FEASIBILITY AND BENEFITS OF INTERMODAL SERVICE IN SHORT-HAUL MARKETS

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for the Pacific Harbor Line

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CONTENTS

1. FOREWORD

This study examines the service implications and economics of a short-haul rail shuttle service to an inland intermodal terminal ("inland port") within 150 miles of the San Pedro Bay Ports (the Ports of Los Angeles and Long Beach). Various public and private entities have expressed interest in the rail shuttle-inland port concept, as it could potentially support several key objectives for the ports, including increasing supply chain performance and capacity and contributing to reduced road congestion and air pollution in the LA Basin.

As the neutral operator of the LA/LB ports' on-dock rail network, Pacific Harbor Line (PHL) is aligned with the ports' objectives. PHL neither controls nor has rights to serve any short haul routes or markets outside of the ports and cannot speak for other carriers. It was proposed with several stakeholders that PHL undertake a study utilizing independent experts to help understand the potential for short-haul rail intermodal to inland terminals on a location-agnostic basis. To this end, PHL retained two consulting firms with expertise in intermodal, rail operations, and supply chain logistics to study this critical issue — Oliver Wyman, Inc. and Leachman and Associates LLC.

Oliver Wyman, Inc. is a global leader in management consulting. With offices in more than 70 cities across 30 countries, Oliver Wyman combines deep industry knowledge with specialized expertise in strategy, operations, risk management, and organization transformation. The firm has more than 6,000 professionals around the world who work with clients to optimize their business, improve their operations and risk profile, and accelerate their organizational performance to seize the most attractive opportunities. Oliver Wyman has the premier and the only dedicated rail practice of any of the global strategy consultancies. Oliver Wyman team members are leading experts in rail, with extensive experience across all major freight and passenger markets. Learn more at: www.oliverwyman.com/our-expertise/industries/transportation/rail-and-public-transit.html

Principal Oliver Wyman study authors are Adriene Bailey and Matthew Schabas. Ms. Bailey is a Partner and leads Oliver Wyman's North American Rail Practice. She is a strategic advisor to rail operators, intermodal service providers, equipment manufacturers and lessors, as well as to private equity firms that are active in the surface transportation/rail/intermodal sectors. Ms. Bailey has held senior positions at various transportation and logistics firms, including two Class I railroads. She has a BS in engineering from Princeton University and an MBA from the Wharton School of Business. Mr. Schabas, a Principal in the Transportation and Services Practice, consults across transportation modes. His focus is on business planning and optimizing network operations for carriers, and traffic demand forecasting for carriers, manufacturers, and private equity investors. He holds a Masters in City Planning, with a focus on transportation systems and public policy, from the University of California-Berkeley. He is a co-author of four transportation policy research papers.

Leachman and Associates LLC provides consulting and software for operations management and logistics analysis to corporations and governments. Principal study author Dr. Rob Leachman is President and CEO and a professor of industrial engineering and operations research at the University of California-Berkeley. Dr. Leachman's work is the basis for Chapter 7 (and as sourced elsewhere in the report). See his separate report, "Market Potential and Marketing Strategy for Short-Haul Intermodal Service in Southern California," for the Chapter 7 methodology, assumptions, and additional detail. Dr. Leachman has authored more than 80 technical publications; he has an AB in mathematics and physics and an MS and PhD in operations research, all from the University of California-Berkeley. Learn more at: ieor.berkeley.edu/people/robert-leachman/.

This study does not presume what terms would be acceptable and ideally accretive to private sector stakeholders, including Class I railroads, drayage firms, and real estate owners, other than to acknowledge their need for a re-investable return on their assets and avoidance of displacement of any existing rail business. Similarly, the study does not presume any specific policy position by public sector stakeholders such as the San Pedro Bay Ports, CalTrans, Metrolink, and state and federal government funding agencies.

PHL does not have plans to develop an inland port or to operate a short-haul intermodal rail shuttle. PHL's goals are aligned with the San Pedro Bay Ports to grow rail share of intermodal port traffic, to provide more efficient port operations through more consistent container throughput and reduced dwell times, and to reduce congestion and emissions in the LA Basin for all stakeholders.

2. EXECUTIVE SUMMARY

Southern California port and shipper challenges

The Ports of Los Angeles and Long Beach are the nation's premier container ports, collectively accounting for 30% of North American containerized imports and exports. They also play an important role in the Southern California economy, supporting freight and logistics jobs and investment. But the ports are facing a range of challenges in maintaining their current economic role, supporting plans for future growth, and ensuring they remain competitive versus other North American gateways.

In addition, Southern California is an increasingly challenging market for shippers moving import containers inland from the ports. Costs for trucking containers (drayage) from the ports are rising due to new labor rules, air quality requirements for trucks, and port/highway congestion that is reducing the number of loads per day per driver. Furthermore, land permitted for industrial development is limited in the Inland Empire for new freight facilities, with little opportunity to expand within 75 miles of the ports. This means that the average dray distance will continue to rise in the future, further increasing drayage costs for import containers.

One potential option that is aligned with the LA/LB ports' goals and that would reduce truck traffic in the region and lower shipping costs would be to move some of the activities that occur at or near the ports (such as freight sorting and transloading freight from marine containers into domestic containers) to a truck/rail terminal further inland — known as an "inland port." The LA/LB ports have on-dock rail capacity that could support an intermodal rail shuttle to move containers to an inland port. This would likely involve a high level of integration with an existing or greenfield logistics park, adjacent to the inland port, that could provide warehousing for high-volume importers, or siting the inland port within the existing warehousing in the Inland Empire, if a suitable site can be found. Rail shuttle-inland port services are successfully being used at other North American container ports today, such as the Port of Charleston, Port of Virginia, Port of Savannah, and Port of Vancouver. **Hence, this study was commissioned to assess at a high level the operational, service, and economic feasibility of the rail shuttle-inland port concept for Southern California.**

Stakeholder-defined success factors

Based on stakeholder and expert interviews and case studies, there are several key precursors required to successfully shift containers from truck drayage to a rail shuttle-inland port service. Overall, these include a single coordinating entity and a dock-to-door transportation cost that is neutral or better compared to existing drayage. For the rail shuttle component, there must be sufficient main line rail capacity to support direct service from the ports' docks to an inland port. The inland port will require municipal government support for permitting/zoning and must align with regional transportation plans to ensure sufficient rail and highway capacity for onward movement of goods. Warehousing and transloading facilities must be able to co-locate near the inland port.

If public financing or legislative support is required, a rail shuttle-inland port will need to demonstrate that it can reduce heavy truck traffic at the ports and on the highway network; reduce greenhouse gas emissions and improve air quality (ideally through day one zero-emissions technology); support regional economic growth and competitiveness (new manufacturing and logistics businesses, new jobs); and increase supply chain resilience (e.g., faster/more reliable inland freight transport). Federal and state programs are available that would support capital investment in this type of infrastructure project.

Defining the opportunity

For the purposes of this study, the opportunity for a rail shuttle-inland port service was defined in terms of how shippers choose between different inland transportation options for containerized imports, depending on their supply chains. A key trend is that shippers are increasingly using transloading for imports; that is, rather than move a 20- or 40-foot marine container off a ship directly to its destination using rail, a shipper will de-van the marine container at a cross-dock and reload the contents into multiple 53-foot domestic containers and trailers, mixing the contents in with freight from other origins headed to the same destination. These containers and trailers then travel onward via either rail or truck. The main benefit in doing this is better inventory management, with a further benefit from consolidation of freight into fewer containers or more flexible trailers — which can result in lower transportation costs.

Given this trend, it is likely that most growth in imports coming into the LA/LB ports will be drayed by truck if there is no other available option to get import containers to transload facilities and distribution centers. This will increase heavy truck traffic on the Southern California highway network and local roads near the ports. Drayage moves also are getting longer and more expensive as warehouses move further east and north to where land is available for growth. A rail shuttle-inland port, however, could provide an alternative, lower cost option that decreases direct import container drayage from the LA/LB ports and improves supply chain efficiency.

Sizing the addressable market

To understand the potential market for the rail shuttle-inland port concept, Leachman and Associates segmented LA/LB port imports by importer type and then evaluated how likely different types of importers would be to shift to a rail shuttle service within 150 miles of the ports, based on their supply chain model. Ultimately, shippers' interest in a rail shuttle-inland port service will be driven by whether the service can reduce their costs and be integrated into their supply chains.

Potential shippers of containerized imports include original equipment manufacturers (OEMs) and nationwide and regional retailers. Leachman and Associates estimated that 85% of large OEMs importing high-value goods have national distribution centers located in California's Inland Empire. This gives them access to the large Southern California consumption market and results in high levels of transloading to serve the rest of the United States. Large nationwide retailers also ship a substantial portion of their goods for the US through the LA/LB ports and have long lengths-of-haul to access population centers beyond

Southern California. As a result, the LA/LB ports see a much higher share of transloading for imports — and thus higher truck traffic — than other North American container ports.

Given the presence of large OEMs and retailers with substantial transloading needs, some 3.1 million TEUs (about a third of imports coming into the LA/LB ports) could be addressable by a rail shuttle-inland port in the Inland Empire, with a further opportunity of up to 1.5 million TEUS if cross-docks (for transloading and onward movement of domestic containers by rail/truck) relocate to the vicinity of the inland port. At full capacity, this would equate to some 5,100 drayage moves every weekday.

Inland ports could be built under different models: a small standalone terminal with two or three shuttle trains a day could shift up to 15% of Inland Empire port drayage. A large inland port with five to ten shuttle trains per day and a large integrated logistics park could shift a quarter to nearly half of Inland Empire port drayage at full capacity.

Concept feasibility and operating economics for shippers

To broadly determine the potential feasibility and operating economics for shippers of the rail shuttle-inland port concept, Oliver Wyman analyzed operating costs and available rail capacity, and developed an illustrative analysis of the societal benefits from reducing emissions and road congestion (based on the Caltrans intermodal freight benefit-cost calculator).

Several scenarios were developed to compare inland transportation costs per container for direct truck drayage from the LA/LB ports with the rail shuttle-inland port concept. Scenarios included consideration of the various zones where an inland port might be built (from about 100 miles up to 300 miles), the destinations of marine containers (local, regional, transload), and how far containers would need to be drayed from the inland port to freight logistics facilities.

A key finding of Oliver Wyman's analysis is that a rail shuttle-inland port would be cost competitive on a per container basis for shippers compared to direct truck drayage from the LA/LB ports in all of the scenarios analyzed, as long as the inland port is either integrated with or located near freight logistics and warehousing facilities. This would require an inland port to be service competitive, and service levels for shippers would be improved if tightly integrated with freight logistics/warehousing, due to bypassing port gate and highway congestion. The scenarios modeled are:

- **Local freight:** To serve local consumption in Southern California, a rail shuttle to an inland port located in the Inland Empire or High Desert with 0–10 miles of drayage would be cost competitive with direct-to-door drayage of up to 100 miles.
- **Regional freight:** To serve local consumption in regional population centers outside of Southern California (such as Central Valley, Phoenix AZ, or Las Vegas NV) within 300 miles of the ports, a rail shuttle to a regionally located inland port with 0–10 miles of drayage would be cost competitive with direct-to-door drayage of up to 300 miles. However, the addressable market size for intact import containers to these destinations is too small to support the service levels required to be competitive with drayage.

- **Transloaded freight:** For import containers transloaded into domestic containers and dry vans for destinations east of the Rocky Mountains, a rail shuttle to an inland port in the Inland Empire or High Desert that is integrated with or near transloading (0–10 mile dray) would be cost competitive with existing drayage options to transloading facilities in the Inland Empire today.

Drayage much further from the inland port would remove the competitive advantage provided by rail. (An inland port could offer additional opportunities to offset operating costs that were not sized in the study, such as through automation or by offering equipment management and container storage.)

In addition to favorable operating costs for shippers, the rail shuttle-inland port would need main line rail capacity to operate. Oliver Wyman's high-level analysis found that the Alameda Corridor and connecting east-west Class I railroad main lines theoretically have sufficient capacity to host an intermodal rail shuttle. There are issues however that would need to be studied further, including potential bottlenecks and the need to preserve capacity to support the future growth of existing passenger and freight rail services.

Oliver Wyman also assessed two illustrative societal cost/benefits of the concept. The analysis found that a rail shuttle-inland port would ideally need to utilize zero-emissions technology from day one to keep pace with trucking in reducing specific air pollutants that the California Air Resources Board (CARB) deems to have high societal impacts (i.e., health costs). The concept would generate a net positive societal benefit in terms of reducing highway traffic accidents (with short drays from an inland port).

The study does not include the full benefit-cost analysis that would be required should stakeholders wish to pursue state/federal grants, as this would require analyzing specific inland port locations. And there are wider benefits, such as avoided infrastructure costs, that could be realized by shifting freight from truck to rail (i.e., the need for highway maintenance and expansion would be reduced).

In conclusion, the intermodal rail shuttle-inland port concept holds the promise of providing benefits to all major stakeholders in the Southern California intermodal inland transportation chain, including the LA/LB ports, shippers, carriers, and state/local governments. This study is only a first step in understanding both the benefits and challenges of the concept, but the current Southern California ecosystem appears ripe for innovation to keep the Ports of Los Angeles and Long Beach competitive and growing.

3. STUDY DEFINITIONS AND OBJECTIVES

Containerized imports arrive at the Ports of Los Angeles and Long Beach (the LA/LB ports) on containerships, which primarily transport 20- and 40-foot marine containers. These containers must move inland to reach their destinations. There are three inland transportation options for import containers arriving at the ports, depending on the destination of the freight:[1]

- **Local:** freight intended for consumption in the southwestern United States. Local in this context extends beyond the Los Angeles Basin/Southern California to markets to the east such as Phoenix and Las Vegas and north to the Central Valley. Loaded marine containers move inland by truck on intermodal chassis (known as "drayage") to a customer's warehouse or distribution center (DC). Few import containers are purely local freight for consumption in the southwestern United States.

- **Inland point intact intermodal (IPI):** Loaded marine containers move inland by rail, mainly from the ports' on-dock rail terminals. The remainder are drayed to near-dock (the Union Pacific ICTF intermodal terminal) or off-dock Los Angeles rail terminals for onward movement by rail. This freight is primarily destined for markets east of the Rocky Mountains.

- **Transload:** Loaded marine containers are moved by truck to a cross-dock transloading facility, where the freight is unloaded and then reloaded into 53-foot domestic containers or 53-foot dry van trucks (enclosed truck trailers) for onward shipping — both for local and inland markets.[2] These facilities may involve some short-term storage and value-added inventory sorting services to deconsolidate and reconsolidate different import products for inland transportation. The key differentiator for this freight is the intent to reship the freight within a relatively short period of time (i.e., not warehouse it at the cross-dock facility).

This study presents a location-agnostic analysis of the feasibility and economics of an alternative transportation concept for containerized freight leaving the LA/LB ports: **a short-haul intermodal rail shuttle and inland port.** While this would be a new concept for the Southern California ports, such services do exist today at other ports in the United States and internationally.

1 These are consistent with the definitions used in the Connect SoCal Goods Movement Technical Report, Southern California Association of Governments, 2020.

2 Since the North American intermodal industry uses domestic containers for inland transportation that are larger and slightly wider than marine containers, transloading reduces the total number of containers required to move freight. Each 40-foot marine container is equivalent to about 80% of a domestic container.

At present, marine containers for local consumption and transloading move almost entirely by truck, which has led to congestion and long truck wait times at the ports and increased pressure on local roads. The intermodal rail shuttle-inland port concept consists of 1) a short-haul rail shuttle train, which would move marine containers directly from the ports' existing on-dock rail facilities to 2) an intermodal (rail/truck) terminal within 150 miles of the ports. This terminal, referred to herein as an "inland port," would reduce truck activity at and around the LA/LB ports, by allowing trucks to pick up freight for the local market/ transloading at a much less congested location instead (or warehousing/transloading could be co-located at the inland port). On-dock IPI would effectively substitute for a portion of truck drayage miles in this concept.

The main objectives of the study thus are to:

- Define key challenges and needs for the LA/LB ports and Southern California shippers that could be supported by the rail intermodal-inland port concept.
- Define import container supply chain stakeholders and required success factors for a rail shuttle-inland port concept, as well as potential obstacles to inland port development.
- Assess current shipper inland transportation trends and define the opportunity for a rail shuttle-inland port.
- Determine the total size of the addressable market for import and export containers that could use an inland port to replace drayage from the LA/LB ports to local destinations and transload facilities.
- Compare high-level inland transportation estimated costs per container for shippers and beneficial cargo owners between existing transportation options, i.e., utilizing drayage from the ports and the rail intermodal-inland port concept.
- Assess the potential implications of a rail intermodal shuttle relative to existing rail capacity.
- Illustrate potential high-level societal impacts of shifting freight from drayage trucking to intermodal rail, and what else might "move the needle" to make a rail shuttle-inland port a competitive option.

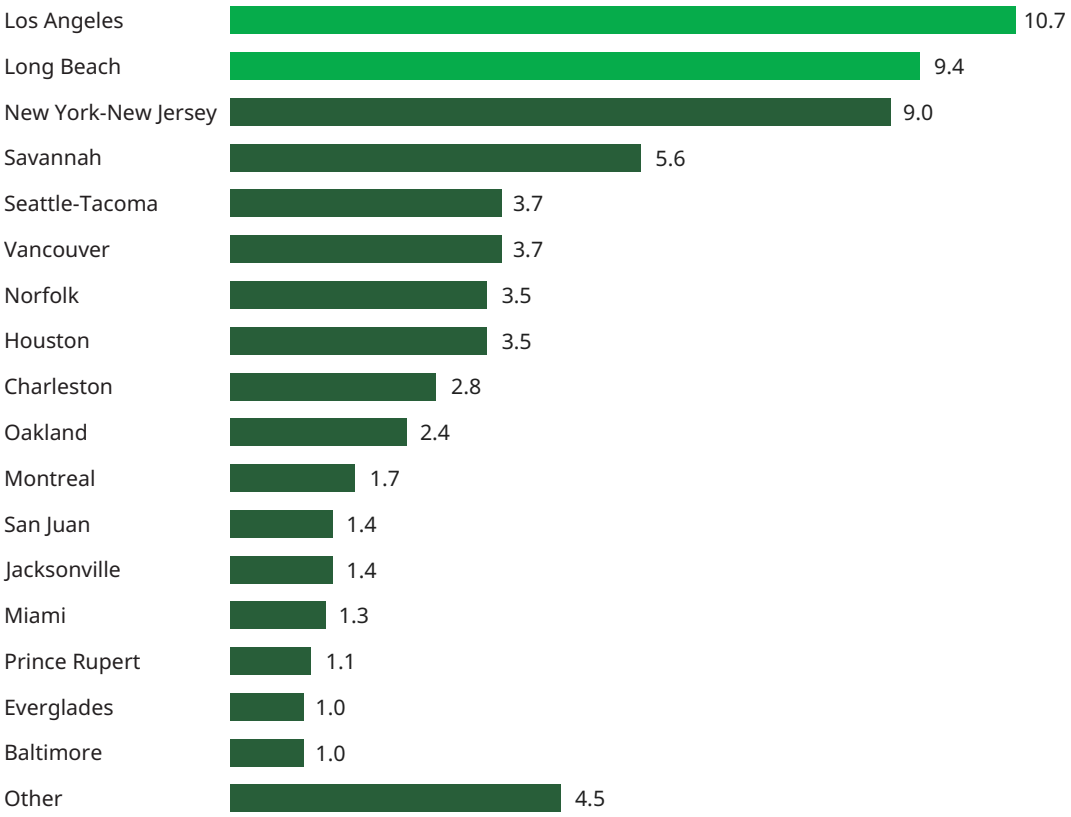
4 CHALLENGES FACING THE SAN PEDRO BAY PORTS AND SHIPPERS

The LA/LB ports are facing a range of challenges, including maintaining their role in the local/national economy, supporting growth plans, and improving their competitiveness vis-à-vis other North American container ports. In addition, Southern California shippers face increased costs and operational challenges. Ports in both the US and abroad have found that using a short-haul rail intermodal shuttle and inland port is one way to address these challenges.

4.1 Critical role in the national and local economy

The LA/LB ports are the largest container ports in the Americas. Thirty percent of all containerized imports and exports (in TEUs)[3] that are handled in the United States and Canada pass through the two ports (Exhibit 4-1). They are a critical link in the American supply chain for importing consumer goods. Equally, freight and logistics underpin the Southern California economy, meaning that ensuring the LA/LB ports' continued health, growth, and competitiveness is important for employment and investment.

Exhibit 4-1: United States and Canada containerized freight, 2021
Millions of TEUS (imports plus exports, loads and empties)



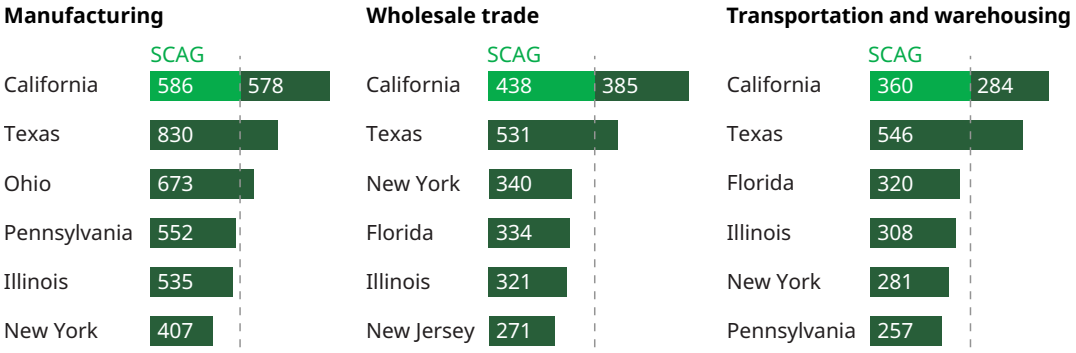
Source: World Bank, Transport Topics News, Oliver Wyman analysis

3 Twenty-foot equivalent unit. The TEU is a standard measurement for containerized goods volume.

The five counties of Imperial County, Los Angeles County, Orange County, San Bernardino County, and Riverside County, which make up the Southern California Association of Governments (SCAG), are home to 17.8 million people,[4] representing one of the largest end consumption markets for retail goods in the country. Importers of retail goods across the Pacific choose the LA/LB ports over other gateways in part because of access to this large consumption market. The hinterland for regional distribution centers in Southern California extends across the southwestern United States: east to Arizona and Nevada and north to Sacramento and the San Francisco Bay area.

Los Angeles and Southern California have one of the densest concentrations of manufacturing, wholesale trade, freight, and logistics business activity and employment. If the SCAG region were a state, it would have more jobs in these industries combined than all other states except Texas (Exhibit 4-2). These jobs are strongly linked to the import-export ecosystem built around the LA/LB ports. A short-haul rail intermodal shuttle and inland port could potentially further enhance the ports' key economic role.

Exhibit 4-2: Top five US states with the largest freight-related employment, 2020
Thousands of employees



Note: Southern California Area Governments (SCAG) is the Metropolitan Planning Organization (MPO) for the municipalities in the following counties: Imperial, Los Angeles, Orange, San Bernardino, Riverside, and Ventura
Source: US Census Bureau Economic Survey for NAICS codes 31–33, 42, and 48–49; Oliver Wyman analysis

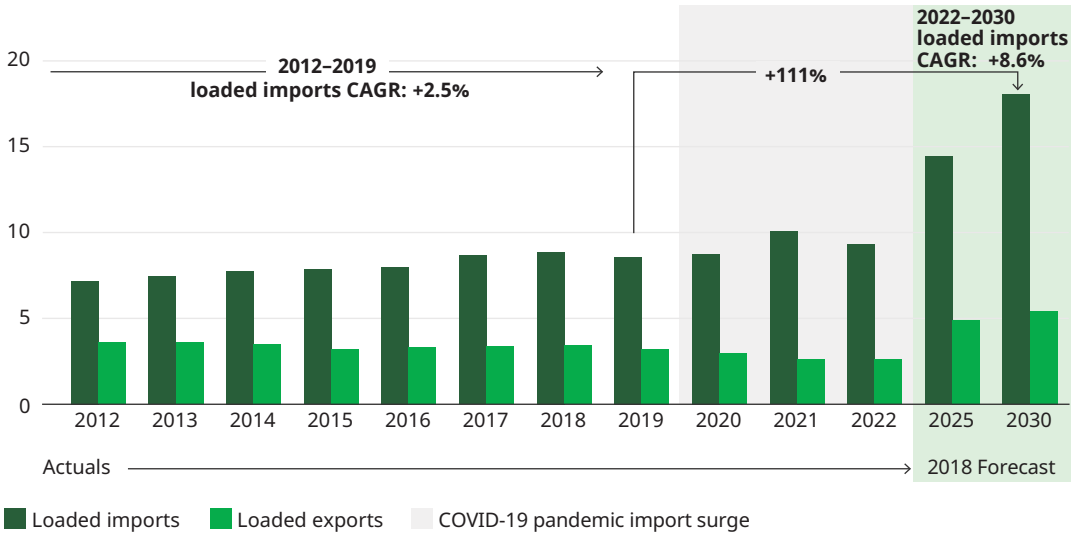
4.2 Port growth plans

The LA/LB ports have set large growth ambitions through 2030, forecasting growth to approximately 18 million import TEUs or about 10.2 million containers (Exhibit 4-3).[5] This is a 111% increase on pre-COVID import TEUs in 2019. To achieve these planned import volumes (which were forecast in 2018), growth would need to average 8.6% per year through 2030. This is significantly more rapid growth than the ports achieved pre-COVID, and so may require a change in the relative competitiveness of Southern California versus other gateways to accomplish.

4 US Census Bureau American Community Survey 2021.

5 In addition to TEUs, an industry benchmark used throughout this report is container count (which assumes 1.75 TEUs per container) — as the number of containers equals the amount of work required for inland transportation.

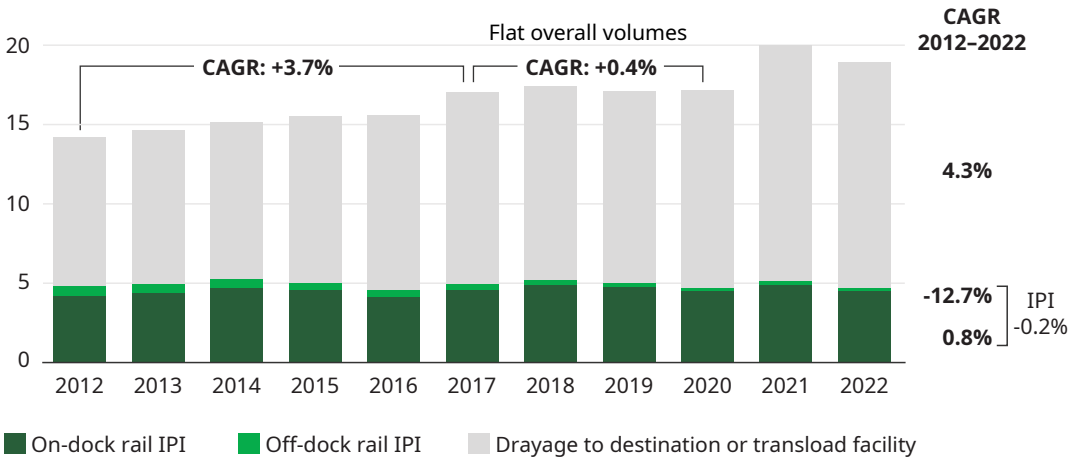
Exhibit 4-3: Loaded imports for Los Angeles/Long Beach Ports, 2012–2030
Millions of TEUs



Source: Port of Los Angeles 2018 Master Plan, Ports of LA/LB public statistics, Oliver Wyman analysis

Without an increase in the use of on-dock rail IPI, the ports' planned growth will all move via truck, leading to drayage volumes in the SCAG region more than doubling.[6] The ports are planning on-dock rail investment to support projected growth, but during the period prior to 2017 and during the COVID-19 import surge, the ports failed to grow IPI segment volumes. Shippers preferred truck drayage to a local destination or to a transload facility (Exhibit 4-4). A rail shuttle to an inland port could moderate truck drayage growth in the region and better utilize IPI capacity.

