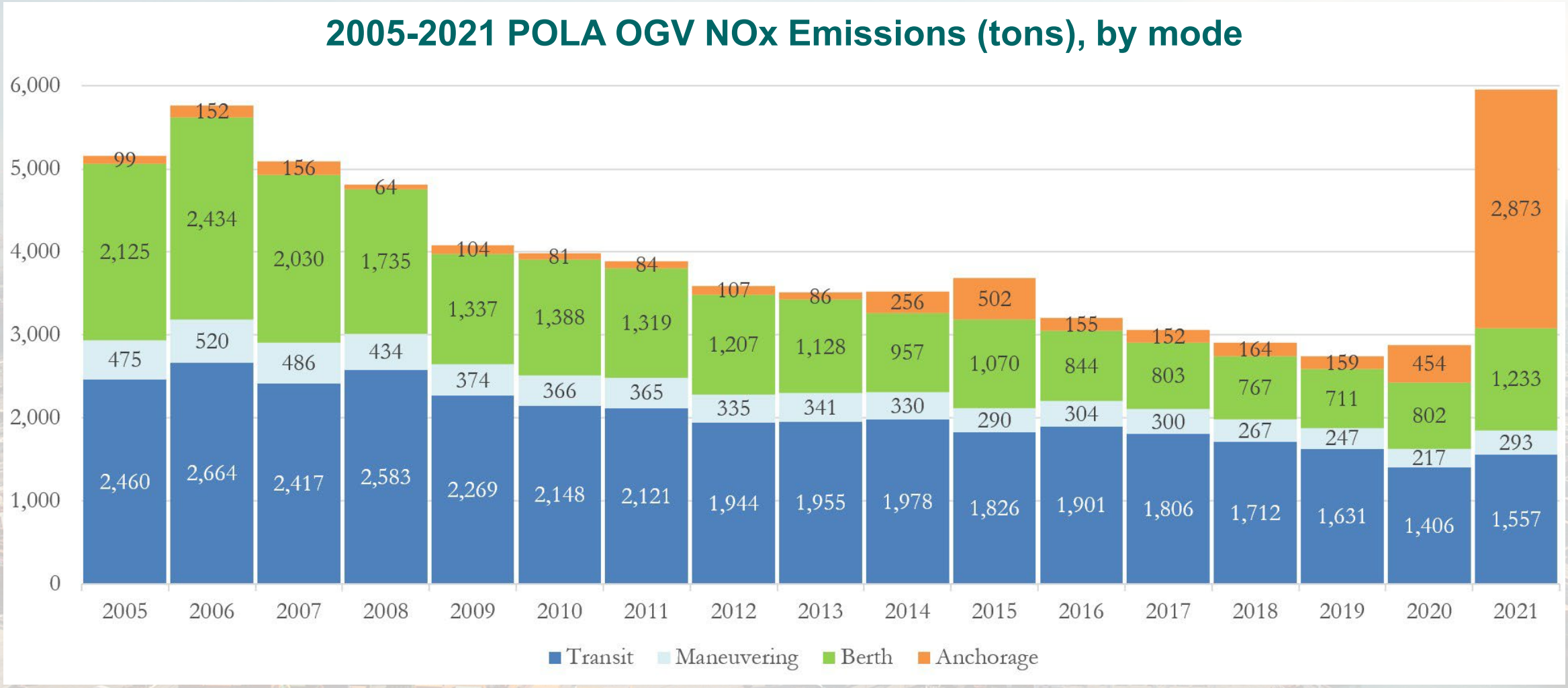
24

*South Coast Air Quality Management District. (18 March 2022). *Current Ozone and PM2.5 Summary & Trends*. Mobile Source Committee.