Exhibit 4-4: Inland transportation of Ports of Los Angeles/Long Beach import plus export traffic, 2012–2022
Millions of TEUs; includes loads and empties



Source: Ports of LA/LB public statistics, Oliver Wyman analysis

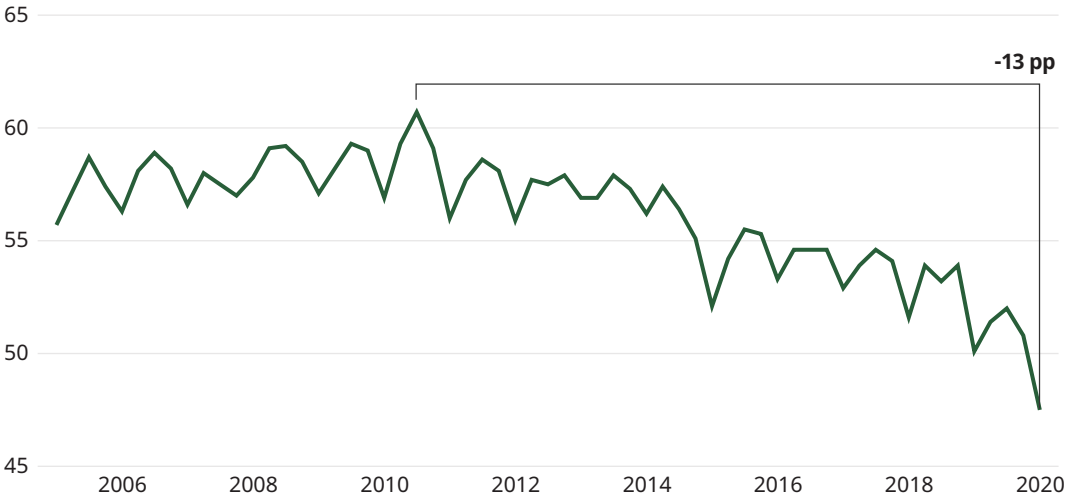
6 Oliver Wyman analysis.

4.3 Competitiveness versus other ports

As shown in Exhibit 4-4 above, the LA/LB ports' growth immediately prior to the pandemic was nearly flat (0.4% CAGR from 2017–2020). Prior to COVID, West Coast ports already were being impacted by shifting trade patterns and the increased competitiveness of gateways on the East Coast, which are close to a number of major population centers where goods are consumed (Exhibits 4-5 and 4-6). From 2005 to 2019, West Coast ports grew by 2.2% per year, compared to 4.1% annual growth for East Coast ports. The eastern ports have become more accessible from East Asia since the Panama Canal expansion and are attractive for a growing percentage of imports coming from Southeast and South Asia. This is a long-term trend and as COVID-driven supply chain disruptions subside, this is the trajectory to which the market will return.

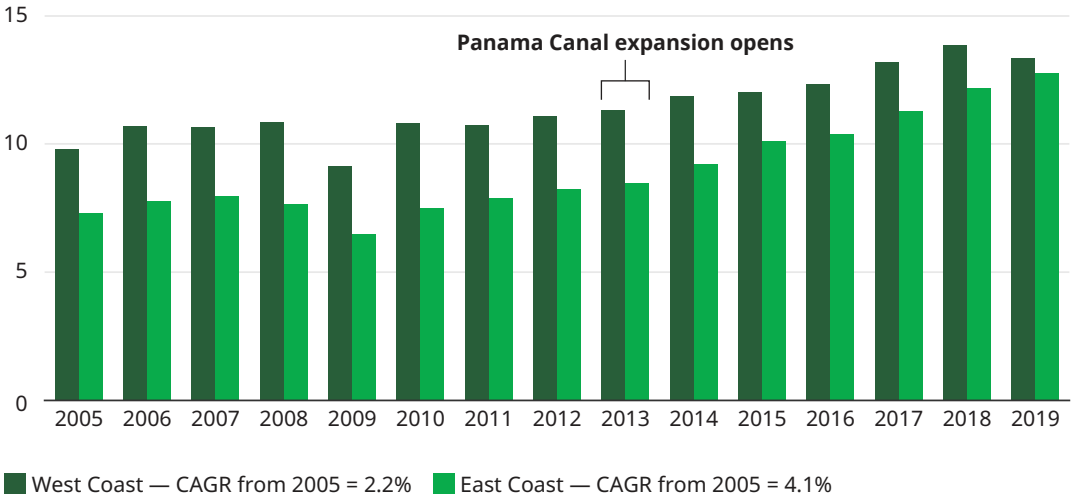
Diversion of import-export traffic to other ports, which may offer lower cost inland transportation, whether through rail intermodal (IPI), drayage productivity, or efficient transloading, are a threat to the continued growth of the logistics and manufacturing ecosystem in the SCAG region. Given favorable economics, a rail shuttle-inland port could help support the LA/LB ports' competitiveness by both reducing costs and improving port fluidity and service performance.

Exhibit 4-5: Quarterly West Coast share of import volume
Percent of North American import TEUs



Note: Excludes relatively small ports in Eastern Canada which do not report in PIERS
Source: PIERS, IANA Market Statistics, Gross Transportation Consulting, Oliver Wyman analysis

Exhibit 4-6: Annual loaded import TEUs by coast
Millions of TEUs



Note: East Coast excludes relatively small ports in Eastern Canada which do not report in PIERS; 2019 is the last year without COVID-19 impacts on share shift
Source: PIERS, IANA Market Statistics, Gross Transportation Consulting, Oliver Wyman analysis

4.4 Shippers face increased challenges

The LA/LB ports are in an expensive location for importing, which used to be offset by scale and the large local consumption market. But stakeholders interviewed for this study pointed out that the costs to operate import supply chains in Southern California just keep rising, due to a combination of labor, operational, and regulatory challenges. Without a change in cost structure, importers are likely to continue to diversify away from a single port of entry, while manufacturing growth in Southeast Asia is making the East Coast more competitive for some imports, as discussed below. A rail shuttle-inland port could offset some of these costs, such as for drayage and local warehousing.

Labor costs

Notwithstanding investments in automation, importing containers remains a labor-intensive operation, as evidenced by the high levels of employment in Southern California in transportation, logistics, warehousing, and wholesale trade. Three important job categories are drayage drivers, longshoremen, and warehouse cargo handlers.

Changing regulations for drayage operations, including drayage driver labor regulation (California Assembly Bill 5) and air quality requirements to move to zero emissions are expected to increase drayage costs and reduce access to owner-operators that currently have a high share of the LA/LB ports' drayage traffic. AB5 creates an independent contractor-employee test which, if it survives legal challenges, will make it difficult for the current owner-operator model to continue and force a shift to company drivers. Investment in zero-emissions drayage tractors will require capital investment that is harder for owner-

operators to access and, although state grants exist, that cost would be expected to be passed through in the form of higher prices. The outlook thus is for higher drayage labor costs as owner-operators are converted to company drivers, and remaining owner-operators are required to invest in new equipment or exit the market.

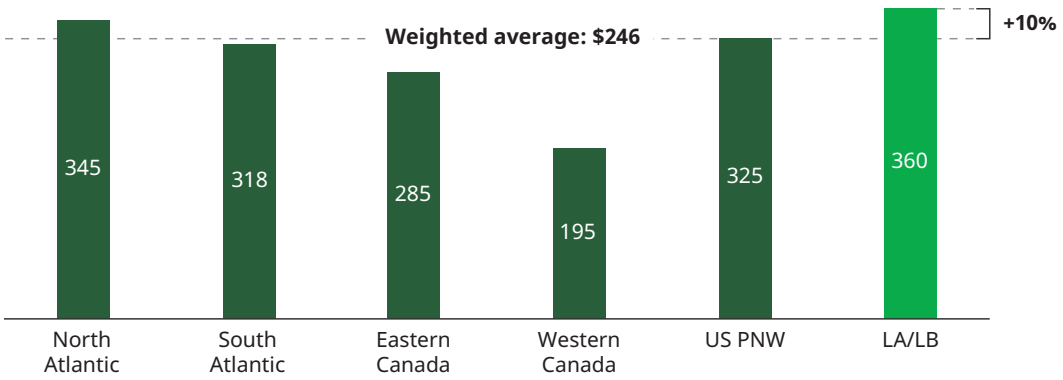
Longshoremen at the ports are a well-paid and unionized workforce. West Coast ports bargain as a group with the ILWU via the Pacific Maritime Association. As a result, all US West Coast ports have comparable wage and work rule arrangements.

Recently concluded ILWU negotiations for port terminal handling are expected to increase handling costs at West Coast port terminals. These arrangements, together with higher land rents, wharfage fees, and other factors, result in costs that tend to be higher than at US South Atlantic and Canada ports and roughly comparable to US North Atlantic ports. (Exhibit 4-7).

However, recent innovations in labor practices and technology have resulted in some productivity improvements at many LA/LB port terminals. Further, the new agreement will provide labor agreement stability through at least mid-2028. This should be an environment that supports innovation and growth.

Exhibit 4-7: Stevedoring handling rates per container, 2020

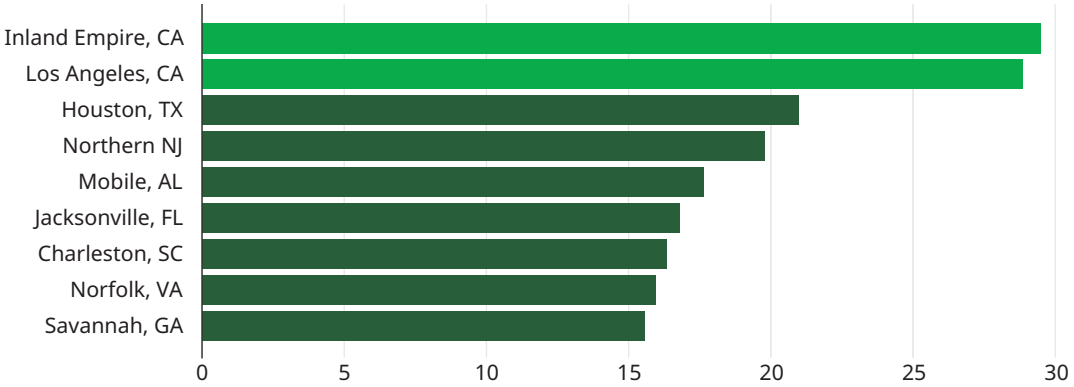
$



Note: Weighted average based on 2020 container volume. Excludes Gulf Coast ports and Mexican ports
Source: Oliver Wyman research and analysis

For all labor groups, the rising cost of living in Southern California will drive up wages. This is particularly important for staffing warehouses, transloading, and other logistics handling facilities. Limited land permitted for development means that adding new warehousing capacity will be further from population centers, potentially resulting in long commutes and a need to pay higher wages to attract staff. The result is that logistics facilities will have higher operating costs compared with competing international gateways (Exhibit 4-8). A 750,000 square foot distribution center with 200 non-agreement employees located in Southern California has operating costs nearly double a comparable facility in the southeastern United States.

Exhibit 4-8: Total annual distribution of warehouse operating costs by location
$ millions



Note: Hypothetical 750,000 square foot facility with 200 non-exempt workers and over-the-road shipping to nearest intermodal terminal and port city
Source: California Freight Mobility Plan (2023 draft), California Department of Transportation

Costs of compliance with new emissions regulations

The cost of new regulations and targets to reduce greenhouse gas (GHG) emissions and other air pollutants at the LA/LB ports and in California freight transportation will be borne in part by import shippers, increasing their transportation costs — and ultimately impacting the cost of goods to consumers. The multibillion San Pedro Bay Ports Clean Air Action Plan (CAAP) targets reducing emissions from all sources at the two ports. The plan established goals of zero-emissions drayage trucks by 2035 and zero-emissions terminal equipment by 2030, and the ports are working to accelerate those goals.[7]

In addition, the California Air Resources Board (CARB) has approved the Advanced Clean Fleets rule and the In-Use Locomotive Regulation to limit fossil fuel use in these sectors, which will require transportation providers to invest in new and upgraded equipment:

- The Advanced Clean Fleets rule bans the sale of new gasoline and diesel Class 8 trucks by 2036.[8] Drayage trucks and yard hostlers will be required to transition to zero-emissions technology beginning in 2024, with 100% zero-emissions trucks by 2035.[9]
- The proposed In-Use Locomotive Regulation represents an expansion of CARB's jurisdiction;[10] the Association of American Railroads (AAR) and American Short Line and Regional Railroad Association (ASLRRA) are currently litigating whether CARB has this authority. In the event this regulation survives litigation in its current form, railroads would be financially penalized for not upgrading their fleets to EPA Tier 4 and/or zero-emissions locomotives, starting in 2026. And starting in 2030, railroads would not be able to operate diesel locomotives older than 23 years in the state (with certain exceptions).

7 "San Pedro Bay Ports release final drayage truck feasibility assessment," Clean Air Action Plan, February 8, 2023.

8 "California approves groundbreaking regulation that accelerates the deployment of heavy-duty ZEVs to protect public health," California Air Resources Board, April 28, 2023.

9 Ibid.

10 Locomotive Fact Sheets, California Air Resources Board.

The State of California and the federal government are providing some funding for transport providers and the ports to meet emissions goals. For example, CARB is offering short line, industrial, and passenger locomotive owners up to an 85% rebate for the purchase of Tier 4 or zero-emissions locomotives (but not Class I railroads).[11] The federal government has awarded a $30.1 million grant to the Port of Long Beach for zero-emissions cargo-handling equipment and the state plans to set aside $875 million for the electrification of port equipment, drayage trucks, and related infrastructure.[12]

Substantial additional investment will be required. The Clean Truck Fund, a product of the Clean Air Action Plan, has recently begun charging diesel trucks $10 per TEU for loaded containers moving in and out of the ports. The fund is designed as a way to invest in zero-emissions trucks, but since drayage trucks utilizing the LA/LB ports are still 95% diesel, the pass-through cost to shippers is expected to be about $113 million annually.[13] At the federal level, Federal Railroad Administration Consolidated Rail Infrastructure and Safety Improvement (CRISI) grants offer another source of capital for new technology.

Another significant strategy to reduce emissions is the Indirect Source Rule, adopted by the South Coast Air Quality Management District (SCAQMD). Once fully implemented, the rule will make warehouses in Southern California larger than 100,000 square feet accountable for the emissions produced by truck traffic associated with their facilities.[14] By one estimate, this policy will result in roughly $1 billion of compliance costs annually.[15] The California Trucking Association is currently in litigation with the State of California to challenge the legality of this regulation. SCAQMD plans to move forward in applying the Indirect Source Rule to rail yards and ports.

Operational disruption costs

Import shippers have been experiencing increased costs due to operational disruption at the LA/LB ports and in the West Coast supply chain. Chassis supply complexity, a lack of consistency in which ports global container shipping alliances call and what terminals they use, and the potential for additional charges (such as dwell fees and PierPass fees), all add up to service inconsistencies and extra costs for shippers.

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11 Incentives for Locomotives, California Air Resources Board.

12 "California plans to spend $2.3 billion on ports," Maritime Executive, January 12, 2022.

13 Based on 2022 loaded container volumes at the LA/LB ports, Oliver Wyman analysis.

14 "South Coast AQMD Governing board adopts warehouse indirect source rule," South Coast Air Quality Management District, May 7, 2021.

15 South Coast ADMD Indirect Source Rule 2035, Revel Energy, October 25, 2022.

One key disruption for shippers is container dwell time — how long a container sits at the port before it is hauled away. At the LA/LB ports, this dwell time has been as high as 8.4 days in recent years and was 3.1 days in April 2023.[16] Each day a container dwells it generates demurrage and storage fees that must be paid by the shipper. Often, container dwell is the result of limited drayage truck or chassis availability. Another example of disruption outside of shipper control is the cyclical process of contract negotiations with the West Coast port workers' union (ILWU), which often takes many months and frequently leads to labor disruptions (strikes, slowdowns) that can impact supply chain reliability.

Inland transportation costs and congestion

As noted previously, shippers increasingly rely on transloading as a form of inventory management. This shift, combined with multi-port diversification strategies, has led to stagnation in IPI volumes and reduced the percentage of containers taking advantage of on-dock rail loading. The result has been disproportionate growth in marine containers being drayed off the LA/LB ports to local transload facilities, with 53-foot domestic containers then being drayed back to domestic intermodal terminals for furtherance.

Caltrans estimates heavy truck share on I-710 exceeds 10%, and the southern segments of I-710 serving the LA/LB ports are already highly congested (Exhibit 4-9).[17] This makes I-710 among the most heavily used truck corridors in California. There are no plans to expand the major highways that access the ports. The Los Angeles Metro Board voted to cancel an I-710 widening project in 2022, which would have added two additional lanes to support projected truck traffic from the LA/LB ports.

If import volumes at the LA/LB ports grow by 8.6% a year through 2030 as the ports are projecting, highway congestion would worsen, as truck trips to/from the LA/LB ports would increase by 105%, from ~15,000 per day in 2021 to ~35,000 in 2030 (assuming no additional IPI or other on-dock rail growth).[18] Growing truck traffic will need to access the Inland Empire, where new warehouses are being built. This is further from the LA/LB ports than existing warehouses, meaning that heavy truck vehicle-miles traveled[19] to/from the ports will increase at a faster rate than the number of import loads. Congested highways also encourage drayage trucks to use local streets that are not suitable for heavy truck traffic.[20] Measured highway truck traffic that has grown slower than port volumes supports anecdotal evidence that drayage drivers are already utilizing the local road network.

16 West Coast Trade Reports, Pacific Merchant Shipping Association.

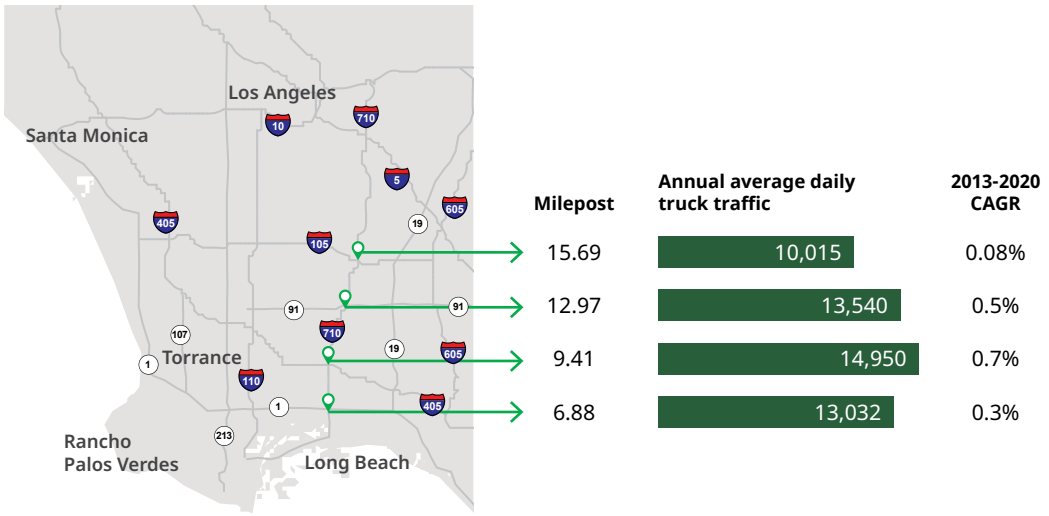
17 Level of service E and F, according to the FHWA Simplified Highway Capacity Calculation Method — Appendix A, Table 13: Freeway Generalized Service Volume Table, 2018.

18 Oliver Wyman analysis.

19 VMT is a standard traffic engineering measure.

20 Analysis of Caltrans traffic probes on I-710 show that since 2013 the CAGR of annual average daily truck traffic (AADT) has been lower than TEU traffic growth at the LA/LB ports, implying the use of local roads for drayage growth to access warehouses and bypass highway congestion. Traffic Census Program, California Department of Transportation; Google Maps; Oliver Wyman analysis.

Exhibit 4-9: I-710 one-way average annual daily traffic count, 2013–2020



Source: Traffic Census Program, California Department of Transportation; Google Maps, Oliver Wyman analysis

Congestion at the gate and on the highways adds travel time. Interviewed drayage carriers noted that the combination of PierPass, highway congestion, and slow service at port terminals has reduced the number of turns per day drayage trucks can make and that carriers are willing to schedule with their shipper customers to ensure good service.

The PierPass appointment system is intended to better manage gate congestion through a mixture of pricing and incentives to spread demand and balance capacity with appointments. The need to pair shipper and PierPass appointments with unpredictable highway drive times from the ports to the Inland Empire has resulted in drayage carriers reporting increased complexity in scheduling appointments and has resulted in reduced driver productivity. Shippers are paying higher drayage costs per load — which must cover daily driver and truck costs that are now allocated to fewer loads per day.

When federal hours-of-service regulations (which limit driver hours per day) are factored in, the result is highly sensitive for a drayage driver working loads to the Inland Empire — there is no buffer for a driver to comply with the maximum 14 hours per day rule, assuming 90 minutes at the port per load and a 90 minute gate-to-warehouse drive time (Exhibit 4-10).

Discussions with drayage carriers raised the important concern that the uncertainty of highway congestion and port dwell times makes it risky for a drayage carrier to commit to two turns per day for a driver working an Inland Empire account. Drayage carriers interviewed said that the high fragmentation of the drayage market among owner-operators makes it difficult for individual drayage carriers to find the optimal mix of near-dock, downtown, and Inland Empire trips to ensure maximum driver productivity each day.

As distribution centers, transloading, and warehouse growth move further from the LA/LB ports — now expanding east and north beyond the Inland Empire — distances beyond 50–70 miles and further will exacerbate drayage expense.

All these factors greatly limit potential drayage turns per day and will further increase the cost to import containers through the LA/LB ports. And given that more highway capacity, which would enable faster drive times, is not a practical nor politically palatable option, near-term drayage productivity improvements appear unlikely.

Exhibit 4-10: Drayage loads per day per driver, by distance

Destination	Drive time	Mileage	Turns per hours-of-service (HOS)	$ per load	Buffer hours per day
Near-dock transload	30 minutes	10–15 miles	3.5 turns per ~13 HOS	$300	~1 hour
Downtown warehouse	60 minutes	20–40 miles	2-3 turns per 13.5 HOS	$400-$500	~1.5 hours
Inland Empire	90 minutes	40–100 miles	2 turns per 14 HOS	$600-$800	0 hours (risk of time-out)
Phoenix/ Central Valley	4-5 hours	200–300 miles	<1 turn per 14 HOS	>$1,000	0 hours (risk of time-out)

Note: Assumes current drayage carriers require ~$120 per hour to operate a company driver drayage truck
Source: Google Maps, drayage.com, Oliver Wyman analysis and interviews

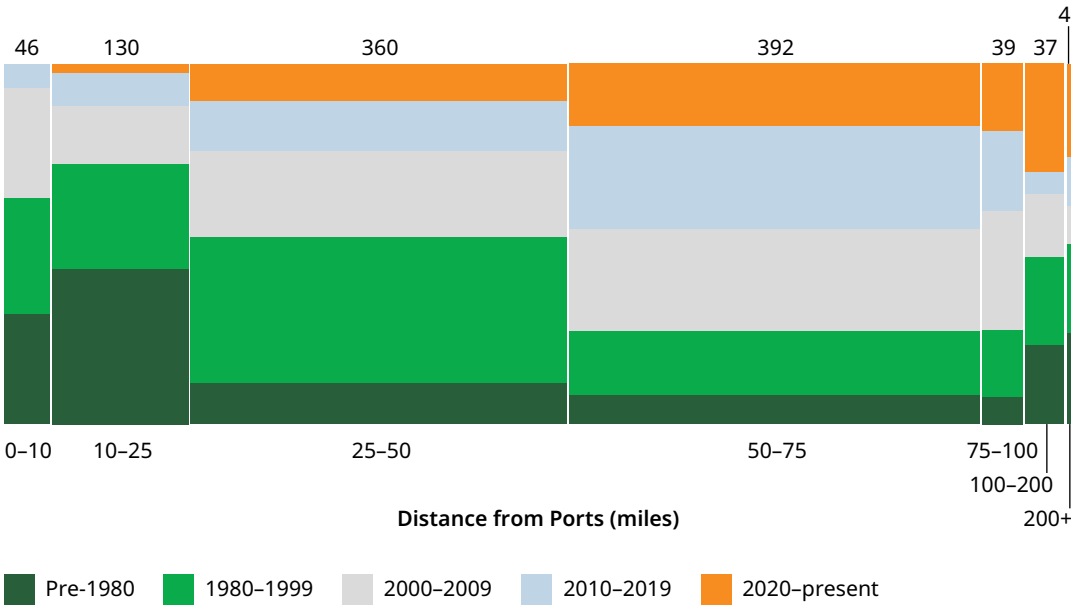
4.5 Limited land for new warehousing in the SCAG region

Growth in volumes coming into the LA/LB ports will require additional transloading and distribution center/warehousing space. But port proximity substantially influences the overall economics of product distribution serving both inland and local markets: the farther distribution centers are from the ports, the greater the percentage of traffic that must bear the extra expense of a backhaul move.

There is limited land permitted for new warehouses and transload facilities inside the Los Angeles Basin, which means these facilities increasingly must be built further from the ports, either in the High Desert region or further afield, at lengths of haul two or three times the existing Inland Empire dray mileage. As shown in Exhibit 4-11, from 2000 to 2019, 7.0% of new construction was built beyond 75 miles from the ports; from 2020 onward, 15.3% of new and planned new construction is located more than 75 miles out. Without

an alternative mode to move containers to their first point of rest, drayage mileage — and resulting costs — for import growth will increase above 75 miles to access the majority of new warehouse sites.

Exhibit 4-11: Southern California warehouse footprint
Millions of square feet
Estimated at a 0.65 FAR (floor area ratio) for facilities over 100K square feet; total = 1,006 million square feet



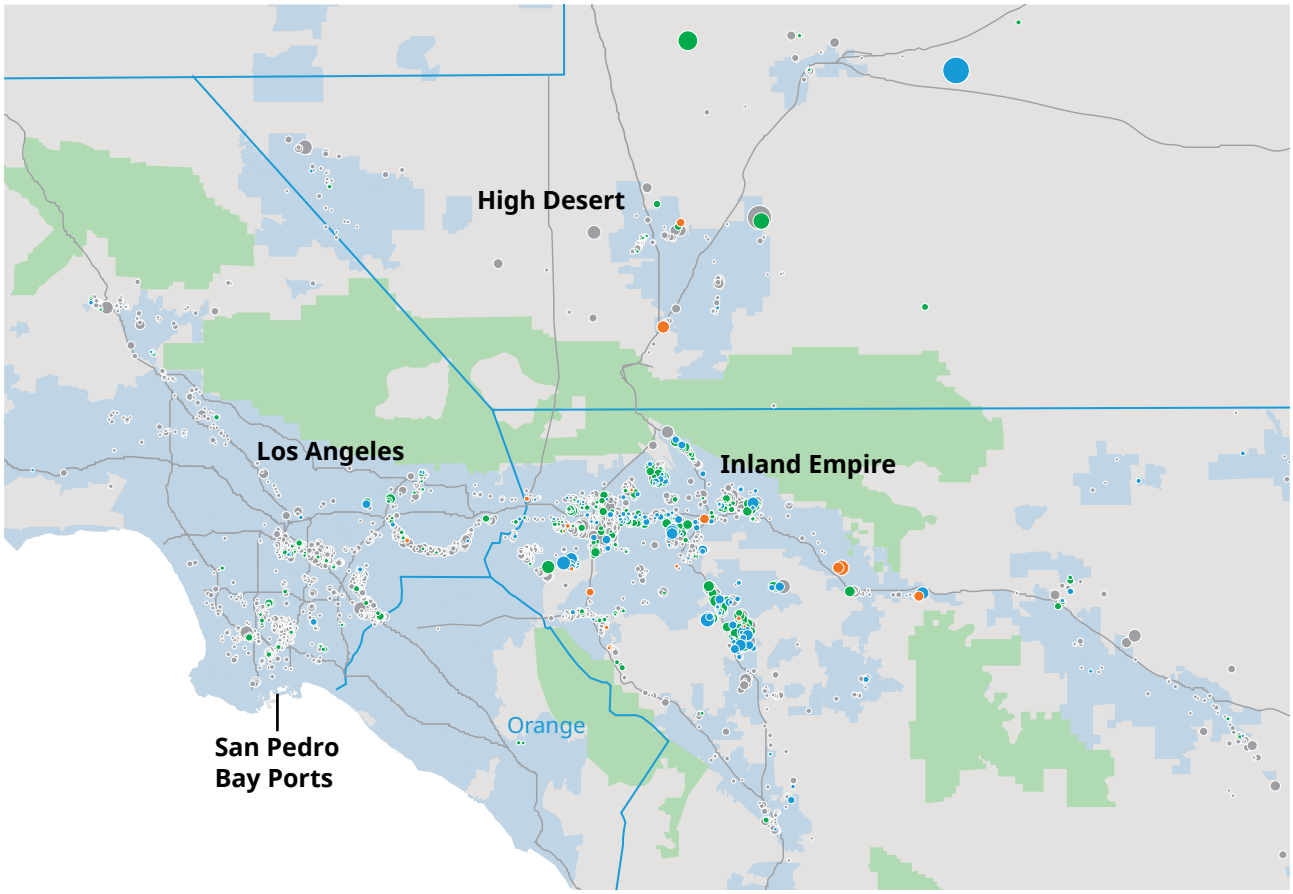
Note 2020 to present includes planned projects. Floor area ratio (FAR) is the maximum internal floor space allowed on a parcel as a ratio of the parcel land area under the municipal zoning code. 0.65 is a FAR suitable for warehouses based on Radical Research LLC analysis

Source: WarehouseCITY, Radical Research LLC; Oliver Wyman analysis

Few facilities have been built since 2015 in Los Angeles County (Exhibit 4-12). New construction is now expanding beyond the Inland Empire, deeper into Riverside County. These new sites are further from the Class I intermodal ramps, adding more drayage costs for transloading, and further from population centers in Los Angeles, Orange, and Ventura counties. Higher transportation costs are a tradeoff for lower rents (about half as much as in Los Angeles County) and wages.[21]

21 CBRE Research, 2022.

Exhibit 4-12: Southern California warehouse locations
Year built and floor space



Year built

Planned 2020–2022 2015–2019 Pre-2015

Cities National forest land 100,000–6.6 million square feet of floor space

Source: WarehouseCITY, Radical Research LLC; MapQuest Open Street Maps; Oliver Wyman analysis

There are about 101 sites in California, including existing and planned, with the land for a 1+ million square-foot warehouse (the size required by large national retailers, such as Amazon, Walmart, and Target, for regional distribution centers). Just three are in Los Angeles County (excluding the High Desert). Land permitted by local municipalities for logistics complexes of this scale are scarce. And redeveloping sites in the Inland Empire has become challenging — local residents are not supportive of additional heavy vehicle traffic, and building vertically is more costly than typical single-story facilities.

New large sites located in Riverside County and the High Desert are 75 to 150 miles from the LA/LB ports, meaning drayage drivers would only be able to make one or two turns per day. Goods destined for Southern California consumption would then need to be trucked back into the Los Angeles Basin.

New warehouse construction also requires more than just vacant land. To be cost competitive, logistics hubs require access to a workforce at attractive labor rates. There is tension between the desire on the part of some communities to encourage economic development and the environmental impacts of such growth (i.e., from greenfield construction and increased truck traffic). This is a particularly delicate issue in the High Desert, which now has a population approaching two million and is growing faster than the rest of the SCAG region; communities there are concerned about damage to the desert ecosystem from further new construction.[22]

Achieving growth at the LA/LB ports will require addressing the need for warehousing to process import freight. A regional approach, led by an agency like SCAG, may be necessary to resolve approving sufficient sites in municipalities that will benefit from economic growth and providing cost-competitive transportation, while recognizing community concerns regarding industrial growth in fragile desert ecosystems.

22 For example, the City of Palmdale introduced more stringent development regulations for greenfield sites in 2020 to protect the local environment. Source: Addendum to the Joshua Tree and Native Desert Vegetation Preservation Ordinance, Dudek, December 2020.

4.6 Global ports are using rail shuttle-inland port services to create economic and service advantages

Oliver Wyman studied a number of existing rail shuttle-inland port operations to look for best practices, lessons learned, and keys to success — as well as issues or obstacles (Exhibit 4-13). See Appendix A for the full case studies.

Exhibit 4-13: Intermodal rail shuttle-inland ports reviewed

Port	Felixstowe, UK	Norfolk, VA	Northwest Seaport Alliance	Savannah, GA	Vancouver, Canada	Charleston, SC	Sydney, Australia
2022 TEUs	4.0M	3.7M	3.3M	5.9M	3.6M	2.8M	2.8M
TEU rail share of port traffic	29%	33%	20–25%[23]	20%	45%	18%	16%
Shuttle train terminals	• Hams Hall • iPort Rail Doncaster • Trafford Manchester	• Front Royal: Norfolk Southern	• Portland, OR and Boardman, OR: UPRR	• Atlanta, GA: CSX and Norfolk Southern • Appalachian Regional Port: CSX	• Pacific Transload Express at CPKC Coquitlam	• Dillon: CSX • Greer: Norfolk Southern	• Enfield • Moorebank (under construction)
Inland port ownership	Various private operators	Virginia (public)	Northwest Container (Private)	Georgia Ports (public)	CPKC/ Maersk (private)	South Carolina (public)	Ports NSW (private)
Shuttle train departures	38 trains per day	1 per day	1 per day	Multiple per day to Atlanta	8 (includes long-haul trains) per day	Dillon (CSX): 1 Greer (NS): 1	Varies: multiple trains per day
Train length	2,000 feet	6,000–10,000 feet	N/A	10,000 feet	6,000–10,000 feet	6,000–10,000 feet	4,000–5,000 feet
Shuttle train operators	• DB Cargo (UK) • Freightliner • GBRF	• Norfolk Southern • CSX	• UPRR	• CSX • Norfolk Southern	• CPKC	• Norfolk Southern • CSX	• Linx Cargo

Source: Oliver Wyman analysis

23 Estimate based on "The Northwest Seaport Alliance launches rail cargo incentive program in the Pacific Northwest," Northwest Seaport Alliance, April 2023.

While these services have their differences (such as types of customers, volumes, schedules), several key similarities stand out that help define their success:

- A coordinating entity markets the service up to the inland port gate and is accountable to the customer for successfully managing modal interfaces. This is either the port authority or ocean carrier in the cases reviewed and not the rail carrier. The benefit of having a single entity handling marketing and accountable for the service is a seamless, reliable product for shippers.
- A logistics hub is integrated with the inland port location, with land available for expansion. This provides density and scale and minimizes drayage costs.
- Anchor shippers/BCOs invest in facilities and supply chain strategies structured to utilize the service and quickly build scale. This attracts base providers to the area and helps accelerate unit cost reductions.
- There is public-sector leadership for the project, ranging from ownership of the terminal to a per-container direct incentive (subsidy) to encourage modal shift. Public benefits are thus directly incorporated into project economics, allowing for more cohesive and integrated regional planning.
- Inland ports are able to more efficiently supply empty containers to export customers, with reduced drayage. Greater capacity certainty promotes additional investment in growth.

A final success factor is buy-in to the project across all major stakeholders, as the service meets key objectives for each:

- For state/local government and citizens: reduced truck traffic and emissions.
- For shippers: optimized supply chains, improved reliability, and lower costs.
- For ocean carriers: quicker turns on marine containers.
- For drayage providers and drivers: more operational certainty, higher productivity, and better quality of life.
- For railroads: new revenue generation and the potential to increase freight market share.

Common to all of these services is that the rail shuttle-inland port is seen as: 1) improving seaport competitiveness by providing a lower-cost alternative to drayage to access the industrial hinterland, and 2) accelerating container velocity across seaport docks, thus reducing dwell for scarce on-dock storage.

The case study of CPKC Express-Maersk demonstrates that short-haul intermodal to a transload facility serving both local and distant markets can be successful on a standalone commercial basis for the ocean carrier operator and the Class I railroad host. The case study of Northwest Container shows that short-haul intermodal to an inland port for local distribution in a neighboring region also can be successful on a standalone basis for the operator and the Class I railroad host.

Interviews with stakeholders emphasized that public agencies and/or the ports need to offer both direct incentives and indirect support to these services for the inland port operation to succeed. The rationale for public sector subsidies can include reduced highway congestion and emissions and improved economic development at inland locations.

Overall, these case studies demonstrate that a properly designed rail shuttle-inland port service could address key challenges in sustaining the LA/LB ports' growth:

- Use the ports' existing on-dock rail capacity to shift volume from truck to rail, thereby reducing Los Angeles County truck congestion and avoiding costly highway and gate expansion projects.
- Make drayage in Southern California more efficient, due to shorter drays to/from an inland port (lower cost per dray and more turns per day).
- Move product distribution (transloading, warehousing) inland, as permitting, land, and labor costs are more advantageous outside of the increasingly expensive Los Angeles County and Inland Empire.
- Make the LA/LB ports more competitive with other gateways, particularly East Coast gateways, by providing access to lower cost warehousing.

5 STAKEHOLDER-DEFINED SUCCESS FACTORS

5.1 Who are the stakeholders?

As part of this study, stakeholders across the container import ecosystem were interviewed to understand their differing priorities and perspectives. This included ocean carriers, drayage providers, railroads, and promoters of inland ports in Southern California (Exhibit 5-1).

The port authorities for the Ports of Los Angeles and Long Beach are clear stakeholders whose support is necessary for a successful inland port. However, building or operating an inland port is beyond the scope of their mandate. Both have extensive capital plans to support long-term growth — both for on-dock rail and overall terminal throughput. They, and the Alameda Corridor Transportation Authority (ACTA),[24] have a strong rationale to increase on-dock rail share to both make better use of existing freight rail infrastructure capacity and improve rail modal share.

California state and regional public agencies, encompassing city and regional planning, transportation, and air quality have broadly aligned objectives that on balance would appear to support the intermodal rail shuttle-inland port service concept.

Exhibit 5-1: Key stakeholders for the Southern California intermodal sector
(not exhaustive)

	Maritime shipping	Inland transportation	Inland port	Logistics	Shippers
Private sector	• Ocean carriers (e.g., Maersk, CGACGM, MSC, ONE, COSCO) • Port terminal operators	• Drayage carriers • Freight railroads (Union Pacific, BNSF) • Over-the-road trucking carriers	• Terminal real estate developer	• Intermodal marketing companies (IMCs) • Terminal real estate developers • Transload operators • Warehouse real estate developers	• BCOs (retailers) • OEMs (importers) • Third-party logistics providers
Public agencies	• Caltrans, CalSTA • Cities of LA/LB • Ports of LA/LB • SCAG	• ACTA • Caltrans, CalSTA • Metrolink • SCAG • USDOT/FRA • CARB • SCAQMD	• Caltrans, CalSTA • Local city/ county governments • SCAG	• CalSTA • CARB • Local city/ county governments • SCAG • SCAQMD	• CARB • Local city/ county governments • SCAG • SCAQMD

Source: Oliver Wyman analysis. See Glossary for terms

24 The Alameda Corridor was built by the Alameda Corridor Transportation Authority (ACTA), a joint-powers authority formed by the Cities and Ports of Los Angeles and Long Beach. The Alameda Corridor, located in southern Los Angeles County, is a rail freight corridor running from the LA/LB ports 20 miles north to downtown Los Angeles.

One potential area of friction with building an inland port and associated logistics real estate is the point of view of local jurisdictions. The California State Constitution has a "Home Rule" provision that grants Charter Cities extensive powers over municipal affairs. This allows land use and transportation planning to be done at the local level, which can result in conflicts between the vision and objectives of the regional Metropolitan Planning Organization (in this case, SCAG) and charter city governments' willingness to zone or grant permits. Land use changes which increase heavy truck traffic, even if creating a net reduction for the region, can be a contentious issue. Consequently, the support of local municipalities is essential to a successful project. Aligning this large group of stakeholders is necessary for an inland port project to succeed. In addition, private-sector carriers and shippers must be fully engaged and buy into the value proposition for a rail shuttle-inland port service to succeed. The concept must be designed to both meet shipper needs and provide satisfactory operating economics for carriers.

The public agencies, including municipal governments, have different goals than shippers and carriers. But economic development, transportation efficiency, and emissions reduction goals can be compatible with shipper desires for lower cost transportation and the carriers' need for profitable operations. An area of complexity, but not necessarily conflict, is identifying a site suitable for a large-scale logistics park and rail terminal that has the support of local municipal governments as well as state and regional planning agencies.

5.2 What must be true to succeed?

The rail shuttle-inland port project must be feasible on an operational, service, and economic basis to succeed. Stakeholder and expert interviews and case study research surfaced several additional precursors for success in terms of shifting drayage to an on-dock rail-intermodal rail shuttle-inland port service long term:

- There is a **single coordinating entity** leading and owning the dock-to-inland port gate product.
- **Dock-to-door transportation cost, transit, and service consistency is neutral or better** for the shipper/BCO than existing drayage to the warehousing/transloading facility of choice.
- **Freight operators** (railroads, drayage carriers, intermodal operators, logistics facility owners) **must all achieve market rate returns on the services offered.**
- **A municipal government supports the inland port** by zoning land and granting permits to enable the construction of a logistics park to provide anchor customers for the service.
- **The intermodal rail shuttle does not displace any train slots (or generates sufficient revenue to pay for incremental increases in capacity)** on the Class I main lines available for long-haul IPI or domestic intermodal trains, merchandise trains, or unit trains operated by the Class I railroads.
- Location is **aligned with SCAG and Caltrans regional transportation capital plans**, to ensure there is sufficient rail and highway capacity to serve the inland port and logistics park.
- The **operating model technology becomes zero emissions** (locomotives and yard equipment) as rapidly as the drayage fleet does, or sooner, to ensure the environmental case remains positive versus truck.

- There is sufficient daily volume for a railroad to provide **reliable direct intermodal rail shuttle service** without introducing variability from additional switching or block swapping between the on-dock terminal and the inland port.
- At least one Class I railroad offers **daily scheduled domestic intermodal service from the inland port or a nearby existing terminal** to multiple eastward destinations (Chicago, Atlanta, Dallas, etc.) to efficiently provide furtherance to the transloading market segment.

If public financing or legislative support is required (and we believe it will be to make the economics work), then the inland port would be expected to demonstrate:

- A **reduction in heavy truck traffic** on the highway network to reduce traffic congestion, improve safety, and lower road maintenance and expansion costs.
- A **reduction in overall greenhouse gas emissions** from freight transportation and measurable progress toward meeting California and federal net-zero targets.
- **Improvements in air quality**, per SCAQMD rules.
- **Day one zero-emissions technology,** including locomotives, intermodal yard equipment, transloading facilities, and drayage trucks.
- Support for **economic growth,** ideally bringing jobs to low-income communities and generating capacity to grow exports.
- Support for **improved competitiveness for the region,** in locating new manufacturing and logistics businesses that are involved in imports and exports.
- A **more resilient supply chain,** such as faster turnaround for empties, increased on-dock velocity, and faster/more reliable inland freight transport dock-to-door.

There are federal and state programs for capital investment in this type of infrastructure under the 2021 Infrastructure Investment and Jobs Act, the 2022 Inflation Reduction Act, and California's various freight transportation and air quality grant programs, administered by CalSTA and CARB, respectively. A rail shuttle-inland port should be considered a priority for such funding based on the benefits and avoided costs it can provide (further discussed in Section 8).

5.3 What are the obstacles?

Stakeholders identified several key obstacles that have held back inland port development in Southern California and nearby hinterland regions. These includes issues around cost competitiveness, fragmented local government, stakeholder goals, air quality regulations, the structure of import/export supply chains, and limited available land.

Cost competitiveness is critical to ensuring that an inland port would be preferred by customers based on economics and service performance. Capital grants are available for building infrastructure, but operating subsidies, particularly for a privately owned carrier, are uncommon. This means that a rail shuttle-inland port service must meet the commercial objectives of rail carriers, port operators, and shippers on a standalone basis.

Drayage carriers, even with the rising costs of drivers and highway congestion, have historically been relatively cheap compared with an assumed Class I railroad price to operate an intermodal service less than 150 miles at an accretive operating ratio. An inland port adds at least two additional lifts to each import container versus local drayage.

Drayage carriers interviewed also pointed out that growing operational complexity (driven by PierPass, the appointment system for the port terminal gates) and travel time variability on highways across Los Angeles County have led to a reported share shift toward owner-operators. These owner-operators continue to offer a lower price point than larger drayage carriers, and despite rising costs and supply chain congestion, keep the market highly competitive. If AB5 independent contractor legislation is successfully applied to the drayage community, this will change the competitive dynamics between larger company-driver carriers and owner-operators, which is expected to result in higher drayage prices.

Fragmented local government can be an obstacle in California to transformative transportation infrastructure investments. Land use planning is a local municipal decision; state agencies distribute capital for infrastructure and, through Caltrans, have a role in maintaining and expanding highway capacity; as an MPO, SCAG sets policy direction and proposes regional plans. If SCAG identifies a suitable rail-served site, the local municipality would be responsible for aligning city zoning regulations to allow an inland port and logistics park, issuing the necessary permits, and setting any local tax or value capture.

Based on interviews with public and private sector stakeholders, the current political environment is not supportive of building out more warehousing and light industrial parks in Southern California. Agreeing on a site and operating model which satisfies community needs was highlighted repeatedly as extremely challenging.

The LA/LB ports operate independently as agencies of the Cities of Los Angeles and Long Beach, which gives their management a local mandate, rather than the regional or statewide perspective seen in the South Carolina and Virginia rail shuttle-inland port projects. The ports also are landlords rather than operators of port terminals. For an inland port to function, it would require close coordination with ocean carriers and the terminals to move containers efficiently from ship to rail with minimal touches.

The Class I railroads consider that the highest and best use of available freight railroad capacity is for long-haul traffic. The railroads have historically taken the position on inland port proposals that their priority is serving long-haul transcontinental intermodal freight flows, whether IPI or transloaded to domestic intermodal containers. The relative absolute revenue and gross profit per container is understandably significantly higher for transcontinental service, reflecting the value to shippers versus long-haul trucking, as are the environmental benefits of modal shift over 2,000 miles. Displacing any train capacity on the congested east-west mainlines in the Los Angeles Basin with an intermodal rail shuttle could restrict railroads' ability to grow at downtown terminals that are already serving transloaded freight.

Metrolink has growth ambitions to operate additional passenger trains. These operate on a mix of Metrolink-owned lines and Class I rail infrastructure (via trackage rights). Offering capacity to an intermodal rail shuttle might be aligned to overarching regional transportation objectives, but this may be difficult to achieve if it takes slots away from commuter rail service. The environmental benefits of a densely loaded commuter train, converting several hundred car trips to rail, also must be considered. If a short-haul intermodal train displaces commuter trains, the net environmental impact will be reduced.

Air quality is an important issue in the Los Angeles Basin and Central Valley. SCAQMD, which covers the Los Angeles Basin, is in the process of imposing stringent air quality regulations on warehousing and logistics land uses to reduce nitrous oxides (NOx) and diesel emissions (Rules 2305 and 316).[25] This could make it more difficult to build a greenfield cost-competitive facility.

The structure of import/export supply chains continues to be a key obstacle to overcome. BCOs importing goods through the ports are importing a mix of freight for consumption in the local region (served by distribution centers in the Los Angeles Basin — primarily in the Inland Empire) as well as inland destinations. This distribution center and transloading infrastructure grew first near the ports in Los Angeles County, then expanded east to San Bernardino and Riverside Counties. There is significant investment in the existing stock. CBRE reported 15 million square feet of warehouses under construction in 2021 and rents have increased from ~$5 to ~$10 per square foot for new construction.[26] Those in Los Angeles County are used for transloading and are well placed close to the ports and the downtown intermodal rail terminals (Union Pacific's ICTF, LATC, East Los Angeles, and City of Commerce terminals; and BNSF's Hobart terminal).

There is limited access to land for a greenfield intermodal terminal in Los Angeles County or the Inland Empire. Existing logistics complexes are either too close to the LA/LB ports for an inland port to be competitive or established in the Inland Empire where there is limited, if any, real estate for constructing a greenfield intermodal terminal to use as an inland port. Creating a new terminal in the Inland Empire would require leadership by a regional or state planning agency and coordination across municipalities. Locating a new inland port terminal in the High Desert would be far from established transloading facilities, although it is reasonable to expect the trend of new freight facilities moving east and north to continue.

25 Rule 2305, the Warehouse Actions and Investment to Reduce Emissions (WAIRE) program, is an indirect source rule that regulates warehouse facilities to reduce emissions from the movement of goods. Rule 316 establishes fees to fund Rule 2305 compliance activities. Rule 2305 applies to warehouses with at least 100,000 square feet of indoor floor space in a single building. Source: SCAQMD WAIRE Program.

26 CBRE Research, 2022.

6 DEFINING THE OPPORTUNITY

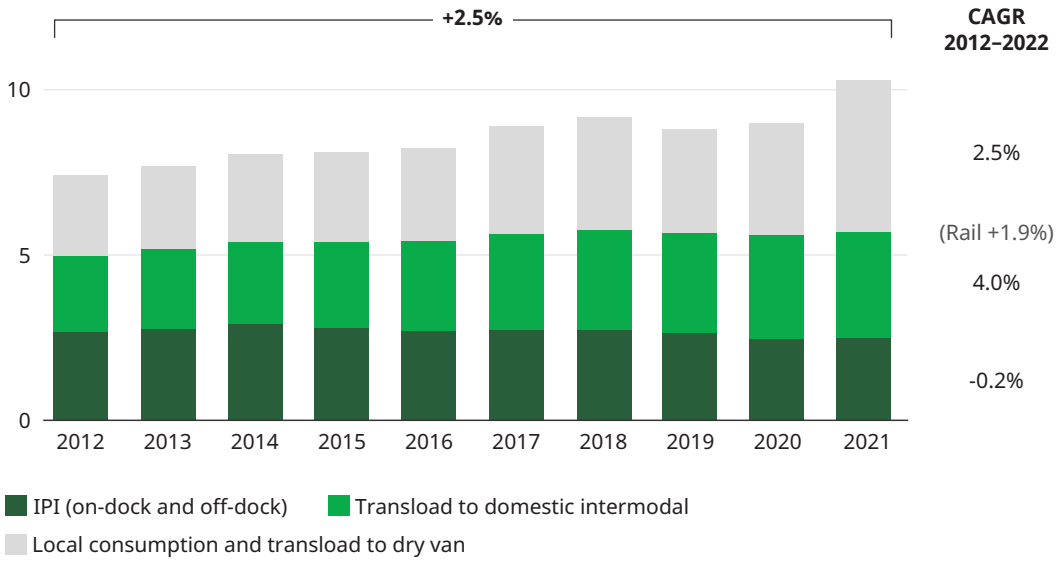
For the purposes of this location-agnostic feasibility study, the opportunity for an intermodal rail shuttle-inland port service was defined in terms of import freight and how shippers choose between different inland transportation options depending on their supply chain. When considering possible locations, the analysis focuses on zones rather than any specific location.

6.1 Trends in shipper choice for inland transportation

Shippers are increasing the use of transloading for imports. Interviews with industry stakeholders indicated that the transloading trend is not expected to reverse. Some ocean carriers are vertically integrating and offering transloading services (e.g., Maersk's facility in Vancouver and acquisition of Performance Team). Transferring freight from smaller marine containers into larger domestic ones at times offers transportation cost savings, but the real benefit comes from improved inventory management.

Recent inland transportation trends for LA/LB port imports are shown in Exhibit 6-1. Growth under the status quo would mean that IPI volumes continue to see a long-term decline, as increasingly sophisticated supply chains leverage the inventory management benefits of transloading. Any growth in import TEU volumes would then require drayage, whether to transload or for local/regional consumption, resulting in increased heavy truck traffic on I-710 and the Los Angeles highway network. And as noted previously, expansion of warehousing capacity for transloading and distribution centers is only feasible further east into Riverside County or north of the Cajon Pass in the High Desert communities, resulting in significantly longer and more expensive drayage moves.

Exhibit 6-1: Inland transportation modes for LA/LB port imports, 2012–2021
Millions of TEUs

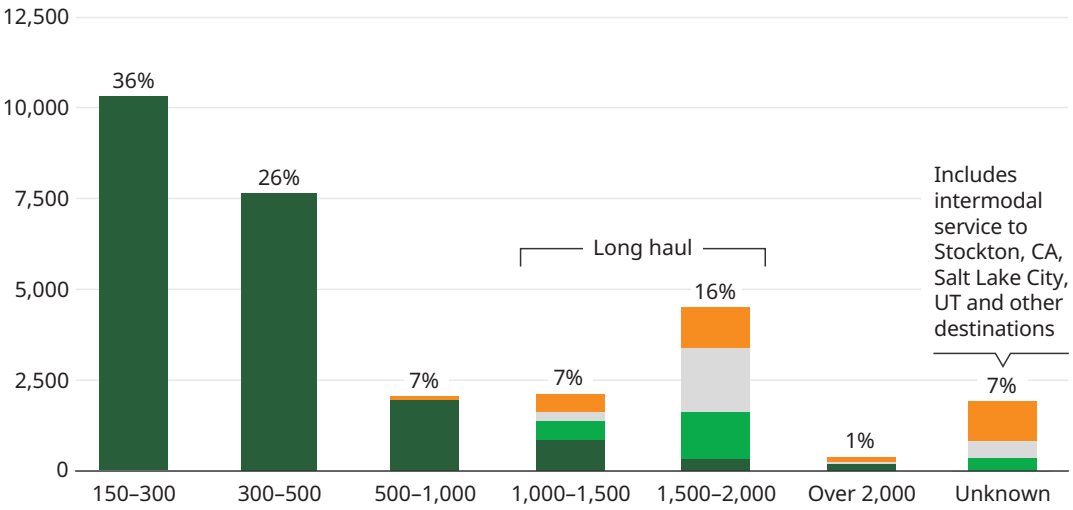


Source: Alameda Corridor Transportation Authority (ACTA) and LA/LB ports' public statistics, Oliver Wyman analysis

For long-haul moves, rail intermodal accounts for 80–90% of market share (whether IPI or transload), making further modal shift difficult (Exhibit 6-2). Intermodal rail volumes from the LA/LB ports are growing more slowly than total imports. This is because a large share of these imports are destined for the local market (Southern California/Southwest), while competitor gateways are capturing a greater share of imports destined for markets east of the Rocky Mountains.