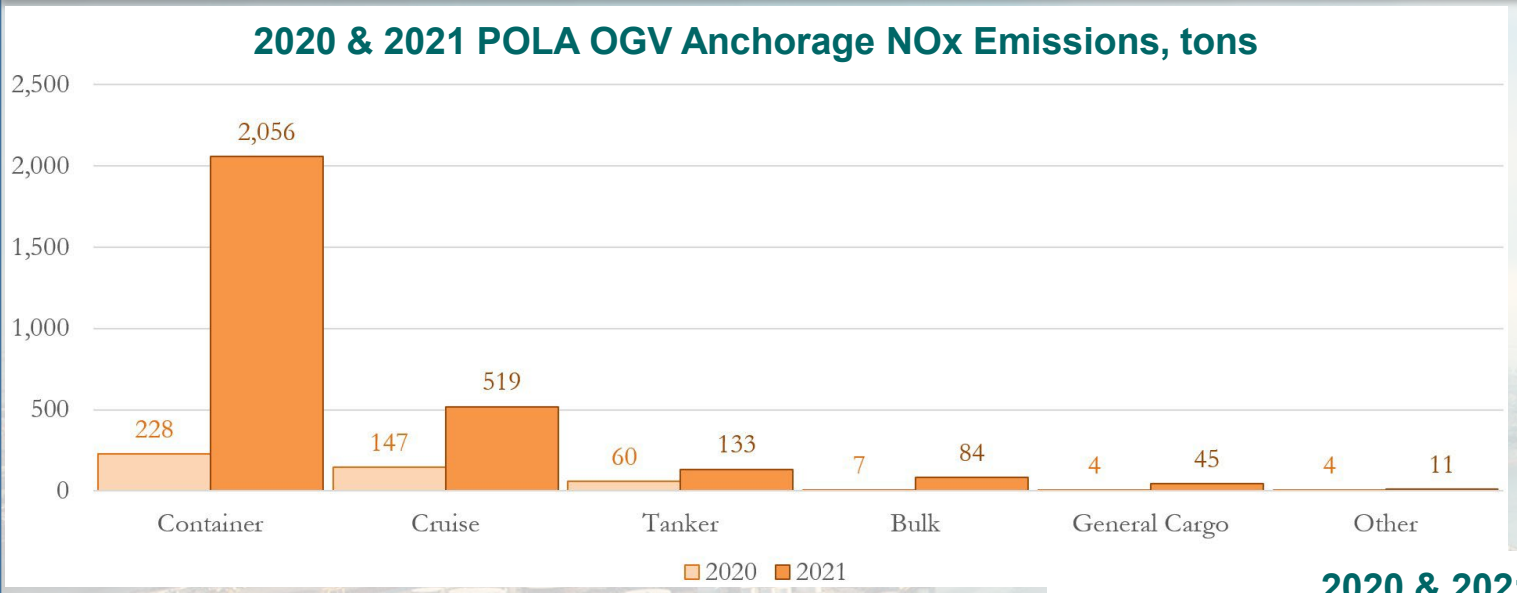
Monthly OGV NOx Emissions (2021)



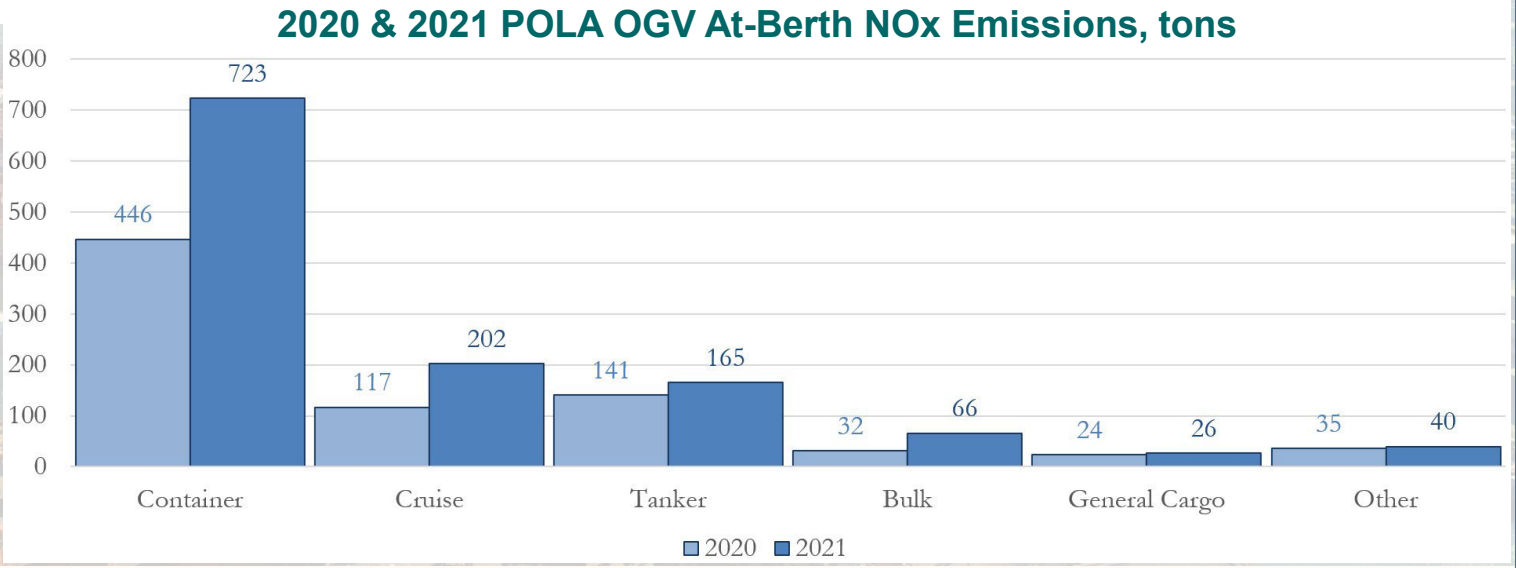
Annual OGV NOx Emissions (2005-2021)



Annual OGV NOx Emissions by Ship Type (2020-2021)



- In 2021, OGV emissions from all ship types increased vs. 2020



Year-to-Year Emissions Detail (2020-2021)