The LA/LB ports are investing to expand on-dock rail (such as Long Beach's $1.5 billion expansion of the Pier B rail yard). But with IPI not growing, the only way that on-dock capacity can be utilized is through short-haul rail to evacuate transload and local freight from the immediate area of the ports to an inland port location. Transloading and last-mile delivery would then be handled using new warehouse capacity co-located with the inland port (or via backhaul to existing facilities for traffic destined for local consumption). The Port of Long Beach reported a 22% on-dock rail share for cargo in 2022, with a target of 35% after the Pier B expansion.[27]

Exhibit 6-2: 2021 freight shipments departing SCAG region per day by length of haul
Thousands of truckloads/containers (total = 29K per day); all freight (domestic and import/export)



Example major destinations in each length-of-haul band
(Great Circle mileage from Los Angeles)

150–300	300–500	500–1,000	1,000–1,500	1,500–2,000	Over 2,000	Unknown
Bakersfield, CA Las Vegas, NV Phoenix, AZ	Sacramento, CA San Francisco, CA Stockton, CA	El Paso, NM Portland, OR Salt Lake City, UT	Dallas-Fort Worth, TX Oklahoma City, OK Kansas City, MO	Atlanta, GA Chicago, IL Columbus, OH	New York City, NY Charlotte, NC Orlando, FL	STB Waybill sample masks destination

Truckload IPI Domestic intermodal Intermodal (domestic or international)

Note: Averaged to 365 days per year. Length of haul estimated based on great circle distance to center of transportation analysis zone (TAZ) or from LAX to main airport in the destination region

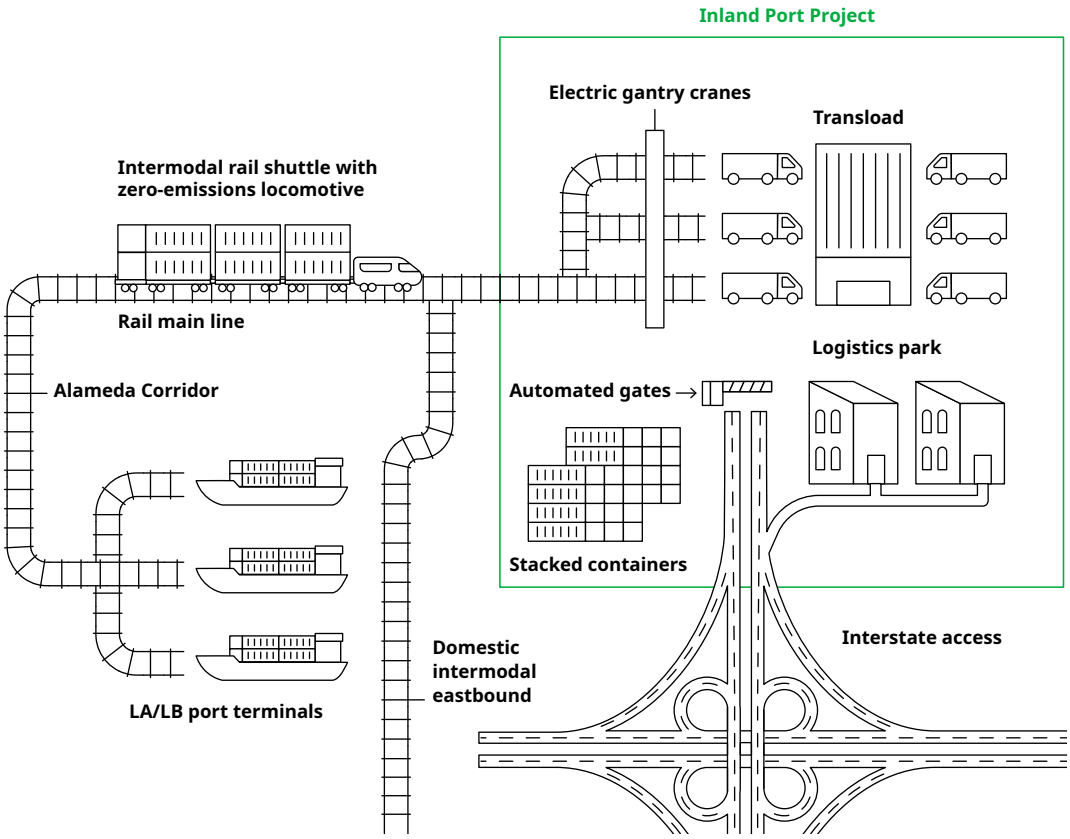
Source: National Household Travel Survey, Surface Transportation Board Public Waybill Sample, Oliver Wyman analysis

27 "New Pier B on-dock rail support facility is on track," Port of Long Beach, May 5, 2022.

6.2 What could a rail shuttle-inland port service look like?

For this feasibility study, it is important to define an ambitious vision for a rail intermodal-inland port service (Exhibit 6-3). There is an opportunity to offer a transformative service that provides greater integration across the import-export supply chain ecosystem, while addressing policy goals to reduce highway traffic congestion and emissions and support local/regional economic development.

Exhibit 6-3: Vision for a Southern California intermodal rail shuttle-inland port service



Stakeholder interviews and case study research pointed to several important characteristics for a successful inland port, as noted in prior sections. These findings were used to build assumptions for the feasibility analysis described in Sections 7 and 8:

- **Single coordinating entity:** The study assumes one coordinating entity for the service from dock to inland port, with the potential for an integrated offering (inland port to door). In this way, the inland port could be marketed as a destination by ocean carriers, enabling rapid sorting of containers at the dock to move them directly to the on-dock rail terminal and freeing up quayside capacity for further growth. Having one coordinating entity also makes it an easier decision for major shippers to develop a supply chain leveraging the inland port, as they do not have to manage the complexity of cargo handling through various parties.

- **Train length and service pattern:** Class I railroads have increased train length for transcontinental IPI and domestic intermodal to over 10,000 feet. The LA/LB ports have more than ten different container terminals with on-dock rail facilities. Building long-haul trains involves extensive switching to consolidate blocks from multiple terminals and ocean carriers into outbound trains. This is worthwhile because it creates large efficiency gains provided by the ~2,000-mile rail movement to Chicago, Dallas, Kansas City, and Memphis. It will be important that long-haul train service, with these larger environmental benefits, is not displaced by short-haul train service consuming the same mainline capacity.

  This study makes the following assumptions about what a short-haul train service would have to include:

  - This study assumes the rail shuttle would run dedicated point-to-point trains per day with a consistent and reliable service product. Each train would serve a single or adjacent terminal to reduce the need for extensive switching inside the port complex to build trains originating from multiple terminals. It also would enable a more reliable service product and the ability to utilize a (perhaps dedicated) fleet of 40-foot intermodal well cars. While the rail shuttle concept may necessitate shorter trains than are typical for existing port traffic, when combined with a short length-of-haul, good asset utilization could be maintained. A shorter train length for port shuttles is common outside the United States.
  - To serve the transload market segment, the study assumes that the inland port offers regular domestic rail intermodal service to destinations in the Midwest, Intermountain, and Southeastern United States. This will require sufficient outbound domestic containers, perhaps 50 to 100 units, to achieve sufficient scale for daily Class I railroad service.
  - The study is agnostic regarding the location or operator of the inland port, as well as which rail carrier provides an intermodal rail shuttle and any onward domestic intermodal rail service. These services could be provided by one or multiple operators.
- **Zero-emissions locomotive technology:** The study assumes that CARB regulations to reduce locomotive emissions could be met by the intermodal rail shuttle using a technology-agnostic zero-emissions locomotive, potentially from the start of the project. This would provide parity with zero-emissions intermodal drayage trucks. The US Department of Transportation, State of California (through CalTrans and CalSTA), and SCAG have plans for extensive investment in rail infrastructure in Southern California. While primarily for commuter, intercity, and high-speed rail, it is reasonable to expect that funding will be available for rail and intermodal freight projects. A credible plan for zero emissions and decarbonization through modal shift and locomotive technology will be important to make the inland port project attractive for government funding.
- **Terminal operating model and technology:** The study assumes that the inland port would be a greenfield terminal. The existing BNSF and UP terminals at San Bernardino and West Colton are currently used for long-haul domestic intermodal. At a greenfield terminal, the operating equipment would use zero-emission cranes, perhaps automated from day one, and electric hostler trucks. It would likely use a stacked storage model to reduce chassis complexity and maximize capacity on the real estate. The gates would utilize the latest AGS and appointment management technology to offer a driver turnaround time of 30 minutes or less (in-to-out, dual mission). This will reduce the emissions footprint of the operation from day one, in line with SCAQMD rules.

- **Integrated with a logistics cluster:** A greenfield inland port would require strong buy-in and coordination from local jurisdictions to ensure that zoning regulations enabled construction of warehousing and logistics facilities in close proximity (a scenario is analyzed in this study where the drayage distance is within 10 miles). This study also considers a scenario, among others, where transloading would be performed without drayage (i.e., within the footprint of the inland port) as a key potential value proposition and competitive advantage for the inland port. This is the vision for BNSF's proposed terminal in Barstow, CA, which would include a transload facility in partnership with J.B. Hunt. One way to reduce truck traffic and emissions impacts on the local community is to enable the direct transfer of containers to transload facilities without accessing public roads.
- **Truck access:** The study assumes that any inland port facility would have access to highways for drayage to intermodal-served rail terminals and long-haul over-the-road dry van trucking. Electric vehicle charging could form part of the project to create a multimodal logistics hub.

6.3 Inland intermodal projects in Southern California

There are several proposed projects (and one recent) that are looking to improve inland intermodal transportation from the LA/LB ports. These serve to illustrate that there is a recognized opportunity to decrease direct import container drayage from the ports and increase supply chain efficiency. They also show that there is private and public interest in doing so, even if three of these four projects are only in the early planning stages. (See Appendix A for additional case study detail.)

- **Already operating — UP West Colton (Inland Empire Intermodal Terminal):** The facility primarily serves domestic intermodal traffic bound for the Midwest and is privately funded and operated by Union Pacific (UP). This recently repurposed rail facility in Bloomington, CA is located close to existing Inland Empire warehouses and designed to provide easier access to domestic rail intermodal service for existing area transloaders, with less backtracking to UP's four other terminals in Los Angeles County. This substantially reduces drayage miles per container for Inland Empire transload facilities. There are no plans however to offer international intermodal service at West Colton, under an inland port operating model, at this time.
- **Planning and design stage — BNSF Barstow International Gateway (BIG):** This proposed $1.5 billion investment in the High Desert region near BNSF's Barstow Yard would offer two services: 1) building trains from traffic originating from northern and southern California to be distributed east to the US interior, and 2) transloading containers moved by rail from the LA/LB ports, with containers then either trucked off or continuing east by rail.[28] No timeline has been set for the project, which if it goes forward would be privately funded by BNSF. This facility has been designed with many of the successful shuttle train service principles in mind (e.g., transloading at the facility).
- **Proposed — Mojave inland port:** This $75 million proposed facility would be located in Mojave, CA, about 90 miles from the LA/LB ports in Kern County. The facility would move marine containers from the ports directly to the facility, via a rail shuttle service that utilizes the Alameda Corridor and Union Pacific main line, with containers then

28 "Barstow International Gateway," and "Why Barstow International Gateway is a big deal," BNSF.

sorted and distributed to nearby warehouses by truck or transloaded to be moved further inland by rail. The proposed location is not in an industrial area and does not have a rail partner as yet. It would be privately funded by Pioneer Partners, which owns the land.[29] No timeline has been set for the project.

- **Proposed — TradePort California:** This initiative is being led by Caltrans to create an integrated logistics corridor from the LA/LB ports, through the Central Valley, up to the Sacramento and Bay Area regions.[30] The project would feature four TradePort hubs (3,000–6,000 acre districts with a logistics core zone) and seven satellite TradePorts feeding traffic to the main corridor.[31] The goal of this $30 billion project would be to connect the state's maritime, rail, trucking, and distribution capabilities to the Central Valley, thereby promoting zero-emissions trucking, reducing highway congestion, and increasing economic development in the area. Caltrans has partnered with GLD Partners, an investment management firm, to conduct preliminary studies of shipper and railroad perspectives on the project.

29 Mojave Inland Port, Pioneer Partners.

30 TradePort California.

31 Project Plan, GLD TradePort.

7 SIZING THE ADDRESSABLE MARKET

To understand the potential market size for a short-haul intermodal rail shuttle-inland port concept, we segmented total imports through the LA/LB ports by importer type and then evaluated the likelihood of different types of importers shifting to short-haul intermodal based on their local needs (within 150 miles of the ports).[32] Exports offer a small and difficult to capture additional market opportunity. Ultimately, shifting share to a rail shuttle-inland port would depend on whether such a service could reduce costs to shippers, by reducing drayage costs, and become integrated with their supply chains.

7.1 Key importer categories

The potential for modal shift from truck to rail of intermodal goods moving through the ports will vary by type of importer, as each category has different supply chain and logistics practices. The key importer categories are:

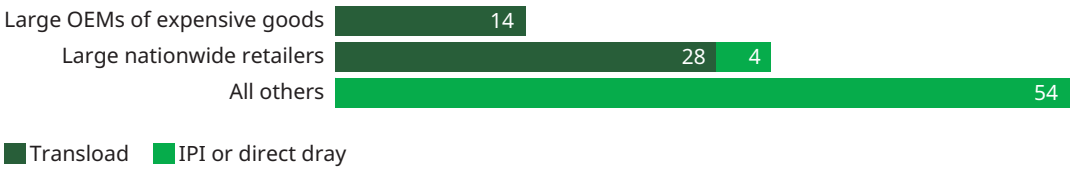
- **Large original equipment manufacturers (OEMs) of expensive goods** (e.g., LCD screens, appliances, machinery) typically operate a national distribution center (NDC) near a single port of entry. Retailing customers pay for domestic transportation from the NDC.
- **Large nationwide retailers** (e.g., Walmart, Target, Home Depot, Lowe's, Amazon) operate 20–40 regional distribution centers (RDCs) feeding retail outlets within each region. (Amazon operates more than 100 regional fulfillment centers.) These retailers typically utilize three to five ports of entry and a mix of IPI/direct dray and transloading. They do not import very expensive goods.
- **Large OEMs of moderately expensive goods** (e.g., auto parts, tires, luggage, toys) — operate one to five DCs using from one to five ports of entry. Retailing customers pay for domestic transportation from the DCs.
- **Small OEMs, small and regional retailers, and contractors** typically operate a single DC or staging point and utilize IPI or direct dray depending on the location of the DC.

The modal mix for importers (transload versus IPI/direct dray) nationwide is shown in Exhibit 7–1. About 85% of large OEMs of expensive goods have located their NDCs in Southern California's Inland Empire. Large nationwide retailers serve a substantial portion of the continental United States via the LA/LB ports. Consequently, imports via the LA/LB ports experience a much higher percentage of transloading than do imports moving via other ports. This means that a tremendous amount of truck traffic in the LA Basin is associated with imports.

32 For the analytical assumptions and methodology used to develop the analyses in this chapter, see the separate paper "Market Potential and Marketing Strategy for Short-Haul Intermodal Service in Southern California," Leachman and Associates LLC, December 1, 2023.

Exhibit 7-1: National modal mix by importer type

% of total import TEUs



Source: "Market Potential and Marketing Strategy for Short-Haul Intermodal Service in Southern California," Leachman and Associates LLC, December 1, 2023

Of these groups, large nationwide retailers are a key category that could be susceptible to modal shift. Large OEMs also may offer viable opportunities for modal shift. Both of these groups transload primarily for inventory management. Retail inventory has four components — and IPI or direct dray of marine containers is a problem for all of them:

- Cycle stock (average stock level between replenishments): One marine container comes from one factory, containing large quantities of only a few SKUs. Even the aggregate sales of an entire region could take a long time to consume the contents of one container, resulting in risks of markdowns, remaindering, and obsolescence. It is better to be able to allocate the contents across multiple regions. This makes IPI unsuited to minimizing inventory carrying costs of cycle stock, as the lead time on allocating inventory must be determined prior to shipping the freight from Asia.
- Safety stock (to cover variability in shipment arrivals): Suppose one marine container is shipped to each of five regions, but one container misses the ship. The DC for that region needs enough safety stock to survive until the next shipment. On the other hand, if the other four containers are routed to the same cross-dock, the contents can be reallocated across regions, so that all regions receive most of what they need, dramatically reducing required safety stock.
- Seasonal stock (sales concentrated particularly at the end of the year): Using IPI requires allocating and pushing seasonal stock into all regions way ahead of time. If instead the first stop is an import warehouse in the hinterland of the port of entry, the retailer can wait to see how demand develops in each region and allocate stock as needed to where it can be sold.
- Pipeline stock (in transit): IPI service is more infrequent and slower than domestic-box service. This can create volatility in transit times, resulting in holding higher inventories to avoid the risk of shortages when the pipeline is disrupted.

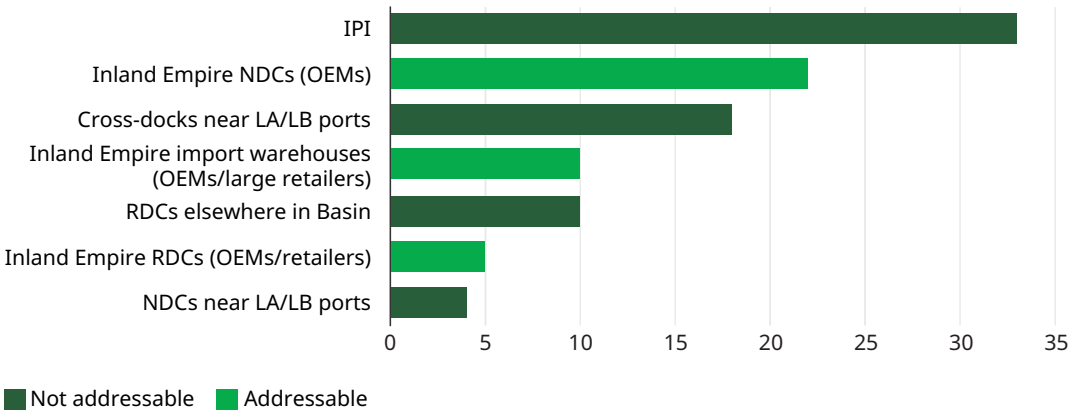
Shipping in domestic containers or trailers partially offsets the costs of transloading. Thus, together with inventory economies, it can make sense to transload most imports, provided a company operates in multiple regions and has enough scale to consistently transload freight from full 20-foot and 40-foot marine containers into full 53-foot domestic containers and 53-foot dry vans. It does not make sense for large retailers to transload everything, however, such as high-volume, low-value items; "one-off" goods (e.g., patio furniture, Halloween costumes); and some goods involved in large promotion events.

7.2 Potential import market size

Based on the 2019 share of imports moving through distribution facilities located in the greater Inland Empire region of Southern California, our analysis indicates that approximately 3.07 million TEUs (36% of LA/LB port imports), could be addressable by an inland port in the Inland Empire. This includes import containers flowing to Inland Empire national distribution centers, import warehouses, and regional distribution centers (Exhibit 7-2). A further opportunity for up to 1.54 million TEUs could be realized if cross-docks near the ports relocated to the Inland Empire (17.6% of total imports).

While some containers are delivered via long-haul drayage to import warehouses and distribution centers outside of Southern California (e.g., Phoenix, AZ), this is understood to be a small market segment due to the high cost of long-term drayage, as well as the missed opportunity for inventory management — since this freight is drayed past the Inland Empire's cross-docks and logistics facilities. It is considered unlikely, without a major change and investment in import warehouse locations, that there is sufficiently dense import volume going direct to a location outside Southern California and within 300 miles (i.e., Las Vegas NV, Phoenix AZ, Bakersfield, CA) to support an inland port project.

Exhibit 7-2: Market segmentation of imports via the LA/LB ports
Share of 2019 TEUs; addressable market = 36.2% of total imports



Note: IPI = inland point intact intermodal (rail-hauled marine containers); NDC = national distribution center; RDC = regional distribution center

Source: "Market Potential and Marketing Strategy for Short-Haul Intermodal Service in Southern California," Leachman and Associates LLC, December 1, 2023

The total addressable market of 4.63 million TEUs is equivalent to 4,260 dray trips of 40-foot containers from marine terminals to Inland Empire DCs and 650 dray trips of 53-foot trailers from cross-docks near the LA/LB ports to Inland Empire DCs every operating day.[33] A short-haul intermodal train that could haul an average of 500 TEUs per trip could move 3.07 million annual TEUs in 21 trains per operating day, or if all cross-docks moved to the Inland Empire, the total volume of 4.63 million TEUs could be hauled by a rail shuttle using 31 trains of this size per operating day.

33 Assumes all imports are in 40-foot containers and 300 operating days per year.

Of course, capturing a portion of this addressable market would require competitive pricing (versus direct dray), reliable and frequent shuttle train operation, and the location of an inland port close enough to warehouse destinations so that drayage from the inland port does not negate the savings from the rail movement.

Portions of the addressable market could be served through inland ports using various operating models. For example, based on proposed inland port/intermodal terminal projects (see Appendix A):

- A small standalone terminal with two to three rail shuttle trains per day. This could serve an existing or a greenfield logistics park (transloading, national and regional DCs, import warehouses). This type of inland port could offer 300,000–500,000 TEUs of capacity, equivalent to a market share shift of 10–16% of Inland Empire port drayage at full capacity.
- A large capacity inland port with five to ten trains per day. It would be most competitive for such an inland port to be located in the Inland Empire, due to the area's large existing logistics cluster, but there are limited, if any sites, available and opposition from local municipalities. It would likely be more feasible to build an inland port in the High Desert because of the requirement for a large site, with local municipal government permitting for an intermodal terminal and logistics park. Such a facility would require significant existing or induced demand near the terminal to be feasible. Consequently, this type of inland port would require a large integrated logistics park and a significant reshaping of BCO supply chain infrastructure to be successful. At this scale, an inland port would have the capacity to shift 750,000 to 1.5 million TEUs from port drayage to rail (24–48% of 2019 Inland Empire TEUs). If an integrated facility of this size resulted in downtown cross-docks relocating to near or at the inland port, an additional 16–32% of the addressable market could be captured at full capacity.

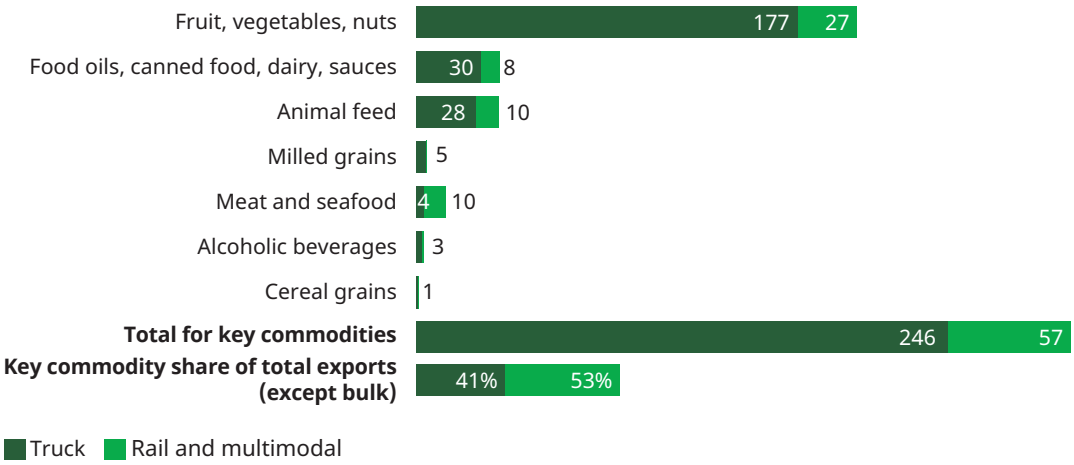
7.3 Potential export market size

In sharp contrast to imports, comprising nearly all retail goods, waterborne containerized exports originating in Southern California are predominantly agricultural products from outside the Los Angeles Basin. While exports are a priority for stakeholders in the Central Valley and Imperial County, they are unlikely to shift the economic case for an inland port. The market size for exports from California, Arizona, New Mexico, and Nevada collectively is only about 0.5 million TEUs annually, compared to the 4.6M TEU addressable market for imports (Exhibit 7-3). The balance of port exports originate in other parts of the United States, outside the potential catchment area of the inland port concept.

With minor exceptions (e.g., the IKEA regional distribution center), there are few warehouses, cross-docks, or distribution facilities receiving marine containers in these origin regions for agricultural exports. Thus containers must be hauled empty to such origin areas, whether by dray or rail intermodal. Thus, a short-haul intermodal terminal located in the greater Inland Empire could be a useful supply point of empty marine containers for agricultural exports if dray distances are comparable to or shorter than draying empties from marine terminals at the LA/LB ports (Exhibit 7-4), but considering the extra lifts involved in using short-haul intermodal, the cost savings are likely to be modest, if any.