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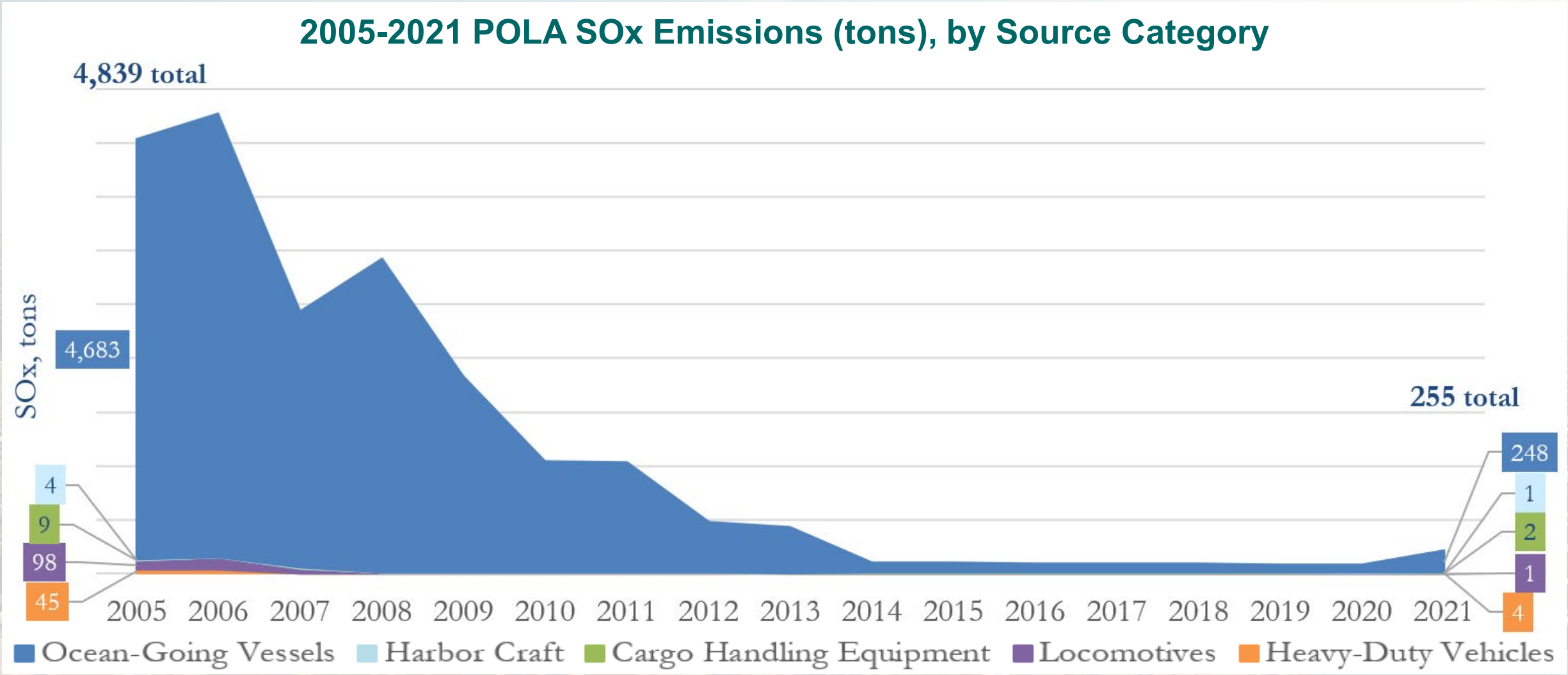
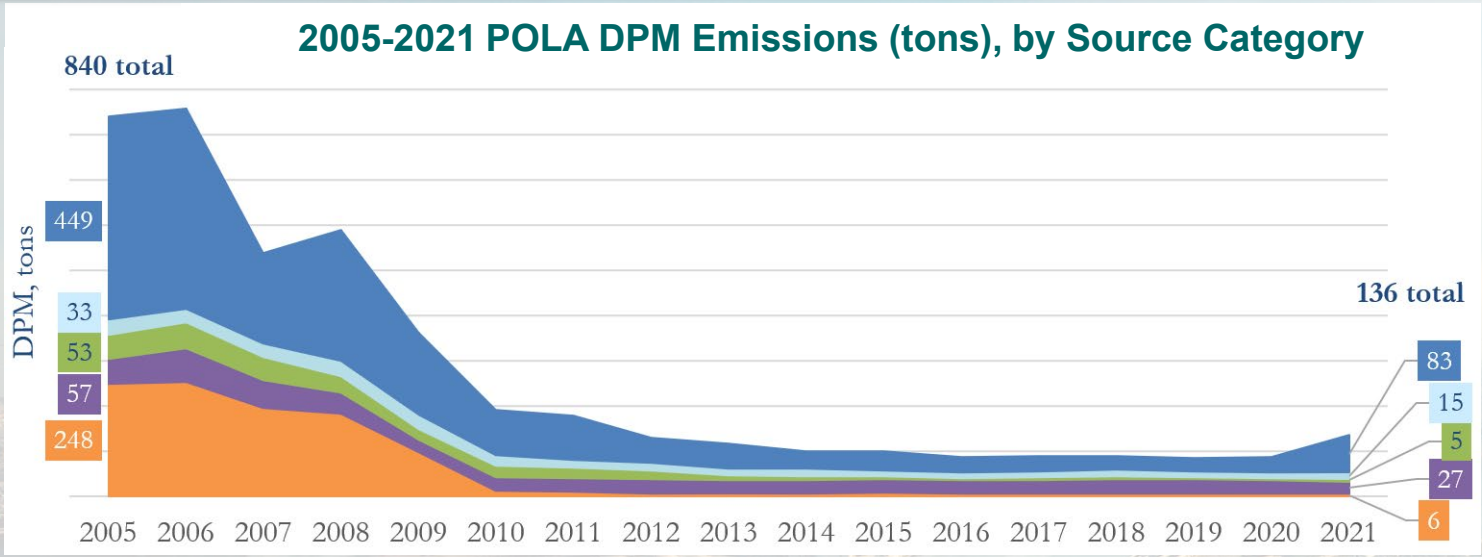
Maritime Industry-related 2021-2020 Emissions Comparison by Source Category