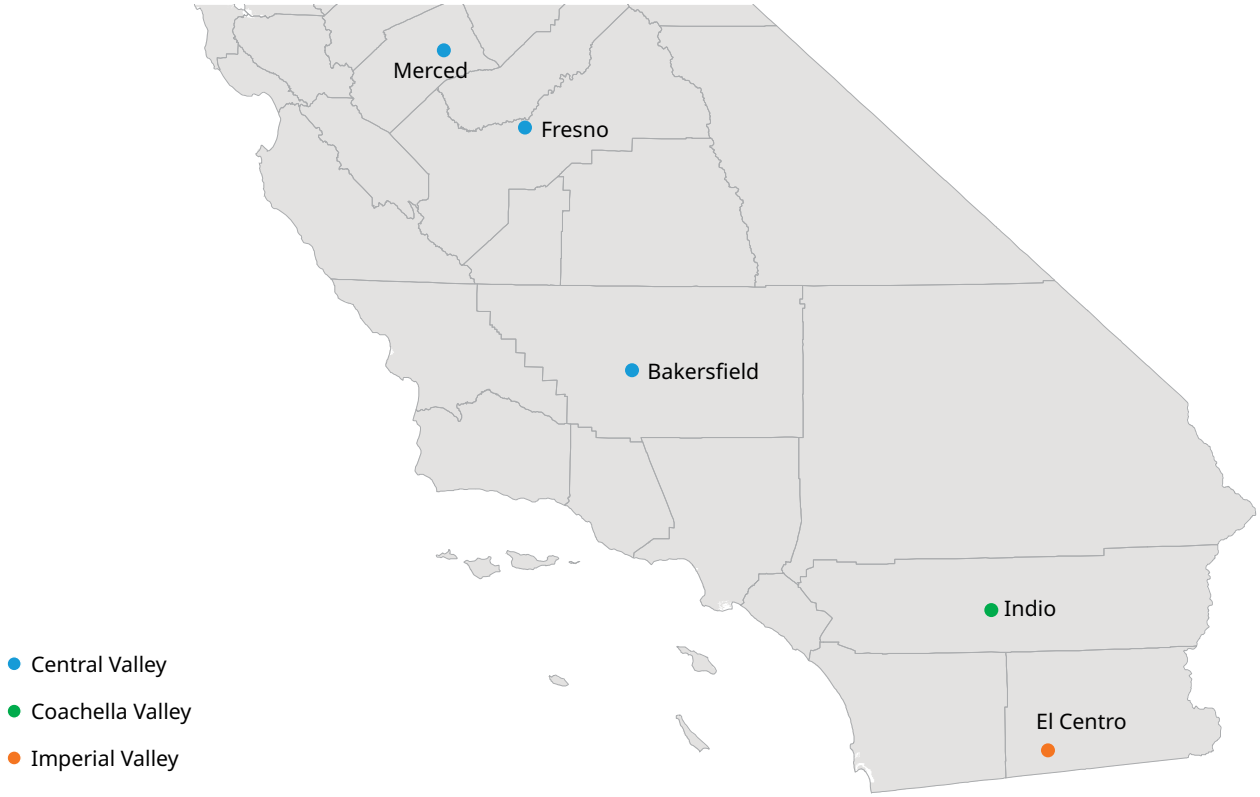
Exhibit 7-3: Waterborne exports of key commodities through the LA/LB ports originating in the southwestern United States (CA, AZ, NM, NV)

2019, thousands of marine containers



Source: "Market Potential and Marketing Strategy for Short-Haul Intermodal Service in Southern California," Leachman and Associates LLC, December 1, 2023

Exhibit 7-4: Potential locations for an inland port serving agricultural export markets



Source: "Market Potential and Marketing Strategy for Short-Haul Intermodal Service in Southern California," Leachman and Associates LLC, December 1, 2023

8 CONCEPT FEASIBILITY AND OPERATING ECONOMICS FOR SHIPPERS

To broadly determine the potential feasibility and operating economics of the proposed service, we developed several scenarios based on where an inland port might be located relative to the LA/LB ports and drayage distances to transloading/warehousing. Key questions analyzed included:

- Would per container economics to the shipper be competitive with current transportation options?
- Does mainline capacity exist for rail service to these potential locations?
- Would there be material societal benefits from the service that would justify public agency support?
- What else could “move the needle” to encourage modal shift from truck to rail?

It should be noted that this study only examines the overall potential feasibility and benefits of the short-haul intermodal rail shuttle-inland port concept on the basis of modal shift. Any specific project under consideration would require additional analyses, including:

- Determining if rail operators would be willing to assign mainline capacity to the service.
- The timeline/implications for drayage costs of zero-emissions and AB5 regulations.
- Whether an existing intermodal terminal would have capacity to serve as an inland port.
- If there are rail-served sites for greenfield terminals/logistics parks near the inland port location.
- The capital investment that would be required to build an inland port, together with determination of ownership and financial terms.

8.1 Inland port potential locations

The study considered three geographic zones for an inland port location (Exhibit 8-1). Each location is assumed to handle both local and long-haul freight, and that it would be less competitive to transload at a location in the US Southwest compared to transloading in Southern California, because a material portion of the freight transloaded would need to be trucked back to the SCAG region. The location of relevant warehouse districts and rail corridors in Southern California are shown in Exhibit 8-2.

Exhibit 8-1: Scenarios for potential inland port locations and onward transportation options

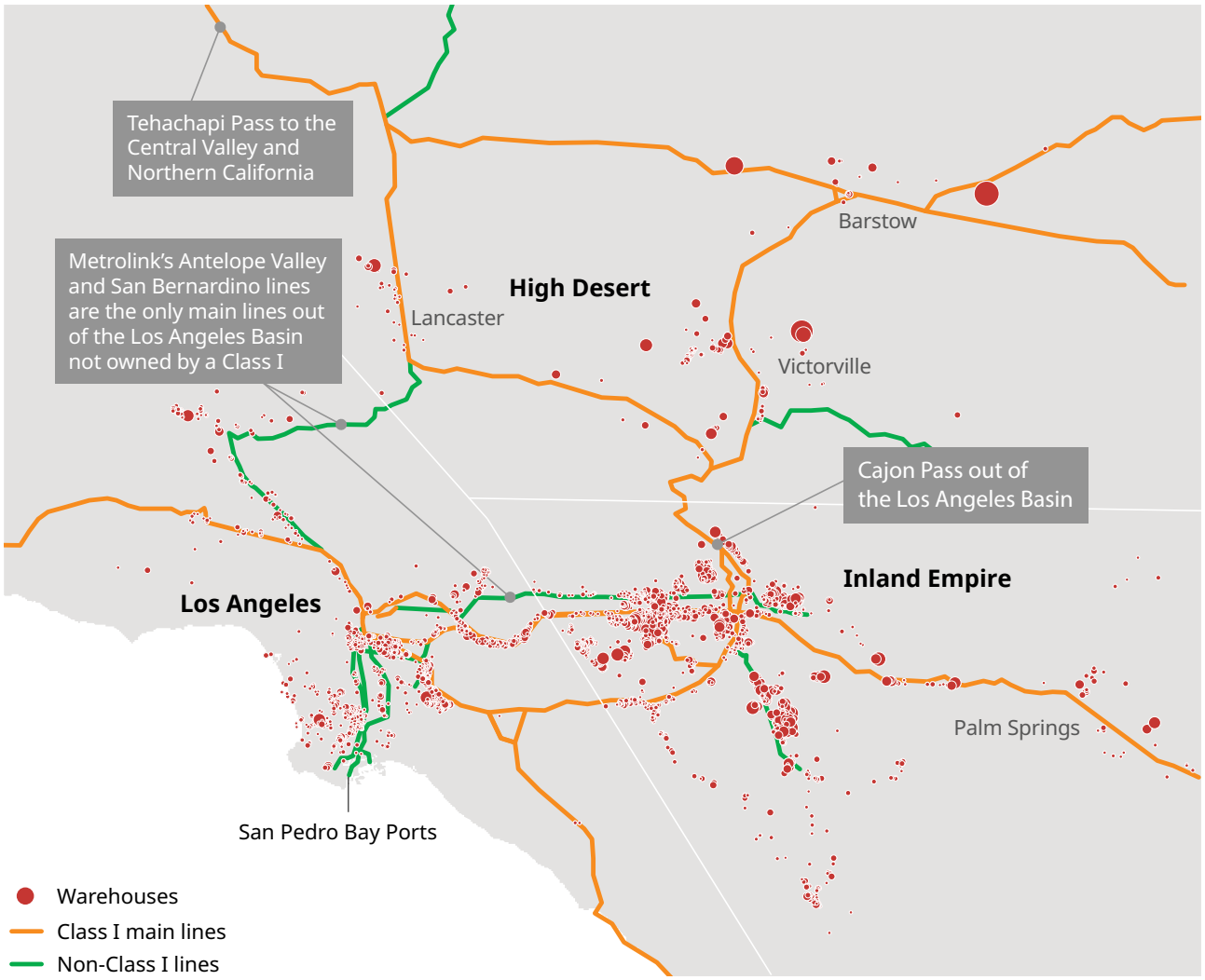
	Freight destination	
Inland port location	**Local/southwest US**	**Long-haul**
Inland Empire (< 100 miles)	• Drayage to Inland Empire destination (~10 miles)	• Drayage to Inland Empire transload (~10 miles) and then by domestic intermodal or dry van
High Desert (100–150 miles)	• Drayage back to Inland Empire destination (~40 miles) • Drayage to High Desert destination (~10 miles)	• Drayage to Inland Empire (~40 miles) or High Desert (~10 miles) transload, and then ship by domestic intermodal or dry van • Integrated transloading facility at the inland port and then ship by domestic intermodal or dry van
US Southwest (Central Valley, Phoenix, Las Vegas — up to 300 miles)	• Drayage to local destination (~10 miles)	• Assumed uncompetitive with transload in Southern California
Current competing transportation options		
	• Drayage from the LA/LB ports direct to destination	• Transload to domestic intermodal via drayage to Inland Empire • Transload to dry van via drayage to Inland Empire • On-dock and near-dock IPI

Source: Oliver Wyman analysis

Key to understanding the economics of the three inland port geographic zones above is the assumed drayage distance from the inland port to local transload and existing warehousing in the region, compared to drayage direct from the LA/LB ports. The following scenarios are considered for this study:

- **Inland Empire inland port:** A rail-served inland port within 100 miles of the ports (plus local drayage of 0–10 miles to warehouse/transload) would offer an alternative to the current option of an 80–100 mile direct drayage move from the ports.
- **High Desert inland port** (e.g., Lancaster, Palmdale, Victorville, Barstow, Mojave): An integrated, rail-served logistics hub in this region 100–150 miles from the ports would offer an alternative to current Inland Empire transloading. With 0–10-mile drayage to local warehousing/transload, the inland port would offer an alternative to current direct truck drayage from the ports of up to 100 miles. With 40-mile drayage back to existing Inland Empire warehousing, it would offer an alternative to the current option of a 60–100 mile direct drayage move from the ports.
- **US Southwest** (Central Valley, Phoenix, Las Vegas): A rail-served inland port up to 300 miles from the ports, with 0–10-mile local drayage, would offer an alternative to the current option of 300-mile direct drayage from the LA/LB ports for service to the region.

Exhibit 8-2: Warehouses and rail corridors in Southern California



Source: WarehouseCITY, Radical Research LLC; Oliver Wyman analysis

8.2 Shipper operating cost comparison

To assess potential operating costs and the cost competitiveness of an intermodal rail shuttle-inland port service with existing onward transportation options, three scenarios were considered on a per container basis for imports currently unloaded at the LA/LB ports:

- **Local consumption:** A local import container headed to a destination in the Inland Empire or High Desert, with a one-way drayage distance of approximately 70–100 miles.
- **Regional:** A local import container headed to a destination in the Central Valley, Phoenix, AZ or Las Vegas, NV, with a one-way drayage distance of approximately 300 miles.
- **Transload:** A transload import container headed to a destination east of the Rocky Mountains, with one-way drayage distance of approximately 70–100 miles to reach transloading in the Inland Empire or High Desert. For illustration, Chicago was used as the final destination in this scenario. (It should be noted that all inbound containers destined for transload will contain freight for multiple destinations — inland and local.)

For each scenario, four transportation mode choices and three inland port options were analyzed to demonstrate the impact of proximity to warehousing and transloading facilities on costs. The costs are from the shipper's point of view, so include the typical industry margins and assume some costs — e.g., a 3PL or import broker — are the same across modes. The modes evaluated were:

- Direct drayage to warehouse.
- Drayage to transload followed by domestic intermodal and domestic drayage at the inland destination (Chicago).
- Drayage to transload followed by dry van.
- On-dock IPI and international drayage at the inland destination (Chicago).

The inland port options modeled were:

- **Integrated logistics hub:** this is reflected by having zero drayage cost on arrival at the inland port. Examples include the proposed BNSF BIG facility's planned on-site J.B. Hunt transloading facility and the Ashley Furniture national distribution center in Arcadia, WI with an on-site CN-served intermodal terminal. An integrated logistics hub option would require a large greenfield site, likely in the Riverside County parts of the Inland Empire or High Desert communities. A challenge to the economics of this option is that without value-added services (as at Ashley Furniture's NDC), the cost of delivery to stores in the Los Angeles Basin and Southern California from the High Desert would be higher than from the Inland Empire.
- **Near existing warehouses:** this assumes drayage of approximately 10 miles each way is required to deliver international containers and dray back freight transloaded into 53-foot containers. This option could reflect use of the existing San Bernardino and West Colton intermodal terminals for an inland port, or a greenfield terminal in the Inland Empire, Victorville, or Palmdale serving nearby warehouses.

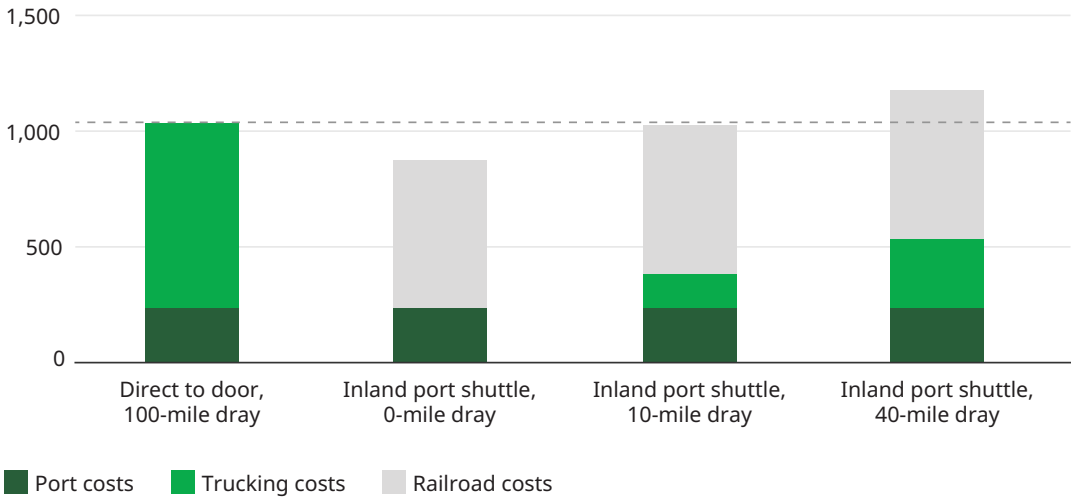
- **Remote greenfield site:** to reflect the lack of available sites in the Inland Empire for a new terminal and demonstrate the challenges of a location like Mojave without an integrated warehousing complex, this option assumes drayage of approximately 40 miles each way to/from the inland port to reach a warehouse or transload facility. This is also representative of an inland port built in the High Desert serving freight destined for Inland Empire warehouses, as there would be drayage back across the Cajon Pass to the container's destination.

Transloading assumes a domestic intermodal rail move from the inland port to the inland destination, and a domestic drayage move at the end of the trip ("last mile"). The analysis summarized below is intended to reflect round-trip costs, to include the return of empty containers. See Appendix B for additional detail on each scenario.

Cost competitiveness for local/regional freight

The local consumption and regional scenarios show that an inland port could compete with drayage on a per unit basis for local freight if co-located with a logistics park (Exhibits 8-3 and 8-4). Draying further, including back into the Los Angeles Basin, removes the competitive advantage from the scale and cost efficiencies of rail (including a typical operating margin for market participants).

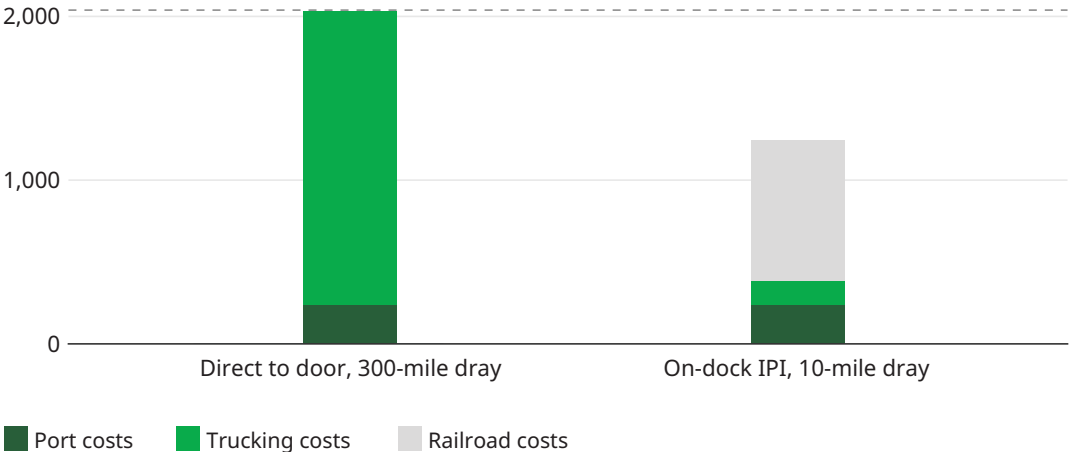
Exhibit 8-3: Inland Empire scenario: comparison of inland transportation costs
$ per import container, including estimate for empty return



Source: Surface Transportation Board URCS and Public Waybill Sample, Class I railroad annual reports, Pacific Harbor Line, industry interviews, Oliver Wyman analysis

Exhibit 8-4: Regional scenario: comparison of inland transportation costs

$ per import container, including estimate for empty return



Source: Surface Transportation Board URCS and Public Waybill Sample, Class I railroad annual reports, Pacific Harbor Line, industry interviews, Oliver Wyman analysis

The cost inputs for the analysis are based on available market data for drayage, industry interviews, and the Surface Transportation Board Universal Rail Costing System (URCS). URCS includes the operating and infrastructure costs to operate rail service. This includes direct costs like labor and fuel; leasing or ownership of locomotives, railcars, and terminal equipment; maintenance of rolling stock and line-of-road; and overhead. The analysis also includes the operating margin of the participants, assuming the typical railroad operating ratio.

It would be critical for rail service, particularly within the on-dock terminals, to match the reliability of drayage. There may be additional cost savings potential from using electric cranes and yard equipment at the inland port and automation technology to reduce the labor requirement to rapidly unload trains.

Additional benefits of an inland port that were not sized but that could provide additional revenues (offsetting operating costs) include equipment management and storage. Chassis management could be simplified if traffic using the inland port utilizes a stacked storage model and a chassis pool. Land around the inland port would likely be cheaper than quayside, enabling the inland port operator to offer cheaper storage for containers (particularly empties).

In terms of growth opportunities, **on-dock IPI service to regional destinations** is significantly more attractive on an operating cost basis than direct drayage moves. This type of IPI service has not been offered from the LA/LB ports, although there are examples in the Pacific Northwest and on the East Coast. From the LA/LB ports, the shortest lane is from the Union Pacific ICTF to Salt Lake City, Utah (around 700 miles). Success would require sufficient volume and that shippers would not need to ship material amounts of freight back west into Los Angeles stores and distribution centers.

- For example, one of the largest long-haul truck origin-to-destination lanes in the United States is from Los Angeles, Riverside, and San Bernardino Counties to the Phoenix metropolitan area, implying that this consumption market is heavily served from Southern California.
- Further market analysis and interviews with BCOs that have large distribution centers in Arizona and Nevada may reveal an opportunity to add new on-dock destinations. The Leachman and Associates market sizing study pointed to these being low-volume markets for drayage from the ports. It is more attractive for shippers to serve these metropolitan regions in the US Southwest with dry vans from Inland Empire transloads and distribution centers.

Cost competitiveness for transload

Using Chicago as a representative long-haul destination, we assumed that each 40-foot marine container requires 80% of a 53-foot domestic container or dry van to handle the same total freight.[34] While IPI is cheaper than any transloading option, as discussed elsewhere in this report, shippers who transload are doing so for inventory management benefits.

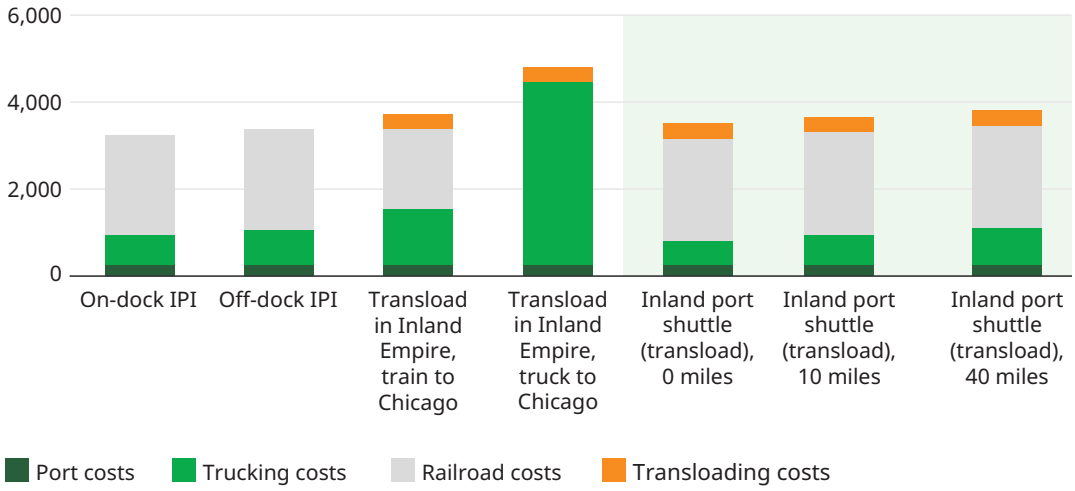
Transloading fully integrated with an inland port — removing both the port drayage and domestic drayage move — is competitive with existing transloading options in the Inland Empire (Exhibit 8-5). Unless significant quantities of transloaded freight need to be returned to the Los Angeles Basin, an integrated facility such as BNSF's BIG would be an attractive option for shippers.

An inland port with short drayage moves also would be competitive versus existing transloading in the Inland Empire followed by onward transportation to a long-haul destination such as Chicago, particularly if the inland port operator could add automation to reduce costs or generate additional revenue (such as through equipment management and container storage). Even the inland port scenario with drayage at 40 miles for both the import container and onward domestic container is close to being competitive with drayage to a transload facility.

34 This is slightly more conservative than the direct length ratio (75%) to assume some loss in packing density in the outbound move.

The cost comparisons shown here do not include benefits from inventory management. IPI is, on a per TEU basis, cheaper for shippers delivering to a distribution center or warehouse in the Midwest if they lack the scale necessary for transloading. This is why an inland port is considered unlikely to capture share from the IPI segment. Shippers using IPI are expected to continue to use IPI because this is the preferred solution for their supply chain. Even large importers will ship some freight directly east of the Rocky Mountains (e.g., fast-moving goods) or have made strategic decisions on siting their national distribution center and do not require a site in Southern California.

Exhibit 8-5: Transload scenario: comparison of inland transportation costs
$ per import container, including estimate for empty return



Source: Surface Transportation Board URCS and Public Waybill Sample, Class I railroad annual reports, Pacific Harbor Line, industry interviews, Oliver Wyman analysis

8.3 Main line rail capacity

Despite competitive operating economics, there are several potential rail capacity "bottlenecks" that could impact the feasibility of a rail shuttle-served inland port. These include the Alameda Corridor exiting the LA/LB port complex, the three rail main lines from downtown Los Angeles to the Inland Empire, and the Metrolink Antelope Valley line as an alternative corridor to the High Desert (Exhibit 8-6). Resolving such bottlenecks would require collaborative efforts on the part of public and private stakeholders and potentially capital investment.

Exhibit 8-6: Southern California rail corridor map

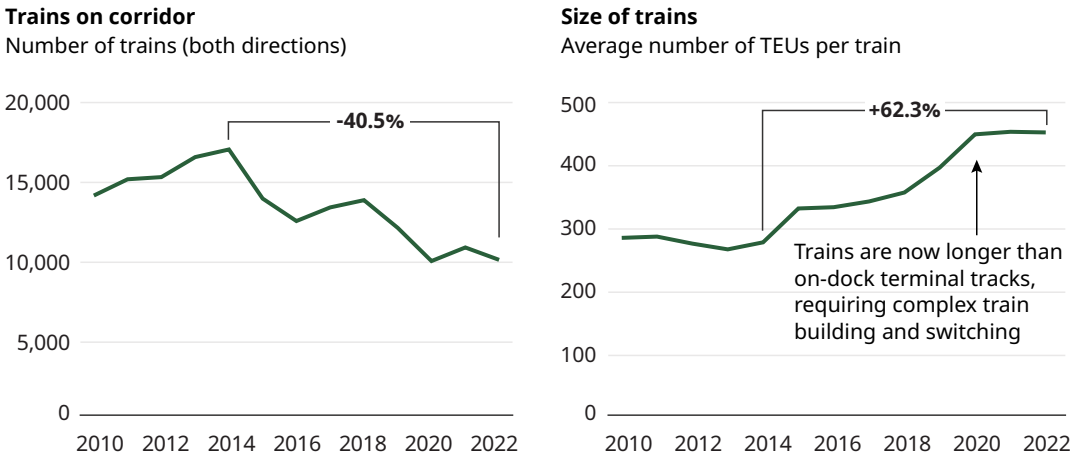
Alameda Corridor

The Class I railroads and public agencies collaborated in the construction of the Alameda Corridor. This fully grade-separated, three-track main line runs from the LA/LB ports north to junctions with UP's Los Angeles and Alhambra subdivisions and BNSF's San Bernardino subdivision. The intent of the Corridor was to shift intermodal volumes from drayage to rail by enabling more efficient access for IPI.

Due to shipper preference for transloading, however, traffic on the Corridor has been effectively flat for a decade (-0.2% CAGR for 2012–2022, including off-dock traffic through UP's ICTF). The number of trains has dropped by ~40%, but the Class I railroads have increased train size (to ~450 TEUs per train or 7,000–8,500 feet on average) (Exhibit 8-7).

The Corridor itself thus appears to have room to add more trains, particularly for an operating model such as an intermodal rail shuttle that would use shorter, faster trains. But longer trains can impact capacity, because of the need to stage long trains waiting to enter the LA/LB ports from the Corridor. The on-dock rail terminals' siding lengths and layouts require that long trains, which can now exceed 10,000 feet, are switched in blocks into and out of the on-dock terminals. The ports are investing in expanded receiving and forwarding yards to accommodate building longer trains, which is intended to alleviate some of this congestion. It is beyond the scope of this study to identify specific bottlenecks in the Alameda Corridor or LA/LB port complex. There is consensus that capacity exists for more on-dock intermodal service, although a bottleneck may exist at the northern end of the corridor at the interlocking with the UP, BNSF, and Metrolink subdivisions.

Exhibit 8-7: Alameda Corridor train volume and train size, 2010–2022

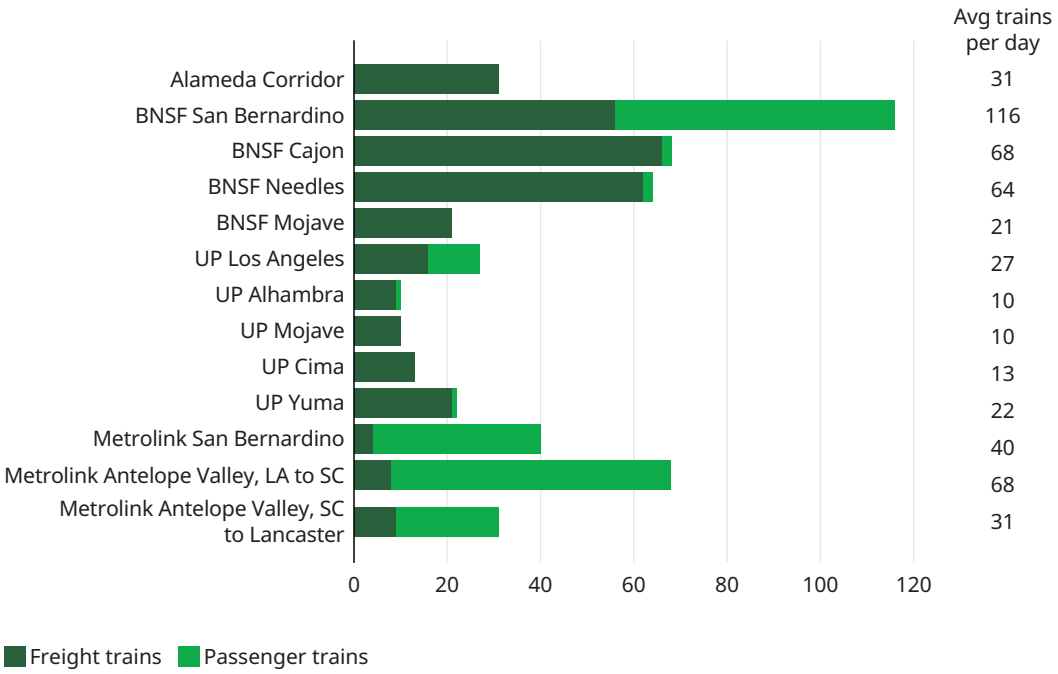


Source: Alameda Corridor Transportation Authority, Oliver Wyman analysis

East-west main lines

A high-level analysis of the rail subdivisions in the Los Angeles region shows capacity exists on most corridors for intermodal rail shuttle trains (Exhibits 8-8 and 8-10). Interviews with the operating railroads, Caltrans, and Metrolink however pointed to the three east-west main lines across Los Angeles County to the Inland Empire as being the most challenging for adding mainline capacity. They currently carry significant commuter rail traffic and long-haul intermodal and merchandise freight traffic, and all parties want to preserve capacity for future growth.

Exhibit 8-8: Southern California trains per day, by rail line subdivision, 2022



Source: Oliver Wyman analysis

Capacity (and thus potential constraints) for these lines was estimated using the framework provided by the Association of American Railroads' National Rail Freight Infrastructure Capacity and Investment Study.[35] As shown in Exhibit 8-9, a rail line's level of available capacity is based on the ratio of the existing volume on the line (average existing trains per day) to the practical capacity of the line (how many trains could practically travel over the line). This indicates if a line is currently below, at, or above capacity (i.e., whether there is room to add additional trains without adversely impacting service). Note that this is a top-down methodology and does not fully consider sidings, dispatching management, and other local factors.

35 National Rail Freight Infrastructure Capacity and Investment Study, prepared by Cambridge Systematics for the Association of American Railroads, September 2007. The average number of trains per day was estimated using publicly available Federal Railroad Administration grade-crossing data.

When this is applied to the rail corridors in Southern California using FRA grade-crossing data, it shows there are two potential bottlenecks: the BNSF San Bernardino subdivision and the Metrolink Antelope Valley line. The BNSF San Bernardino subdivision is shared between freight (local, intermodal, and merchandise) and passenger (Metrolink and Amtrak). Both these corridors may have capacity for adding an intermodal rail shuttle service if operated outside peak commuter rail periods or after investment in infrastructure. The other corridors analyzed have capacity for additional train service dedicated to serving an inland port without issue (Exhibit 8-10).

Exhibit 8-9: Rail line volume to capacity ratios and level-of-service grades

LOS grade	Description	Volume/capacity ratio
A B C	**Below capacity:** Low to moderate train flows with capacity to accommodate maintenance and recover from incidents	0.0 to 0.2 0.2 to 0.4 0.4 to 0.7
D	**Near capacity:** Heavy train flows with moderate capacity to accommodate maintenance and recover from incidents	0.7 to 0.8
E	**At capacity:** Very heavy train flows with very limited capacity to accommodate maintenance and recover from incidents	0.8 to 1.0
F	**Above capacity:** Unstable flows: service breakdown conditions	> 1.00

Source: National Rail Freight Infrastructure Capacity and Investment Study, prepared by Cambridge Systematics for the Association of American Railroads, September 2007

Exhibit 8-10: Southern California rail line capacity by subdivision, 2022

Corridor	Freight trains per day	Passenger trains per day	Total trains per day	Minimum # of tracks	Trains per track	Signaling	Practical capacity (trains per day)	LOS grade
Alameda Corridor	31	0	31	3	10.3	CTC	163	A
BNSF San Bernardino, LA to Fullerton	56	46	102	3	34.0	CTC	148	C
BNSF San Bernardino, Fullerton to San Bernardino	56	26	82	2	41.0	CTC	90	E
BNSF Cajon	66	2	68	2	34.0	CTC	99	C
BNSF Needles	62	2	64	2	32.0	CTC	99	C
BNSF Mojave	21	0	21	1	21.0	CTC	48	C
UPRR Los Angeles	16	11	27	1	27.0	CTC	39	C
UPRR Alhambra	9	1	10	1	10.0	CTC	45	B
UPRR Mojave	10	0	10	1	10.0	CTC/ABS	25	C
UPRR Cima	13	0	13	1	13.0	CTC	48	B
UPRR Yuma	21	1	22	1	22.0	CTC	47	C
Metrolink San Bernardino	4	36	40	1	40.0	CTC	45	C
Metrolink Antelope Valley, LA to SC	8	60	68	2	34.0	CTC	96	D
Metrolink Antelope Valley, SC to Lancaster	9	22	31	1	31.0	CTC	41	D

Below capacity Near capacity At capacity

Source: National Rail Freight Infrastructure Capacity and Investment Study, prepared by Cambridge Systematics for the Association of American Railroads, September 2007; FRA grade-crossing data; Oliver Wyman analysis

California High Speed Rail and Brightline West are proposing building a new passenger main line to link downtown Los Angeles with the Inland Empire. This could absorb Metrolink's San Bernardino and Riverside Line capacity, and potentially provide freight capacity at night. However, these plans are currently not funded, will require billions in capital investment, and have not identified an alignment for environmental impact studies, detailed planning, or engineering. Metrolink has aspirations to add passenger service and may require constraints on additional intermodal rail shuttle service (e.g., night-time only). This could limit usage of the Antelope Valley line to the High Desert, which already hosts the UP intermodal "Z trains" that run in the I-5 corridor.

For the Class I railroads, the "displacement cost" of one long-haul train by an intermodal rail shuttle is significant. Any intermodal rail shuttle to an inland port would need to generate enough value to offset the displacement of this revenue and the perceived benefits of operating a long-haul train instead — or provide enough return to pay for the capacity enhancements required to run both. This could lead to resistance to operating intermodal shuttle trains to an inland port via the San Bernardino subdivision, as it is operating at capacity. Metrolink investments may alleviate capacity limitations here.

What is not analyzed here is whether the impact of mode shifting port drayage to the inland port would replace freight train traffic across Los Angeles. If shippers choose to relocate transloading facilities to an integrated logistics park at the inland port, that could reduce domestic intermodal demand for the downtown Los Angeles terminals. A compelling integrated transload service product could result in domestic intermodal train starts moving east to the inland port, with the intermodal rail shuttle using the same track capacity across Los Angeles.

Metrolink Antelope Valley line

The Metrolink Antelope Valley Line is a rail corridor out of the Los Angeles Basin not owned by a Class I railroad. At Los Angeles Union Station, this Metrolink-owned main line connects with the UP Los Angeles subdivision and the northern end of the Alameda Corridor.

Current service levels are 30 roundtrip passenger trains between Los Angeles Union Station and Burbank per day, with 11 roundtrips continuing past to Santa Clarita and Lancaster. The other trains continue into Ventura County and beyond. Metrolink confirmed usage of the route by UP freight trains, primarily at night, to serve a couple of customers and as a route for UP intermodal "Z trains" on the I-5 corridor departing the downtown Los Angeles intermodal terminals. The route is single track north of Burbank, with several long passing sidings.

The Antelope Valley Line is expected to be part of the California high-speed rail corridor. Although the high-speed lines will primarily be in bored tunnel, there are plans to add new double-track sections and expand Metrolink passenger service as well.[36]

As shown in Exhibit 8-10, the line is near capacity. However, based on information available from Metrolink at this time, it could be feasible to slot additional intermodal trains, particularly at night, on the line to Palmdale. This would provide a route for intermodal rail shuttle trains from the LA/LB ports out of the Los Angeles Basin without crossing Class I track. (More detailed analysis would be required to fully validate capacity.)

The route would put the trains onto the UP Mojave subdivision, which has available capacity based on current freight train counts versus other single-track segments in the region. This would give access to the Central Valley and communities in the High Desert (Victorville, Palmdale, Mojave) without requiring capacity on the congested east-west Class I mainlines in Los Angeles County.

While this route appears feasible, agreements would be required with Metrolink and potentially UP, and a passenger rail level of on-time performance and velocity to operate in slots between commuter trains. The Antelope Valley Line offers an alternative if a government agency or short line freight railroad wanted to offer intermodal shuttle train service without requiring trackage rights on the Class I mainlines in Los Angeles County or across the Cajon Pass.

36 Strategic Business Plan, Metrolink, January 22, 2021.

8.4 Illustrative societal cost/benefit impacts

This study includes an illustrative review of a subset of potential societal cost/benefit impacts for the proposed service in terms of 1) reducing certain greenhouse gas emissions and other air pollutants, and 2) reducing traffic accidents and improving traffic safety. The Cal-B/C benefit-cost tool from the Transportation Economic Branch of CalTrans was used to determine the societal costs of traffic accidents (current status quo versus built project). Additional societal benefits could be available but were not modeled, such as the significantly higher fuel efficiency per ton-mile of rail compared to trucking.

Greenhouse gases and other air pollutants

California has proposed new regulations that set a deadline of 2035 for all truck fleets to transition to zero-emissions vehicles and for locomotives to transition to the latest emission standard (known as "Tier 4" engines) or cleaner technology. The proposal includes locomotives transitioning to zero emissions by 2047. CARB estimates that Tier 4 locomotives will emit less particulate matter ($PM_{2.5}$) and nitrogen oxides (NO_x) than diesel trucks in 2030, while older locomotives will emit more.[37] In 2040, while CARB estimates that trucks will be completely zero emissions, potential "Tier 5" locomotives would emit significantly less NO_x and $PM_{2.5}$ than prior generations of locomotives.[38]

Based on CARB's analysis, railroads will need to transition their California locomotive fleets to Tier 4 or better technology to remain competitive with trucks from an environmental standpoint. Locomotives for the inland port rail shuttle should be Tier 4 or better and provide an environmental impact improvement compared to the existing locomotive fleet captive to California. This would give the rail shuttle an environmental benefit versus truck through 2030 and would be a strong case for a test operation of zero-emissions technology.

Transportation safety

When leaving the LA/LB ports, most drayage trucks take the I-710 corridor before dispersing to different areas of California. This contributes to high levels of congestion and traffic collisions on Los Angeles highways. Using the Cal-B/C tool, we examined the societal costs of each of our possible scenarios against their respective base cases.

37 Draft Truck vs. Train Emissions Analysis, California Air Resources Board, September 23, 2020.

38 Ibid.

The results of our analysis show that in most cases, an inland port would provide net positive societal benefits to California in the form of reducing traffic collisions. Specifically:

- Inland Empire scenario versus 100-mile dray to an inland warehouse: Societal costs would be reduced with a 0–10-mile dray, but there would be no additional benefit with a 40-mile dray.
- Regional scenario versus 300-mile dray to an inland warehouse: A rail shuttle service would provide a societal benefit versus drayage.
- Transload scenario versus 75-mile dray to the Inland Empire, transloading to a 53-foot domestic container, and a 2,000-mile-rail haul to the Midwest: Shuttle service would provide a societal benefit for a 0–10-mile dray, with no additional benefit for a 40-mile dray.

Our analysis suggests that in most cases, a rail shuttle to an inland port would reduce the number of traffic collisions per container. This finding, however, is bound by a few constraints. Namely, the shuttle service to the inland port would need to be within 40 miles (80-mile round trip) of warehouses and transload facilities, to not negate the benefits of the shuttle with a long dray move thereafter.

In the case of a long-haul trip, such as from LA to Chicago, the facility also would need to provide transload services, since when cargo is transloaded, fewer trucks and railcars are required to move the same amount of cargo, ultimately reducing collision rates. Conversely, it should be noted that there is a societal cost incurred by using both on- and off-dock IPI. This is attributable to the fact that these containers are not being transloaded and thus require more railcars for long-distance moves and more drayage trucks on arrival in Chicago.

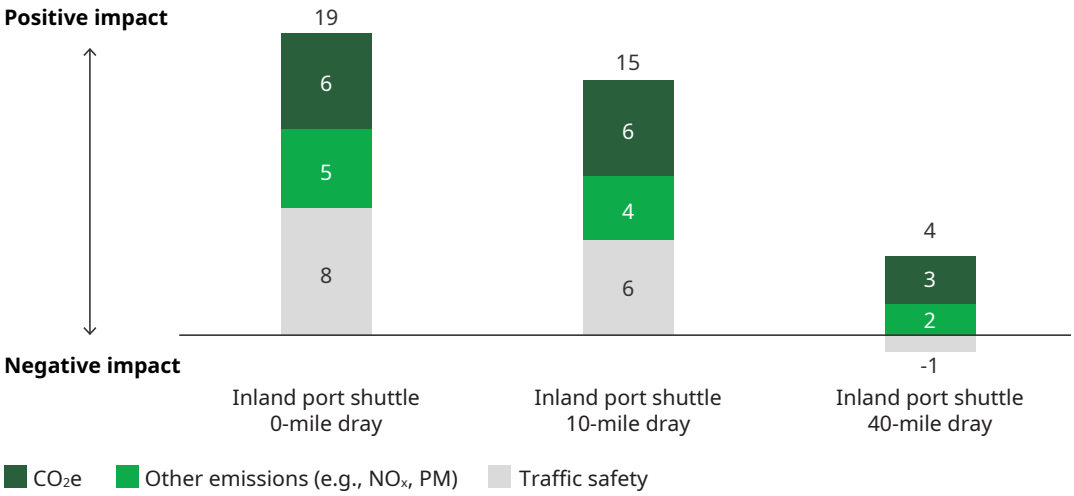
8.5 What else could move the needle?

Air quality and zero-emissions locomotives

As noted above, moving to zero-emissions locomotive technology more quickly would help engender support from public stakeholders for an intermodal rail shuttle. As shown in Exhibit 8-11, a zero-emissions locomotive fleet would generate positive environmental benefits (i.e., reduced health costs) and thus be competitive with CARB's projected environmental impact for trucking.

Exhibit 8-11: Selected high-level societal cost impacts of an inland port with a zero-emissions rail shuttle (2030)

$ per container, net positive or negative impact



Source: CalTrans Cal-B/C IF v8.1, Oliver Wyman analysis

It is important to note that environmental benefits would diminish as the distance of last-mile drayage increases, meaning that to increase the environmental advantage of the inland port, it should be less than 40 miles from warehouses and transloading facilities.[39] Lastly, on-dock and off-dock IPI would generate lower societal benefits, due to the additional drayage required to move containers to their final destinations after the long-haul rail move to Chicago.

Increased regulatory costs for trucking

Over time, drayage labor costs are expected to increase in Southern California. One reason for this is California's 2020 Assembly Bill 5, which requires many independent contractors to be reclassified as employees. Application of the law was delayed by several legal challenges but is now expected to be forthcoming. The law is expected to significantly impact the trucking industry in the state, as some 70,000 self-employed independent owner-operators provide port drayage and long-haul trucking in California. Earnings calls in 2022 from Landstar and Schneider included warnings to their owner-operator drivers that to remain compliant, they would need to move their domicile out-of-state.

39 CalTrans Intermodal Freight B/C calculator v8.1.

Compliance will require larger drayage carriers to either switch to a brokerage model — separating from their owner-operator drivers — or hire company drivers. Industry analysts have estimated the conversion of an owner-operator to a company driver could raise operating costs by up to 20% in what is a low-margin business.[40] In addition, the initial costs of acquiring tractors would lead to higher drayage prices over the long term. This would make a rail-served inland port increasingly competitive.

In addition, CARB regulations that came into effect at the start of 2023 will eliminate trucks with model years 2010 or older from port work. Carriers are predicting that this will affect some 5,000 trucks used at the LA/LB ports.[41] This will further tighten the supply of drayage drivers and impact the already high cost of trucks, already up 30% over pre-COVID pricing.[42]

Other costs and benefits not sized

This feasibility study does not include a benefit-cost analysis in the case where state or federal grants will be pursued. To complete this type of analysis would require analyzing a specific location to understand construction costs, market share capture, and job creation potential in the surrounding community. Serving existing warehouses would not create the same economic benefits as a project that enabled new economic growth.

There are also wider benefits, in terms of infrastructure costs that could be avoided by shifting freight from truck to rail. Caltrans, for example, sees an operating subsidy for an inland port with an intermodal rail shuttle as a possible alternative to the debt service and maintenance required to expand highways by building dedicated truck lanes.[43]

A recommended next step for any proposed project seeking public financing would be to combine the current-state operating economics and emissions benefits assessed in this report with the expected economic development impacts from a specific proposed project location, to develop a more comprehensive understanding of benefits and costs.

40 The Cowen Insight, October 2022.

41 Logistics Management, November 2022.

42 The Cowen Insight, October 2022.

43 Draft 2023 California Freight Mobility Plan, Caltrans.

9 | CONCLUSIONS

As discussed in this report, for containerized imports arriving at the LA/LB ports and destined for the Southern California market, a short-haul rail intermodal shuttle-inland port could provide a feasible alternative to direct truck drayage. Such a service could support the ports' competitiveness and growth, reduce truck congestion and delays at the ports, increase supply chain efficiency and velocity, and reduce inland transportation costs for shippers. Key conclusions based on the study findings are as follows:

Addressable market: Overall, the study found that there is a sizable addressable market of containerized freight suitable for an inland port, some 3.07 million TEUs per year, while an additional 1.54 million TEUs could be addressed if cross-dock facilities near the LA/LB ports were to relocate to the inland port.

In addition, the LA/LB ports expect container imports to more than double from 2019 to 2030. Based on even today's levels of highway congestion and capacity limits, together with increasing costs for drayage and transload/warehousing facilities in Southern California, it will be extremely challenging for a large portion of future volumes to leave the LA/LB ports by truck on the existing highway network. The ports' on-dock rail capabilities need to be better utilized to play a bigger role in moving traffic off the ports — or this traffic will end up being diverted to other ports in North America. Main line rail capacity exists to move freight from the on-dock facilities to intermodal rail terminals, but would require negotiations with freight and passenger rail operators to ensure that all parties needs could be equitably met.

Operating economics for shippers: The study findings support that the rail shuttle-inland port concept could be competitive with direct truck drayage in Southern California in terms of shipper costs, particularly as drayage costs are expected to increase, as new California labor and emissions regulations impact the availability of drivers and equipment.

The rail shuttle-inland port concept would have to meet certain shipper requirements, however. In particular, the longer the drayage move required from an inland port to get a container to its destination, the less economic the service becomes. Thus, an inland port will be most competitive with trucking on shipping costs if it is either built near a currently established logistics park or is able to facilitate the development of transloading/warehousing in close proximity to the terminal's operations.

Short drayage hauls are also an important consideration given that an increasing proportion of the LA/LB ports' imports are destined for local consumption. The economic and logistics benefits of an inland port would deteriorate if containers required significant drayage back from an inland port to the Los Angeles Basin.

Common factors supporting concept success: Successful inland ports elsewhere in the US and globally typically have two things in common: the presence of anchor shipper/BCO tenants and primary coordination by a single entity.

While all stakeholders — port agencies, railroads, shippers, etc. — have a role to play in the development of an inland port, successful inland ports to date are owned/operated by a single entity (which can be public or private). A single owner/operator appears best able to drive the initiative, gather stakeholder support, market the service, and coordinate operational delivery.

The presence of anchor tenants (either as a cluster of warehouses or a sophisticated logistics park) ensures a pipeline of traffic to support an inland port long term. (And as noted, proximity increases operational efficiency.) This does not limit where an inland port might be built, however, as there are examples of inland ports that were developed in already industrialized areas as well as examples of greenfield customer facilities being developed alongside the port — as long as there are key tenants that are vested in the port's success.

Alignment with California state/local goals: An inland port in California would need to align with the long-term goals of the State of California, key California regulatory agencies, and local governments. There is a natural alignment in some cases; for example, California seeks to reduce highway congestion and highway maintenance costs, which a rail shuttle-inland port concept would support. I-710, the corridor most commonly used by drayage drivers from the LA/LB ports, is unlikely to be expanded further, while the LA/LB ports' import volumes are expected to continue increasing.

Another state goal is to encourage economic development further inland. Land within the Los Angeles Basin is valuable and there is limited available land for industrial development. By moving certain operations of the LA/LB ports inland, the ports would be able to grow volumes without expanding their physical footprint. Central regions of California have significant undeveloped land and communities looking to expand their economies, and so could be willing to support the development of logistics facilities and warehousing.

Ensuring the rail shuttle-inland port concept is in sync with other state/local goals would require additional analysis and targeted actions. Rail is environmentally friendly compared to trucking in terms of better fuel efficiency and lower carbon emissions. California has developed regulations to drive rapid deployment of zero-emissions trucks, and set societal cost impacts for certain types of emissions (NOx and PM). Ensuring public support of a rail shuttle-inland port thus may require zero-emissions locomotives and other equipment from day one of operations.

Southern California has rail line capacity and existing logistics and warehousing facilities. An inland port served by an intermodal rail shuttle could provide a cost-competitive service option for importers, whether transloading or for local consumption. Site selection and securing government support, particularly at the municipal level to gain permitting for the terminal and new warehousing, remain challenges to overcome. Case studies of other ports in North America and internationally demonstrate that shippers do utilize inland ports and have successfully integrated the service into their supply chains over the long term.

In conclusion, the intermodal rail shuttle-inland port concept holds the promise of providing benefits to all major stakeholders in the Southern California intermodal inland transportation chain, including the Ports of Los Angeles and Long Beach, shippers, carriers, and state/local governments. This study is only a first step in understanding both the benefits and challenges of the concept, but the current Southern California ecosystem appears ripe for innovations that can keep the San Pedro Bay Ports competitive and growing.

10. GLOSSARY

BCO	Beneficial cargo owner
BNSF	A Class I railroad, one of two providing main line freight service in California
CalSTA	California State Transportation Agency
Caltrans	California Department of Transportation
CARB	California Air Resources Board
Container	A box used for shipping goods. Marine containers are 20 or 40 feet long, domestic containers are typically 53 feet long and slightly wider
Cross-dock	Facility where freight is transloaded for onward shipping by rail or truck
DC	Distribution center
Drayage	Short-haul inland movement of marine containers by truck to a warehouse or distribution center
Dry van	Standard 53-foot enclosed truck trailer
FRA	Federal Railroad Administration
GHGs	Greenhouse gases
High Desert	Western Mojave Desert region of Southern California, typically between 2,000 and 4,000 feet of elevation
HOS	Hours-of-service, refers to federal regulations for how many hours truck drivers can drive per day and required rest periods
ICTF	Union Pacific Intermodal Container Transfer Facility, near the LA/LB ports
ILWU	International Longshore and Warehouse Union
Inland Empire	Region adjacent to coastal Southern California, centered around the cities of San Bernardino and Riverside
Inland point intact intermodal (IPI)	Loaded marine containers moved inland by rail from a port's on-dock rail terminals
Inland port	An inland intermodal terminal that is similar to a maritime port, in that it holds freight for pick up by rail or truck
Intermodal	Specifically refers in this report to the movement of shipping containers by rail and truck
Intermodal rail shuttle	A short-haul train designed to move containers from a port to an inland intermodal terminal
Logistics park	Industrial area specifically designed to store, manage, and distribute freight
Los Angeles Basin	Los Angeles County, includes some 80 communities
Metrolink	Southern California commuter rail system
MPO	Metropolitan planning organization
NO_x	Nitrous oxides, a form of air pollution
OEM	Original equipment manufacturer
On-dock rail	Refers to the ability to directly unload an oceangoing vessel to a train on the dock (and vice versa)
PierPass	Appointment system for trucks to utilize the LA/LB port terminal gates
PM	Particulate matter, a form of air pollution
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SKU	Stock-keeping unit
TEU	Twenty-foot equivalent unit; a standard measurement for container volumes
Transloading	Removing the contents of a marine container and reloading it into a domestic container or dry van (and vice versa)
UP	Union Pacific, a Class I railroad, one of two providing main line freight service in California
Well car	A type of railcar specifically designed to carry intermodal containers (also known as a doublestack car)

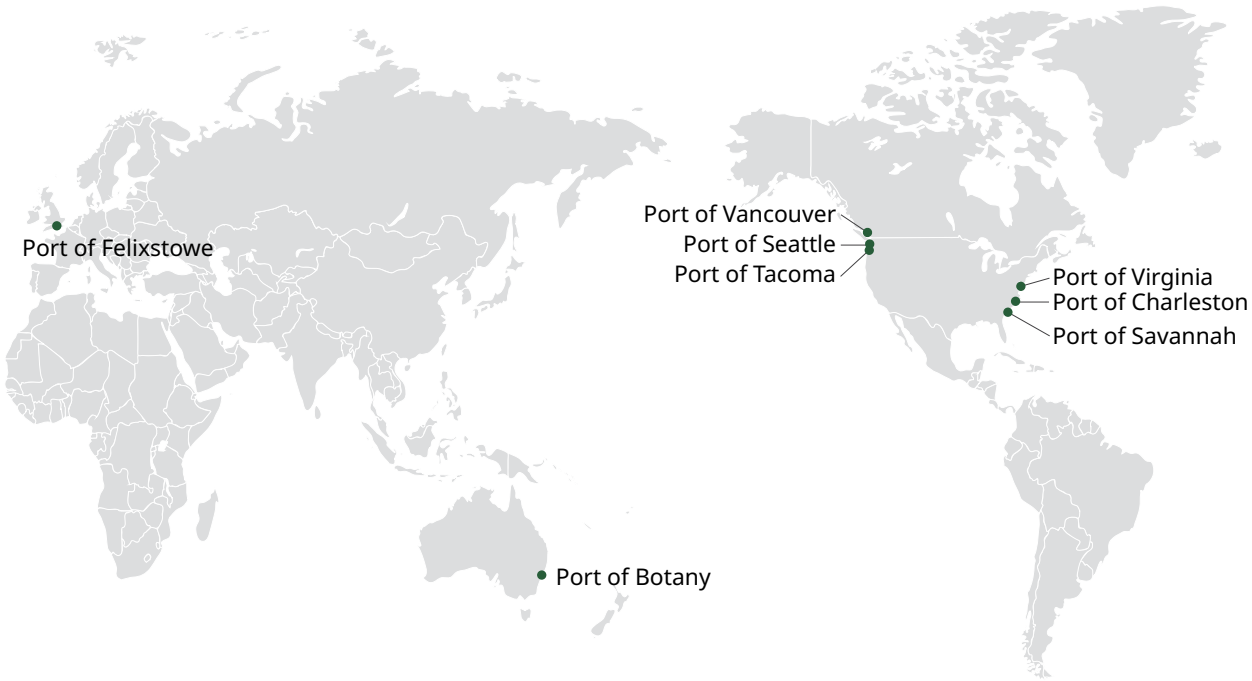
APPENDICES

APPENDIX A. CASE STUDIES OF INLAND PORTS

A.1 Existing US and international rail shuttle-inland port services

Oliver Wyman reviewed five existing US and international ports that utilize the rail shuttle-inland port concept (Exhibit A-1).