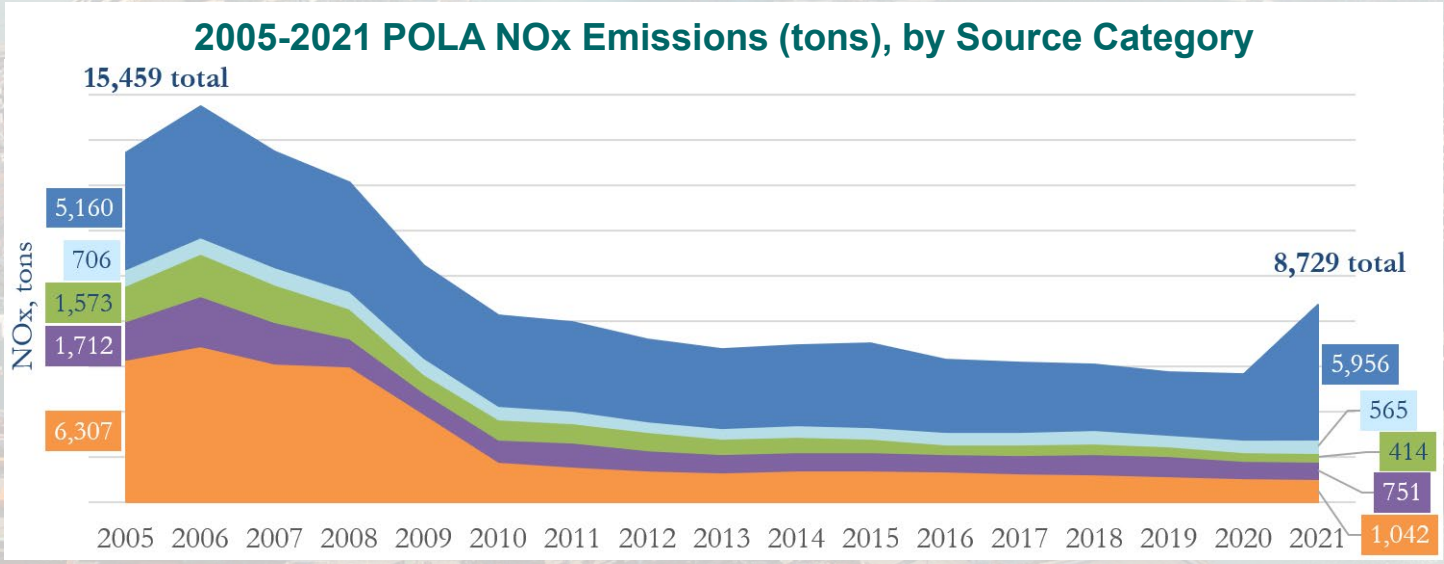
	PM_{10} tons	$PM_{2.5}$ tons	DPM tons	NO_x tons	SO_x tons	CO tons	HC tons	CO_2e tonnes
2021								
Ocean-going vessels	127	117	83	5,956	248	605	255	504,842
Harbor craft	15	15	15	565	1	112	29	53,521
Cargo handling equipment	6	6	5	414	2	780	86	184,837
Locomotives	27	25	27	751	1	187	42	65,216
Heavy-duty vehicles	6	6	6	1,042	4	356	52	444,814
Total	**182**	**168**	**136**	**8,729**	**255**	**2,040**	**464**	**1,253,229**
2020								
Ocean-going vessels	52	48	34	2,879	97	273	127	213,981
Harbor craft	14	13	14	571	0	111	26	52,325
Cargo handling equipment	6	5	4	366	2	643	66	165,961
Locomotives	29	27	29	786	1	189	45	65,987
Heavy-duty vehicles	6	6	6	1,071	4	274	41	401,199
Total	**107**	**99**	**87**	**5,672**	**104**	**1,491**	**306**	**899,453**
Change between 2020 and 2021 (percent)								
Ocean-going vessels	143%	143%	147%	107%	154%	121%	101%	136%
Harbor craft	11%	12%	11%	-1%	2%	2%	9%	2%
Cargo handling equipment	12%	12%	11%	13%	12%	21%	29%	11%
Locomotives	-8%	-8%	-8%	-4%	-1%	-1%	-6%	-1%
Heavy-duty vehicles	0%	0%	0%	-3%	10%	30%	27%	11%
Total	**69%**	**69%**	**56%**	**54%**	**145%**	**37%**	**52%**	**39%**