Exhibit A-1: Case study ports utilizing a rail shuttle-inland port service



A.1.1 South Carolina Ports

The Port of Charleston, Port of Georgetown, and inland ports Greer and Dillon are all owned and operated by the South Carolina Ports Authority, a state government-owned agency.[44] The Port of Charleston is the 12th largest port in North America[45] and has a heavy focus on intermodal containers and a commitment to invest in future port expansion. Approximately 18% of containers at the port are moved by rail.

Between FY 2018 and FY 2022, the SC Ports Authority spent $1.25 billion in capital investments, including $55 million toward its inland ports.[46] In 2022, the South Carolina ports generated $36.9 million in revenue and handled 2.9 million TEUs of containerized cargo.[47] Of the rail share, there were a combined 177,280 container lifts at inland ports Greer and Dillon (approximately 310,000 TEUs) in 2022, which means approximately 60% of containers moved through the inland ports. Each inland port has a direct connection to the Port of Charleston via the two eastern Class I railroads, Norfolk Southern and CSX.

Inland port Greer, a 91-acre facility, was completed in 2013 and is served exclusively by railroad Norfolk Southern. It is located roughly 190 miles from the Port of Charleston and 18 miles from the Virginia state line.[48] Greer's anchor tenant is BMW, which utilizes the port to export 60% of its vehicles produced in Spartanburg County.[49] Michelin, Adidas, and Eastman are among the other major companies that use the port, both for export and domestic distribution.

Inland port Dillon was completed in 2018, is served exclusively by CSX, and is a 40-acre facility.[50] The terminal is located 120 miles away from the Port of Charleston and is nine miles from the Virginia state line. Inland port Dillon's anchor tenant is Harbor Freight Tools, which owns a one million square foot distribution center just two miles away.[51] Northwest Grains International also recently invested $2.5 million in a transload facility that will utilize inland port Dillon to export agricultural products.[52]

While the Port of Charleston and inland ports Greer and Dillon are all owned and operated bya government agency, they are focused primarily on the economic benefits of increasing commerce. The inland ports were designed to efficiently move containers closer to the population and industrial centers in the northeast of the state, in a cost effective and shipper-friendly manner. The existence of anchor tenants is also crucial to the economic viability of the inland ports.

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44 About the Port, South Carolina Ports Authority.

45 Top North American Freight Ports, Transport Topics, November 2022. Sized by 2021 TEUs.

46 Capital Spending and Investments, South Carolina Ports Authority.

47 Rail Move, Pier Container, and TEU History, South Carolina Ports Authority.

48 Inland Port Greer, South Carolina Ports Authority.

49 "Inland Port Greer expansion continues to boost regional, state economic growth," Upstate Business Journal, November 21, 2022.

50 Inland Port Dillon, South Carolina Ports Authority.

51 "Harbor Freight announces 1 million-square-foot expansion in Dillon County," Midlands Biz, November 8, 2017.

52 "Northwest Grains breaks ground on transload facility," Feed and Grain, June 14, 2021.

A.1.2 Port of Virginia

The Port of Virginia is the ninth largest port in North America.[53] The Norfolk International Terminal (NIT), Virginia International Gateway (VIG), Virginia inland port (VIP), and three other Virginia terminals are all owned by the Port of Virginia (i.e., the Virginia Port Authority or VPA). The facilities are operated by Virginia International Terminals, LLC (VIT), a limited liability company wholly owned by VPA. The ocean ports are served by both eastern Class I railroads: Norfolk Southern and CSX. Roughly 41% of cargo handled by the ocean ports are containerized intermodal units (by weight), representing 3.7 million TEUs in 2022; 33% of this volume moves by rail.[54]

The Virginia Inland Port is located in Front Royal, VA and was opened in 1989 at an initial cost of $10 million.[55] It sits on 161 acres of land and has direct access to both the Norfolk International Terminal (NIT) and the Virginia International Gateway (VIG) via Norfolk Southern, which runs trains five days per week.[56] VIP is located roughly 180 miles from the Virginia ocean ports and less than 20 miles from both the Maryland and West Virginia state lines. The inland port was designed to encourage economic activity in the state by shortening supply chains and bringing port operations closer to the inland markets. While not in the middle of a large logistics park, there are several nearby distribution centers that utilize the port, such as Home Depot, Sysco Foods, Nature's Touch, and Family Dollar. In addition to standard port operations, the facility also consolidates and containerizes local cargo as well as offering other services.

VIP was one of the first inland ports built in North America. From the beginning, the project was geared toward the economic benefits of shortening supply chains, as opposed to reducing the number of trucks on the road or reducing emissions. Though the footprint of this inland port is comparatively small compared to other intermodal terminals (~110,000 TEUs in 2022), it continues to be utilized by surrounding distribution centers, due to the convenience of the facility, the proximity to major industrial areas, and the relatively inexpensive surrounding land adjacent to I-81 and the distribution centers in the region.

A.1.3 Northwest Seaport Alliance | Northwest Container

The Northwest Seaport Alliance — the ports of Seattle and Tacoma, WA — forms the sixth largest port in North America.[57] Northwest Container is a private intermodal operator, and subsidiary of publicly traded Waste Connections, that offers an intermodal rail service between the Northwest Seaport Alliance ports and Portland and Boardman, OR. The service launched in 1986 in partnership with railroad Union Pacific, marketed as "Daily Direct" with six day-per-week overnight service between Portland and the Tacoma and Seattle terminals.

53 Top North American Freight Ports, op. cit. Sized by 2021 TEUs.

54 Calendar Year 2021 Trade Overview, 2022 Financial Report, and Port Stats website, the Port of Virginia.

55 "Virginia is studying to open a second inland port," Cardinal News, December 6, 2022.

56 Virginia Inland Port, Port of Virginia.

57 Top North American Freight Ports, op. cit. Sized by 2021 TEUs.

These are both relatively short lanes (by North American standards) in which to offer intermodal service. Portland, OR is in approximately 150–175 highway miles on I-5 from the ports, and Boardman, OR is approximately 250 miles on I-90 and I-82.

Northwest Container owns a fleet of 42 railcars, each with the capacity for ten 40-foot marine containers, and owns and operates its own terminals in all four locations (Seattle, Tacoma, Portland, and Boardman). The Portland terminal is the largest, with 13,500 feet of working track and storage for approximately 8,000 containers. Both Northwest Container terminals directly serving the Northwest Seaport Alliance ports are off-dock and rail-served by Union Pacific. The service also has access to on-dock terminals. While there is a drayage move from the port to access the intermodal rail shuttle service to Portland and Boardman, this is less than five miles gate-to-gate.

Northwest Container offers an integrated service to shippers. It offers drayage using its own capacity (30 owner-operators) for both the marine terminal and delivery from the rail terminal to the destination. This means a shipper or ocean carrier (all the major ocean carriers are listed as partners) can utilize the service with coordination managed by Northwest Container from pick-up of an import container at the port. The operation uses leading TMS and EDI for data exchange. Drayage driver turn times are below 30 minutes per transaction at the inland terminals.

Northwest Container does not share its list of shippers publicly. It does advertise partnerships with the ocean carrier alliances, the Northwest Seaport Alliance, Port of Portland and Port of Morrow, and domestic asset-based IMCs. From a market standpoint, the rail move replaces the long drayage move on I-5 to Portland, OR for importers. It also gives agricultural exporters in the Tri-Cities region of eastern Washington and Oregon access to intermodal containers for export. Walmart operate a regional distribution center[58] in Hermiston, OR, 20 miles from Boardman, OR and other distribution centers in the Tri-Cities. These are located approximately 250 miles from the Northwest Seaport Alliance, so at the limit or beyond a single-day drayage round-trip for drivers.

Waste Connections does not report its intermodal business unit, which also handles shipping municipal waste by intermodal rail separately, grouping this BU with other revenues from landfills and waste transfer stations. In 2022, this business unit (intermodal and other) reported $188.5 million in revenue, including a $12.1 million year-over-year increase in intermodal revenue.[59] The STB Carload Waybill Sample estimates 55,000 intermodal units and $26 million in railroad revenues for the linehaul service from the Northwest Container lanes.[60] The Northwest Seaport Alliance handled 3.3 million TEUs (import, export, and domestic)[61] in 2022, giving Northwest Container an approximately 3% market share at 1.8 TEUs per container.

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58 The Walmart Distribution Center Network in the United States, MWPVL.

59 Annual Reports, Waste Connections.

60 Surface Transportation Board Carload Waybill Sample, 2022.

61 Cargo Statistics, Northwest Seaport Alliance.

In volume, the Northwest Container business is of a comparable scale to the Port of Virginia Front Royal operation. While it works with the ports, the operation does not use on-dock rail. It demonstrates that the inland port model is feasible on a commercial basis in North America for private investors and Class I railroads.

A.1.4 Georgia Ports

The Port of Savannah is the fourth largest port in North America and one of the fastest growing.[62] It has benefited from macro trends with the shift to importing via the East Coast. Located in the southeastern United States, it is well placed to benefit from imports from Southeast and South Asia using the Suez Canal route and larger ships using the expanded Panama Canal. Container handlings grew 35%, by an average of 7.9% per year, between 2018 and 2022, to 5.9 million TEUs in 2022.[63]

The port is owned and operated by the state through the Georgia Ports Authority, which has invested heavily in a rail intermodal strategy that gives Savannah access to both regional logistics markets (e.g., Atlanta) and long-haul into the Midwest. The $218 million Mason Mega Rail project is complete and can handle one million containers per year.[64] Current on-dock rail share is estimated at 20% of containers. Service is provided by railroads CSX and Norfolk Southern to Atlanta, GA (250 miles), with daily departures on each Class I railroad and to destinations in the Midwest.

Georgia Ports continues to invest in its network of inland ports:

- The Appalachian Inland Port opened in 2018. CSX provides direct rail service to Savannah, GA (388 miles each way). It is designed for 50,000 containers per year, with space to double throughput capacity. The terminal has 6,000 feet of working track and capacity for 2,975 TEUs. The terminal is owned and marketed by the Georgia Ports Authority.[65]
- The Northeast Georgia Inland Port is planned to open in the near future. It is located northeast of Atlanta near Gainesville, also giving access to the industrial and logistics clusters in South Carolina along I-85 and I-985. This terminal will have a capacity of 80,000 units initially, growing to 150,000 containers per year, and will receive daily Norfolk Southern service. It will offer an alternative to the seven-hour round-trip drayage drive time to Savannah, a trip too long for drivers to do more than a single round-trip per day.[66] Importers and exporters see the potential to switch to intermodal from this terminal, which is about a 1–2 hour drive from the existing rail terminals in Atlanta.

Both Georgia inland port examples are longer lengths-of-haul than under consideration in Southern California. Both demonstrate, similar to the South Carolina examples, the importance of linking inland ports to industrial clusters with space to expand logistics facilities. They also show that inland ports can offer a railhead to remove a day of drayage driver time to access inland points.

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62 Top North American Freight Ports, op. cit. Sized by 2021 TEUs. Only the ports of Los Angeles, Long Beach, and New York/New Jersey are larger.

63 Annual Container Trade, 2018-2022, Georgia Ports.

64 Mason Mega Rail, Georgia Ports.

65 Appalachian Regional Port, Georgia Ports.

66 Northeast Georgia Inland Port, Georgia Ports.

A.1.5 Port of Vancouver | CPKC Express and Maersk

The Port of Vancouver is the largest port in Canada, seventh largest in North America, and is owned by the Vancouver Fraser Port Authority, a federal agency.[67] It maintains 29 marine terminals, including four container terminals. The port also handles the rail operations of each terminal in conjunction with railroads Canadian National (CN) and Canadian Pacific Kansas City (CPKC). BNSF and Southern Railway of British Columbia, a short line railroad, also has access to the port. In 2022, the Port of Vancouver moved nearly 3.6 million TEUs of containerized cargo, with 45% of that cargo being handled by on-dock rail facilities.[68]

In 2021, CPKC and Maersk built a dedicated transloading and distribution center in Coquitlam, a town ~16 miles from the GCT Vanterm intermodal terminal; it was built on CP-owned land and is operated by Maersk Warehousing and Distribution.[69] The primary function of this facility is to transload 40-foot ocean containers into either 53-foot domestic containers, where the container is then shipped east, or into dry vans, where the cargo is trucked for primarily local consumption. The "value-add" for stakeholders includes:

- Quick turns on ocean-bound containers, which allows Maersk to more efficiently utilize its containers.
- Increased asset utilization for shippers, who are able to now transport the same amount of cargo in fewer containers (five 40-foot containers require the same amount of space as three 53-foot containers), which reduces shipping and demurrage charges.
- A new revenue service for both CPKC and Maersk.
- An increase in modal share for CPKC.
- Increased on-dock rail utilization for the Port of Vancouver, reducing gate/highway congestion.

There are a few key features that have made this inland port into a viable operation, the most important being that the objectives of the ocean carrier, the railroad, and the marine port are aligned. It is also important to consider that while the views of the government-owned port and the independent companies are aligned, the idea was not forced upon the companies by the port, nor was it subsidized. CP and Maersk launched the project because it was in their own economic interests.

It is worth noting that bringing this facility into operation required the cooperation of all parties involved. This project was not owned or led by a single entity, but rather was a collaborative effort. It demonstrates that an inland port model focused on transloading is attractive on a standalone commercial basis in North America for private investors, steamship lines, and Class I railroads.

67 About Us, Port of Vancouver; Top North American Freight Ports, op. cit. Sized by 2021 TEUs.

68 Container Statistics Report, 2008-2022 and Long-Term Container Traffic Forecast, 2020–2060, Port of Vancouver.

69 "CP, Maersk launch Pacific Transload Express," Railway Age, September 10, 2021.

A.1.6 Port of Felixstowe

The Port of Felixstowe is the United Kingdom's largest container port and is located on the east coast of England. Approximately 29% of container traffic is moved by rail. It is well located for ocean carriers, being a small diversion for container ships en route to Rotterdam, Hamburg, and northern European ports. The port offers over 30 daily intermodal rail shuttle departures to a network of inland ports across the UK. Distances range from approximately 150 miles to the West Midlands to up to 400 miles to Scotland's Central Belt. Current intermodal rail modal share of TEUs at Felixstowe is 29%, and over 50% for destinations in the West Midlands and northern UK.[70] The on-dock rail terminal at Felixstowe includes 20 tracks served by nine overhead widespan gantry cranes.

The UK is a densely populated country. Major retailers have located distribution centers in the East Midlands, West Midlands, and Greater Manchester, which are also regions with concentrations of British manufacturing. This allows retailers to access the majority of the population within a truck driver's hours of service. The size of major population centers means that the largest retailers and supermarkets still need multiple distribution centers for their nationwide store networks.

The UK rail network was privatized in the 1990s, with the original British Rail intermodal business unit (which focused on linking ports to inland terminals) becoming independent (Freightliner). Today, intermodal rail service, both domestic and maritime, is provided by four freight train operating companies (TOCs): DB Cargo, Freightliner, GBRF, and Direct Rail Services.

The port to inland terminal service product is led and marketed by the ocean carriers or 3PLs. The inland port terminals are owned by third parties, including both intermodal 3PLs and real estate firms that manage the logistics parks. The ocean carrier or 3PL typically contracts rail capacity from the on-dock terminal to an inland port on a take-or-pay basis with one of the TOCs. Contracting the full train by a single customer is common. The trains shuttle directly between port and inland terminal: there is no block swapping or multi-stop services. The TOC is a pure transportation carrier, with a limited role in terminal operations.

The newest and independent terminals are tightly integrated with logistics parks. They are co-located with warehousing. Several greenfield sites opened in recent years have built their rail pad tracks adjacent to large supermarket and e-commerce distribution centers. Containers are moved directly to the doors for unloading using yard hostlers, which eliminates drayage for those customers. Examples include iPort Rail in Doncaster, owned by Verdion, and Daventry Intermodal Freight Terminal, owned by Prologis.[71] Some supermarkets, such as major chain Tesco, also operate domestic intermodal for outbound freight headed to regional distribution centers and stores. Tesco's service includes both temperature controlled (reefer) and dry van freight on dedicated domestic intermodal trains.

Part of the value proposition for this service is the cost efficiency of rail, particularly since the UK adopted the Mode Shift Revenue Support Scheme (MSRS). This provides direct cash

70 Rail Services, Port of Felixstowe.

71 Prologis RFI Daventry International Rail Freight Terminal, Prologis.

incentives to cover the operating costs of rail operators where the door-to-door rail cost is higher than truck. Direct cash incentives can be up to £139 per intermodal container, depending on lane (i.e., distance).[72] The scheme is designed to facilitate and support modal shift through pass-through of better pricing to intermodal customers, generating environmental and social benefits from reduced truck trips on UK roads.

The use of intermodal rail for port containers also offers labor productivity benefits to 3PLs and ocean carriers providing carrier haulage. Drayage drivers in the UK can typically perform only a single turn per day from the Felixstowe port to a logistics cluster but do not come close to hitting the maximum hours-of-service. Those additional driver hours can be used to get a second turn from the inland port.

A key constraint to growth at the port is quayside capacity for storing containers. This results in high storage charges to encourage shippers to outgate their freight. Inland terminals historically offered shippers access to cheaper storage, though industry experts report that storage rates have risen.

The UK model demonstrates that a high frequency, multi-terminal inland port network can operate at scale and compete with highway drayage on service at short lengths-of-haul. The UK government subsidy per container is modest compared to the door-to-door cost and the environmental and societal benefits from modal shift. Two key features to the success of this program is that ocean carriers and 3PLs market the ship-to-gate or ship-to-door product, and that the inland port terminals are tightly integrated with logistics parks.

A.1.7 Port Botany

Port Botany is Sydney's container port and one of Australia's largest container ports. It is located near the urban core and expansion is tightly constrained by residential neighborhoods. Industrial development is not located nearby.

Historically, the Australian market was segmented. Ships can go from Asian factories to any city in Australia for relatively the same cost. Once the goods are landed, BCOs distribute them nationally, primarily using intermodal rail, as truck is uncompetitive over the large distances between population centers. Melbourne was the primary distribution hub in the past, but new distribution centers are now being built in other state capitals (Sydney and Perth in particular). Consequently, much of international intermodal rail service is short-haul.

In Sydney, the port is linked to two logistics hubs (Enfield and Moorlands) and an empty container yard (Cooks River). Trains move import containers to these logistics hubs within the Sydney urban area. The key benefits are a reduction in cost and heavy goods vehicle traffic through neighborhoods near Port Botany. Rail has a share of ~15% today, with plans by Transport for NSW to increase that to 28%, or 930,000 TEUs by 2021 (a pre-COVID target).[73]

72 Guide to the Mode Shift Revenue Support Scheme, UK Department for Transport, February 2022.

73 NSW Ports; Use of Rail Freight at Port Botany, Transport for NSW.

Federal and state governments have invested heavily in freight rail capacity to serve the port. The port itself is a private sector concession. It owns the relationship with ocean carriers and contracts with the inland port terminals to offer the destination. Rail carriers also have contracts with 3PLs to shuttle containers across the city, which can be part of a larger portfolio of value-added services for shippers. The train operation is multiple trains per day and onward domestic intermodal rail is also offered at these terminals to facilitate transloading and inland distribution.

Stakeholders are expanding rail shuttle capacity. Ports NSW is investing A$250 million in developing the Enfield inland port and logistics hub further. It is being supported by government-led investment of ~A$400 million in capacity expansion on the Sydney rail network for freight trains. This case study demonstrates that a rail shuttle can be attractive even over short distances when managed by a single entity — in this case, the port — with support from the public sector.

A.2 Southern California intermodal projects

A.2.1 Proposed BNSF Barstow International Gateway

BNSF's Barstow International Gateway (BIG) is a proposed $1.5 billion investment that would offer two separate services: 1) building trains from traffic originating from northern and southern California to be distributed east to the US interior, and 2) transloading containers moved by rail from the LA/LB ports, with containers then either trucked off or continuing east by rail. There also would be opportunities to move freight westbound to the LA/LB ports, particularly empty marine containers and agricultural products bound for export.

The facility will be located in the High Desert region at Barstow, CA on 4,500 acres of land, near BNSF's already operational Barstow Yard. BIG will be strategically located at the convergence of two BNSF main line tracks, one running north-south through Stockton, CA and the other connecting to Los Angeles and the Inland Empire. This will allow for the facility to efficiently service rail traffic heading to and from northern and southern California.

The motivation behind this facility is to capture modal share from both rail and trucking competitors. By making the investment in this facility, BNSF believes that "BIG will consolidate many of the handoffs and transitions that add inefficiencies throughout the supply chain by bringing them into one simplified and integrated ecosystem."[74] The project would be privately funded by BNSF. No timeline has been set for the project.

74 Why Barstow International Gateway is a big deal, BNSF.

A.2.2 Proposed Mojave inland port

The Mojave inland port is a proposed inland port facility located in Mojave, CA, approximately 90 miles from the LA/LB ports. The $75 million project is being managed by Pioneer Partners, a Texas-based private holding company, which owns the 410-acre plot of land where the port will be built.[75] Based on an interview with Pioneer Partners, the local jurisdiction, Kern County, is supportive, has granted the necessary permitting to build the terminal, and is open to enabling others to develop the surrounding land to build a logistics park in the vicinity of the Mojave airport.

The project plans to move marine containers from the LA/LB ports directly to the facility, via a rail shuttle service that utilizes the Alameda Corridor and Union Pacific main line. At the inland port, marine containers would be sorted and distributed to nearby warehouses by truck or hauled further inland by rail. Pioneer Partners expects capacity to be up to three million TEUs per year.[76] Currently, the project does not have a rail partner to provide domestic or international intermodal service.

The project aims to alleviate efficiency issues at the LA/LB ports, by enabling the ports to focus on loading and unloading containerships, while the sorting and stacking of containers is handled inland. This would increase port fluidity and thus container capacity, generate additional business for the railroads, and reduce shipping and demurrage charges for shippers.

An obstacle this project may encounter is that it will not be located in an existing industrial area. This would not affect shipments bound for an IPI rail move to somewhere like the Midwest, but for either transloading or local consumption, the facility would either need to attract new facilities to the Mojave area, or containers would need to be drayed to either a shipper's warehouse or a transloading facility, which could negate some of the proposed benefits (such as taking trucks off highways and reducing costs to shippers).

The project would primarily be privately funded, although Pioneer Partners has stated that it would be open to a "mutually beneficial public-private partnership.[77] No timeline has been set for the project.

A.2.3 Proposed TradePort California

TradePort California is an initiative being led by Caltrans to create an integrated logistics corridor from the LA/LB ports, through the Central Valley, up to the Sacramento and Bay Area regions (a 425-mile Market Area, with over one million containers moving inbound/outbound annually).[78] The goal of this $30 billion project is to connect the state's maritime, rail, trucking, and distribution capabilities to the Central Valley, in an effort to reduce the number of diesel trucks on the road and replace those trucks with more rail and alternative fuel trucks.

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75 The Project, Mojave Inland Port.

76 Ibid.

77 Electronic Press Kit, Mojave Inland Port.

78 About, TradePort California.

The project proposes a network of four "TradePort hubs" across the Central Valley, with up to seven "satellite TradePorts" feeding international and domestic traffic to the main corridor.[79] TradePorts would be 3,000–6,000 acre districts with a 150–300 acre logistics core zone. These hubs would serve to promote the use of zero-emissions trucks, reduce congestion on California highways, and spur economic development in the area.

The envisioned value of the project to private sector stakeholders includes quicker turns for drayage drivers, increased revenue service for the Class I railroads, and an efficient and business friendly environment for shippers. The project would be funded by a combinations of grant money from the state and private investments.

Caltrans has partnered with GLD Partners, an investment management firm, to help understand the needs and desires of shippers and railroads to ensure: 1) that the project would produce the conditions needed to support buy in from all stakeholders and 2) that the corridor would be utilized by railroads, drivers, and shippers while still meeting the environmental, social, and economic needs of the state.

A.2.4 UP Inland Empire Intermodal Terminal

The recently constructed Union Pacific Inland Empire Intermodal Terminal (IEIT) (UP West Colton) is an intermodal facility in Fontana, CA, privately funded by UP. The new terminal competes with the BNSF San Bernardino intermodal terminal. The original intermodal rail yard has been expanded to provide a wider range of intermodal services, most notably the ability to offer domestic intermodal service to transloaders in the Inland Empire, with less backtracking to UP's four other terminals in Los Angeles County. The initial plan is for 45,000 lifts annually, with plans in place to expand further.[80]

The facility is located in the heart of the Inland Empire and is "within 10 miles of most of the 625 million square feet of industrial warehouse space."[81] The terminal also is located at the convergence of UP's north-south and east-west lines in California, allowing the facility to handle traffic terminating and originating in northern and southern California. The transloading facility primarily serves intermodal traffic bound for the Midwest, but further expansion of the facility will allow for shipments bound for Arizona, New Mexico, Texas, and beyond.

A feature of this facility is its proximity to the already existing warehouses of the Inland Empire. Many of the other rail facilities both in California and North America generally tend to be located in rural areas with low population densities and are primarily utilized by just a handful of anchor tenants or a small logistics park. In contrast, this facility is located in the densest industrial market in the US, [82] where ocean containers are already destined, with or without additional rail capacity. This provides an economic and environmental opportunity

79 Project Plan, TradePort California.

80 "Union Pacific takes aim at BNSF with new Southern California intermodal terminal," Trains, May 6, 2021.

81 Ibid.

82 "Backlash to Inland Empire warehouse sprawl growing," Globest.com, June 15, 2022.

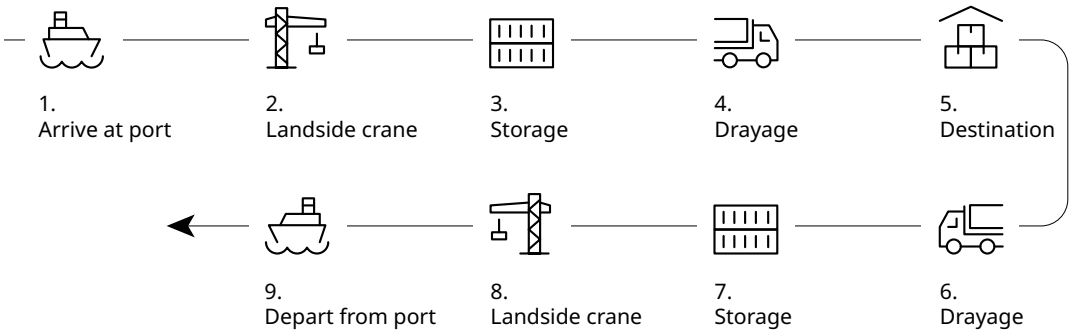
to reduce the number of trucks on the road and increase port capacity by reducing the number of dray miles per container and increasing the number of possible drayage driver turns per day, due to the shorter required drayage distance.