Annual SOx Emissions (2005-2021)



Annual DPM & NOx Emissions (2005-2021)





Emissions Comparison (2005-2021)

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Diesel Particulate Matter

DOWN

84%

2023 Goal 77%

Nitrogen Oxides

DOWN

44%

2023 Goal 59%

Sulfur Oxides

DOWN

95%

2023 Goal 93%

Greenhouse Gases

UP

23%

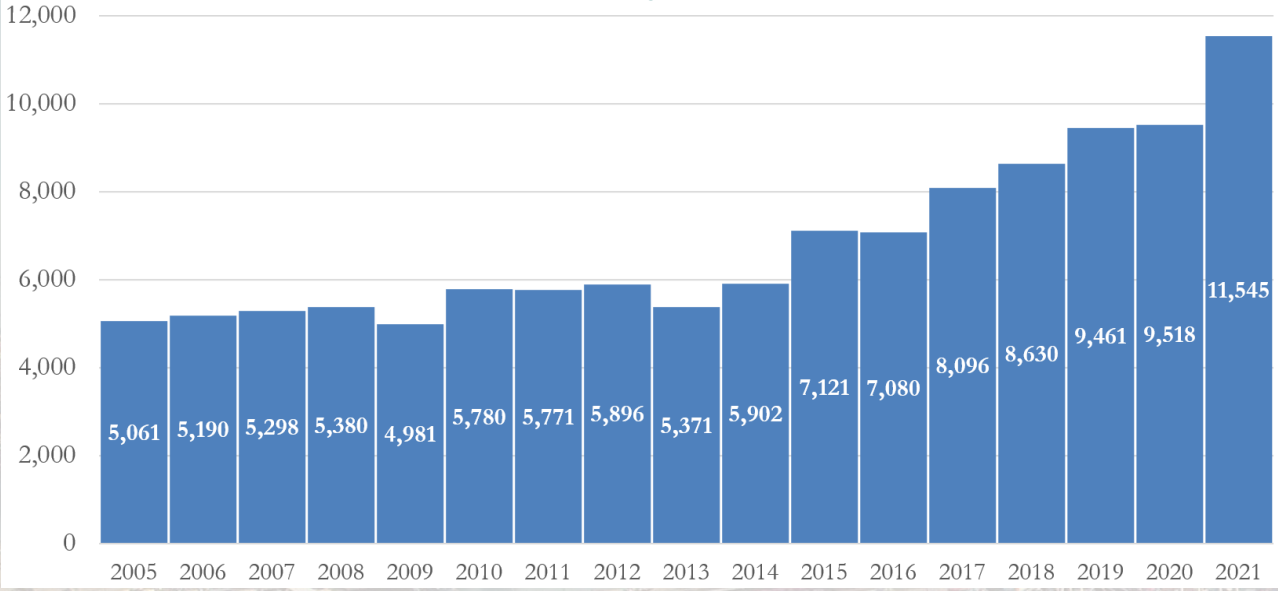
TEUs

UP

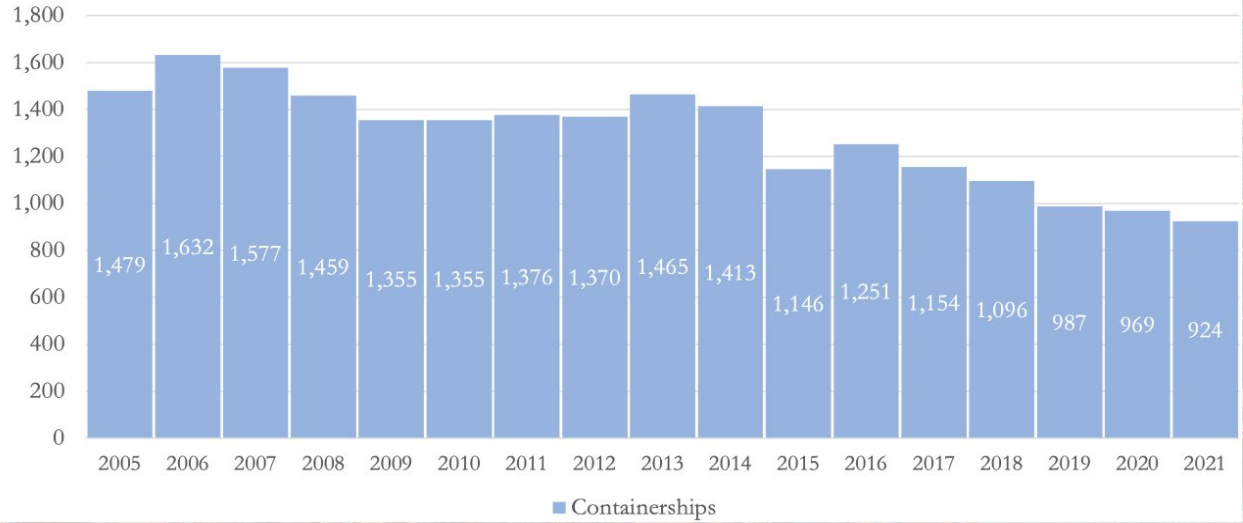
43%

Trends

Container Ship Call Density per Arrival, TEUs/arrival



Container Ship Arrivals



Trends

	2005 vs. 2020	2020 vs. 2021	2005 vs. 2021
NOx emissions per TEU	↓ 71%	↑ 33%	↓ 60%

- 2005 NOx emissions per TEU – 4.1 pounds
- 2020 NOx emissions per TEU – 1.2 pounds
- 2021 NOx emissions per TEU – 1.6 pounds

Looking Ahead

- 2021 was a very unusual year due to COVID-19 related effects on the supply chain
- 2022 emissions will be lower due to:
  - Ongoing supply chain “velocity” improvements
  - Continued use of new container ship queueing system
  - Less ships with increased cargo/ship
- Will continue to fight climate change through development and ongoing deployment of zero emissions technology

Available Online

http://portofla.org/emissions-inventory

PORT OF LOS ANGELES
Inventory of Air Emissions 2021

Technical Report | September 2022

THE PORT OF LOS ANGELES

STARCREST CONSULTING GROUP, LLC
ENVIRONMENTAL MANAGEMENT · AIR QUALITY · CLIMATE · SUSTAINABILITY

AIR QUALITY REPORT CARD 2021

SAN PEDRO BAY STANDARDS

The San Pedro Bay Standards establish the long-term emissions-reduction and health risk-reduction goals for the ports of Los Angeles and Long Beach. Emission Reduction Standards for DPM, NOx, and SOx have target years of 2014 and 2023 to support state ambient air quality goals. The Health Risk Reduction Standard has a target year of 2020 to align with California Air Resources Board's Goods Movement Emission Reduction Plan.

All changes shown are compared to 2005 baseline levels.

CLEAN AIR ACTION PLAN (CAAP) GOALS

	2014	2023
DPM	72%	77%
NOx	22%	59%
SOx	93%	93%

	2020
Health Risk	85%

OVERALL EMISSIONS REDUCTIONS

Pollutant	%	Tons
DPM	84%	704
PM2.5	80%	693
PM10	82%	819
NOx	44%	6,730
SOx	95%	4,584

EMISSIONS REDUCTIONS PER 10,000 TEU HANDLED

Pollutant	%	Tons
DPM	92%	0.99
PM2.5	91%	0.99
PM10	91%	1.17
NOx	60%	12.48
SOx	96%	6.22

OCEAN-GOING VESSEL EMISSIONS CHANGES

Pollutant	%	Tons
DPM	81%	366
PM2.5	76%	372
PM10	79%	482
NOx	15%	796
SOx	95%	4,435

HEAVY-DUTY VEHICLE/CLEAN TRUCK EMISSIONS REDUCTIONS

Pollutant	%	Tons
DPM	98%	242
PM2.5	98%	232
PM10	98%	242
NOx	83%	5,265
SOx	91%	41

HARBOR CRAFT EMISSIONS REDUCTIONS

Pollutant	%	Tons
DPM	54%	18
PM2.5	54%	17
PM10	54%	18
NOx	20%	141
SOx	88%	3

RAIL EMISSIONS REDUCTIONS

Pollutant	%	Tons
DPM	52%	30
PM2.5	53%	28
PM10	52%	30
NOx	56%	961
SOx	99%	97

CARGO-HANDLING EQUIPMENT EMISSIONS REDUCTIONS

Pollutant	%	Tons
DPM	91%	48
PM2.5	88%	44
PM10	88%	48
NOx	74%	1,159
SOx	78%	7

CO2 EQUIVALENT CHANGES BY SOURCE TYPE

Source Type	%	Metric Tons
Ocean-Going Vessels	80%	223,989
Harbor Craft	19%	8,525
Cargo-Handling Equip.	37%	50,216
Rail	21%	16,985
Heavy-Duty Vehicles	6%	30,063
TOTAL	23%	235,680

PRIMARY POLLUTANTS DEFINED:

DPM = Diesel Particulate Matter
NO_x = Oxides of Nitrogen
SO_x = Oxides of Sulfur
$PM_{2.5}$ = Particulate Matter less than 2.5 microns in diameter
PM_{10} = Particulate Matter less than 10 microns in diameter
CO_2 = Carbon Dioxide (A greenhouse gas contributor)

portofla.org/emissions-inventory

Appendix: Presentation Acronyms

- AMP: Alternative Maritime Power
- CAAP: Clean Air Action Plan
- CARB: California Air Resources Board
- CHE: Cargo Handling Equipment
- CH_4: methane
- CO: carbon monoxide
- CO_2: carbon dioxide
- CO_2e: carbon dioxide equivalent
- DPM: diesel particulate matter
- EI: emissions inventory
- EPA: U.S. Environmental Protection Agency
- HC: hydrocarbons
- NOx: oxides of nitrogen
- N_2O: nitrous oxide
- OGV: ocean-going vessel
- PM: particulate matter
- PMA: Pacific Maritime Association
- PMSA: Pacific Merchant Shipping Association
- South CAQMD: South Coast Air Quality Management District
- SOx: sulfur oxides
- SPBP: San Pedro Bay Ports
- TEU: twenty-foot equivalent unit
- tonnes or mtons: metric tons