The IEIT is expected to reduce costs to shippers by reducing the number of containers required via transload and the number of drays required after the long-haul rail intermodal move. But there are no plans to offer international intermodal service to West Colton under an inland port operating model at this time.

APPENDIX B. DESCRIPTION OF SCENARIOS

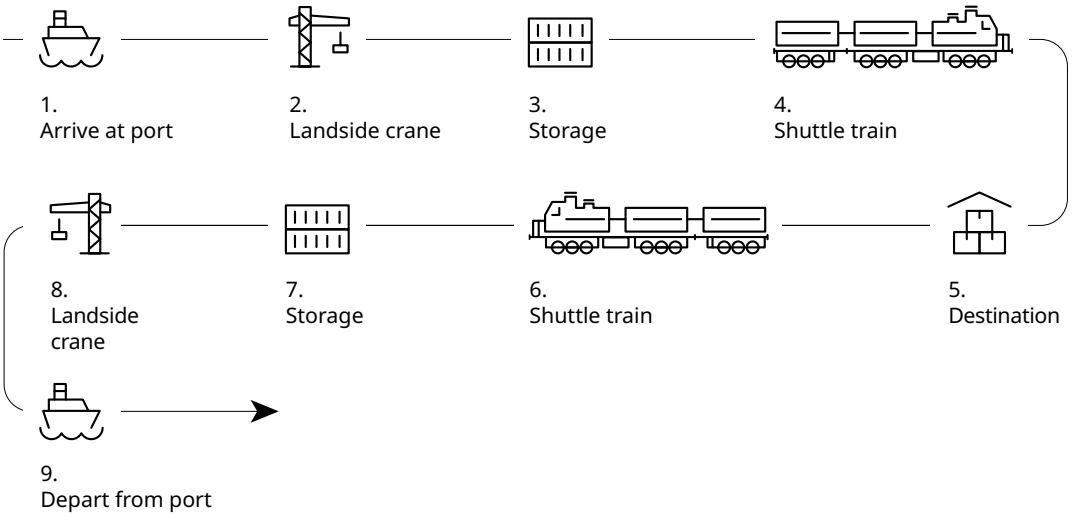
B.1 Inland Empire

Exhibit B-1: Direct to door, 100-mile dray



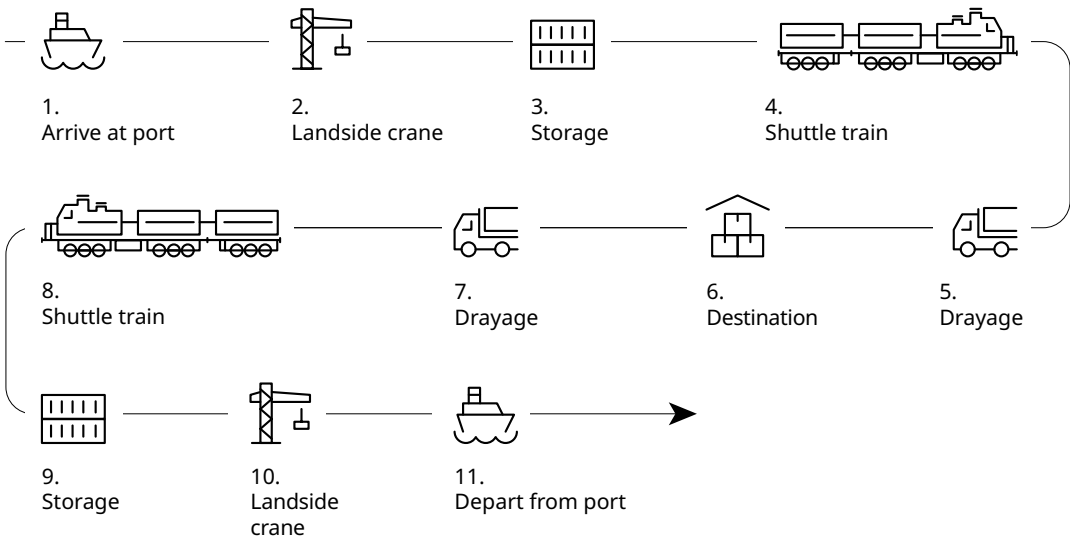
The container arrives at the port and is unloaded from the ship using a landside crane. It is then stacked and stored at the port until it is picked up by the drayage driver. The container is then trucked 100 miles inland, where it is delivered to a warehouse in the Inland Empire, its final destination. After a few days at the warehouse, the empty container is then trucked back to the LA/LB ports, where it is then stacked at the port, loaded onto the ship and then shipped abroad.

Exhibit B-2: Inland port shuttle, zero-mile dray



The container arrives at the port and is unloaded from the ship using a landside crane. It is then stacked and stored at the port until it moved by the LA/LB ports' on-dock rail service. The container then connects from the on-dock rail to a rail shuttle service, travels through the Alameda Corridor. The container is then hauled to the Inland Empire, where it is hauled directly to a warehouse, where there is no need for drayage. After a few days at the warehouse, the empty container is then hauled back to the LA/LB ports via rail, travels through the Alameda Corridor, and connects with the LA/LB ports' on-dock rail service. The container is then stacked and stored at the port before being loaded onto the ship and then shipped abroad.

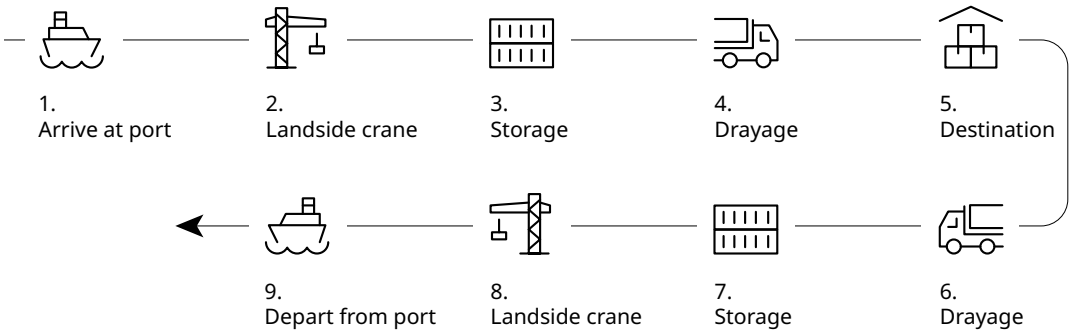
Exhibit B-3: Inland port shuttle, 10-mile or 40-mile dray



The container arrives at the port and is unloaded from the ship using a landside crane. It is then stacked and stored at the port until it moved by the LA/LB ports' on-dock rail service. The container then connects from the on-dock rail to a rail shuttle service, traveling through the Alameda Corridor. The container is then hauled to the Inland Empire, where it is either drayed 10 miles or 40 miles to a warehouse. After a few days at the warehouse, the empty container is then hauled back to the LA/LB ports via rail, travels through the Alameda Corridor, and connects with the LA/LB ports' on-dock rail service. The container is then stacked and stored at the port before being loaded onto a ship and shipped abroad.

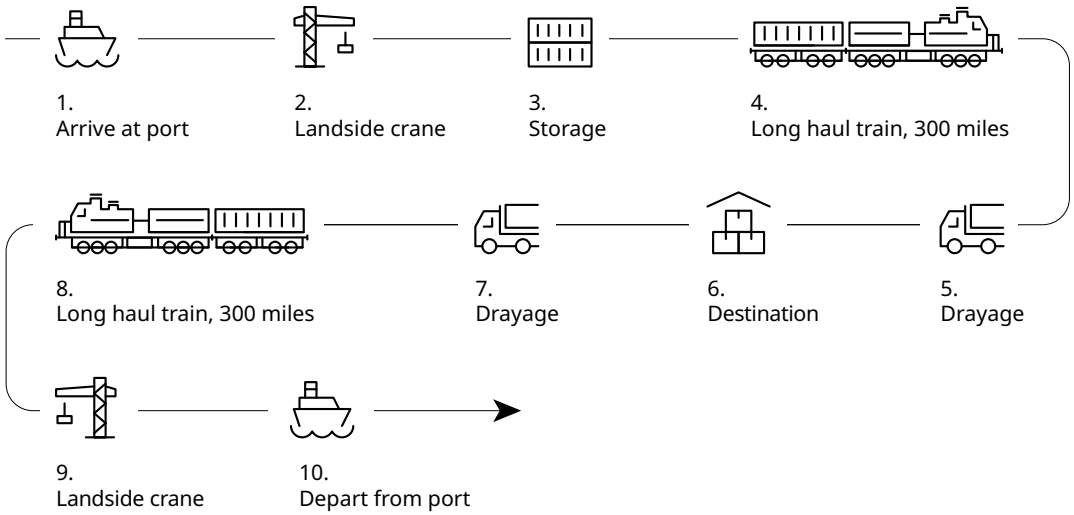
B.2 Regional

Exhibit B-4: Direct to door, 300-mile dray



The container arrives at the port and is unloaded from the ship using a landside crane. It is then stacked and stored at the port until it is picked up by the drayage driver. The container is then trucked 300 miles inland, where it is delivered to a warehouse in Phoenix, Las Vegas, or Sacramento, its final destination. After a few days at the warehouse, the empty container is then trucked back to the LA/LB ports, where it is then stacked and stored at the port before being loaded onto a ship and shipped abroad.

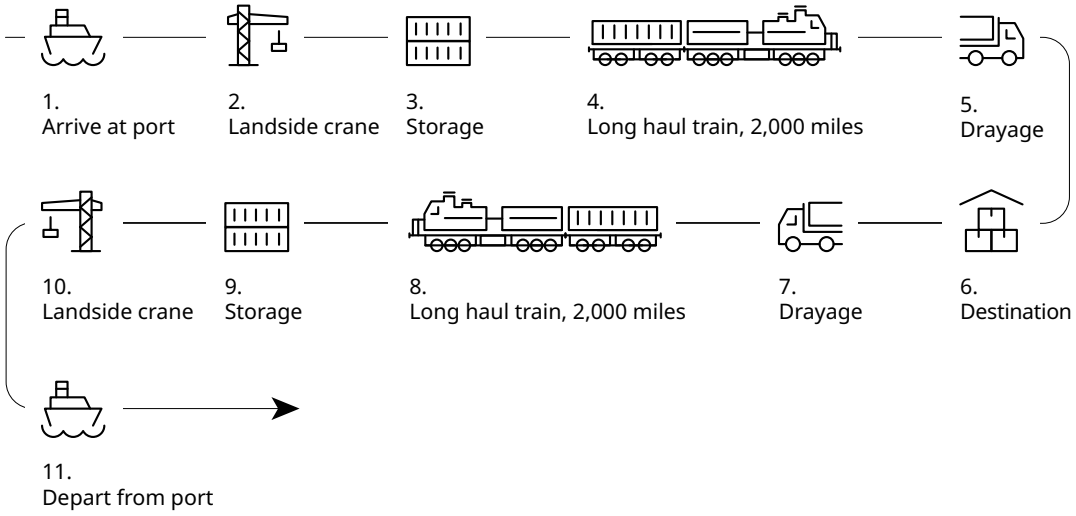
Exhibit B-5: Regional on-dock IPI



The container arrives at the port and is unloaded from the ship using a landside crane. It is then stacked and stored at the port until it moved by the LA/LB ports' on-dock rail service. The container is then switched to a Class I railroad, moved through the Alameda Corridor, and hauled 300 miles to an intermodal terminal in Phoenix, Las Vegas, or Sacramento, and then drayed 10 miles to the shipper's warehouse. After a few days at the warehouse, the empty container is then drayed to the terminal and hauled back to the LA/LB ports via rail, travels through the Alameda Corridor, and connects with the LA/LB ports' on-dock rail service. The container is then stacked and stored at the port before being loaded onto a ship and shipped abroad.

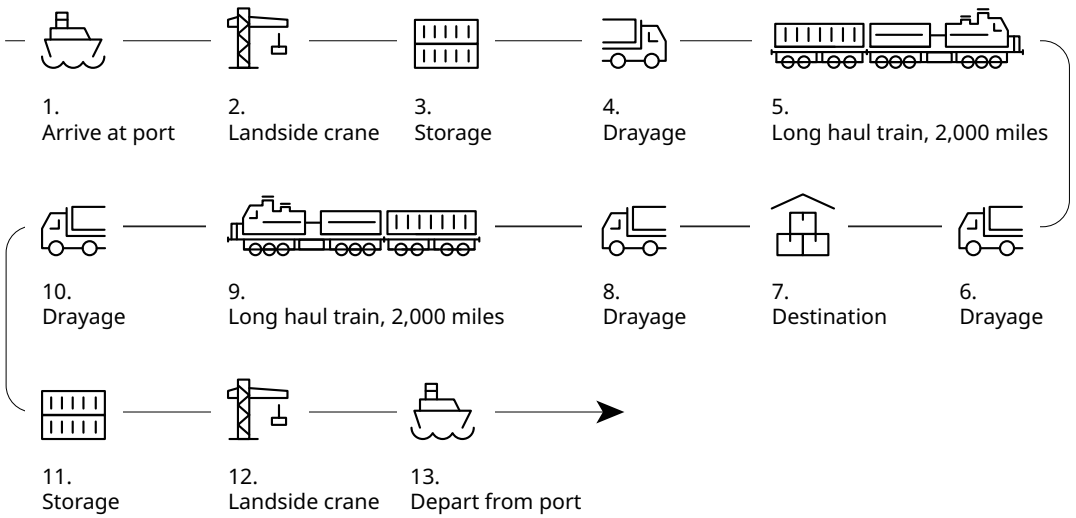
B.3 Long distance

Exhibit B-6: On-dock IPI to Chicago



The container arrives at the port and is unloaded from the ship using a landside crane. It is then stacked and stored at the port until it moved by the LA/LB ports' on-dock rail service. The container is then switched to a Class I railroad, moved through the Alameda Corridor, and hauled 2,000 miles to an intermodal terminal in Chicago, IL, and drayed to the shipper's warehouse. After a few days at the warehouse, the empty container is drayed back to the terminal and hauled back to the LA/LB ports via rail, travels through the Alameda Corridor, and connects with the LA/LB ports' on-dock rail service. The container is then stacked and stored at the port before being loaded onto a ship and shipped abroad.

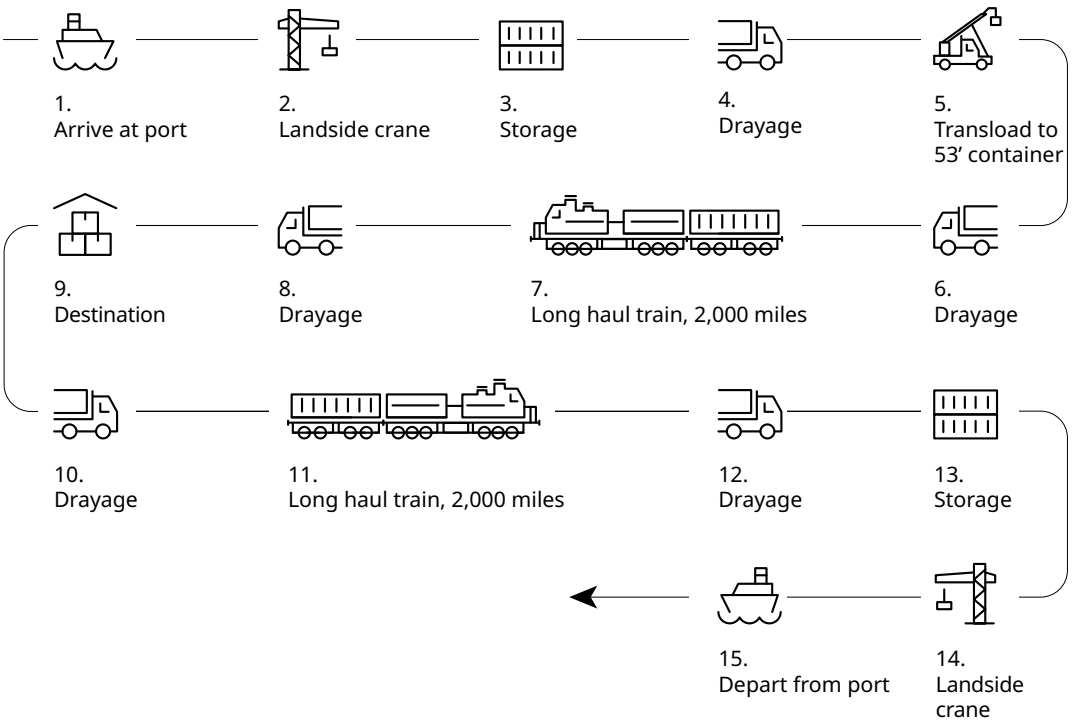
Exhibit B-7: Off-dock IPI to Chicago



The container arrives at the port and is unloaded from the ship using a landside crane. It is then stacked and stored at the port until it is picked up by the drayage driver. The container is then trucked a short distance to a Los Angeles rail yard. The container is then moved by a Class I railroad through the Alameda Corridor and hauled 2,000 miles to Chicago, IL. It is then drayed to the shipper's warehouse. After a few days at the warehouse, the empty container is then drayed and hauled back to the LA/LB ports via rail, travels through the Alameda Corridor, and connects with the LA/LB ports' on-dock rail service. The container is then stacked and stored at the port before being loaded onto a ship and shipped abroad.

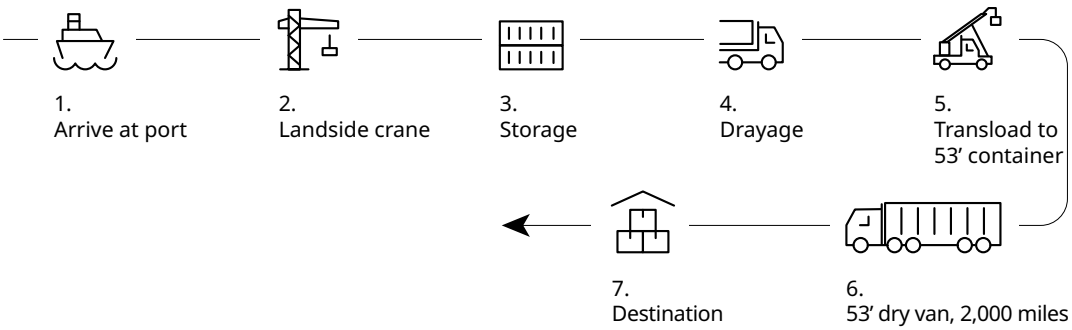
Note: To ensure the readability of the diagrams below, the return trip for the 40-foot ocean container from the transload facility back to the Ports of LA and Long Beach is not included. However, the return trip of the containers was included in all of our shipper, emissions, safety, and congestion calculations.

Exhibit B-8: Transload in Inland Empire, train to Chicago



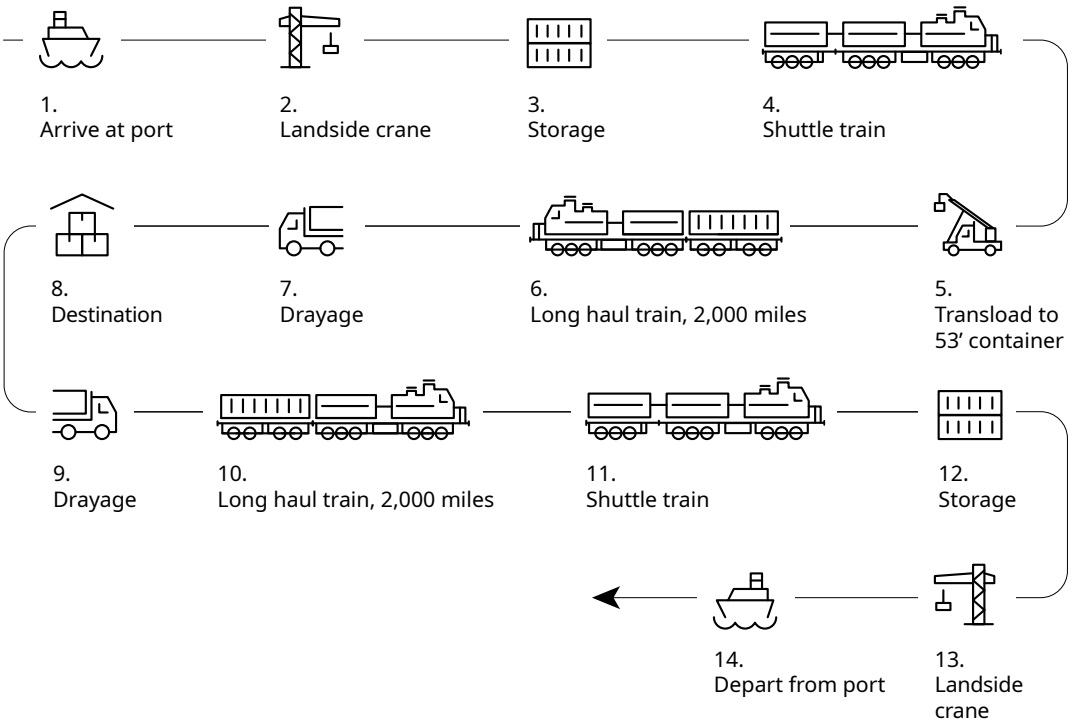
The container arrives at the port and is unloaded from the ship using a landside crane. It is then stacked and stored at the port until it is picked up by the drayage driver. The container is then drayed to the Inland Empire to a transloading facility. The contents of the 40-foot marine container are then transferred to a 53-foot domestic container. The domestic container is then drayed to a Class I rail facility where it is hauled 2,000 miles to Chicago, IL, while the 40-foot marine container is drayed back to the LA/LB ports. The domestic container is then drayed to the shipper's warehouse. After a few days at the warehouse, the empty domestic container is then drayed and rail-hauled back to the Inland Empire.

Exhibit B-9: Transload in Inland Empire, truck to Chicago



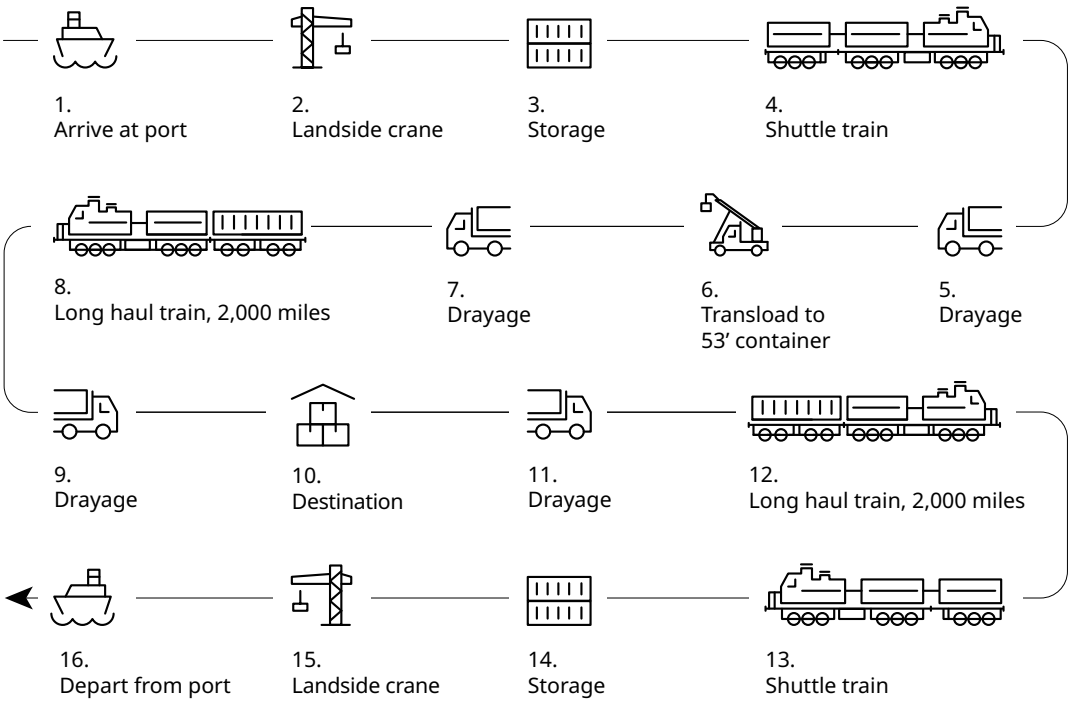
The container arrives at the port and is unloaded from the ship using a landside crane. It is then stacked and stored at the port until it is picked up by the drayage driver. The container is then trucked to the Inland Empire to a transloading facility. The contents of the 40-foot marine container are then transloaded to a 53-foot dry van. The domestic container is then trucked 2,000 miles to Chicago, IL, directly to the shipper's warehouse, while the 40-foot marine container is drayed back to the LA/LB ports.

Exhibit B-10: Inland port shuttle (with transload) to Chicago, zero-mile dray



The container arrives at the port and is unloaded from the ship using a landside crane. It is then stacked and stored at the port until it moved by the LA/LB ports' on-dock rail service. The container then connects from the on-dock rail to a rail shuttle service and travels through the Alameda Corridor. The container is then hauled to the Inland Empire, directly to a transloading facility. The contents of the 40-foot marine container are then transferred to a 53-foot domestic container. The domestic container is then hauled 2,000 miles to Chicago, IL by a Class I railroad, while the 40-foot marine container is drayed back to the LA/LB ports. The domestic container is then drayed to the shipper's warehouse. After a few days at the warehouse, the empty domestic container is then hauled back to the Inland Empire.

Exhibit B-11: Inland port shuttle (with transload) to Chicago, 10-mile or 40-mile dray



The container arrives at the port and is unloaded from the ship using a landside crane. It is then stacked and stored at the port until it moved by the LA/LB ports' on-dock rail service. The container then connects from the on-dock rail to a rail shuttle service and travels through the Alameda corridor. The container is then hauled to the Inland Empire and drayed either 10 miles or 40 miles to a transloading facility. The contents of the 40-foot marine container are then transferred to a 53-foot domestic container. The domestic container is then hauled 2,000 miles to Chicago, IL by a Class I railroad, while the 40-foot marine container is drayed back to the LA/LB ports. The domestic container is then drayed to the shipper's warehouse. After a few days at the warehouse, the empty domestic container is then drayed and rail-hauled back to the Inland Empire.

B.4 Categorical costs, by scenario

Exhibit B-12 shows the estimated shipper costs to move one FEU (forty-foot equivalent unit) from the LA/LB ports to either the Inland Empire, a regional destination such as Phoenix or the Midwest. The costs have been broken out into four primary cost categories: port, trucking, railroad, and transloading. These four categories are aggregations of several granular items that make up all the costs a shipper can expect to incur for its cargo:

- For port costs, we have included stevedoring, wharfage, and on-dock rail charges.
- Trucking costs were compiled using a combination of industry interviews, online freight quotes, and drayage load boards. The costs include the cost of fuel, the time the drayage driver spends waiting at the gate, as well as the time spent driving between the ports, rail yards, inland facilities, and the final destination.

- For railroad costs, we estimated costs to the railroad for yard operations such as switching and crane operations, using the Uniform Rail Costing System (URCS) published by the Surface Transportation Board. Similarly, we used the URCS framework to estimate the cost of a shuttle service from the LA/LB ports to the Inland Empire. An estimated profit margin that the railroad would expect to receive for these services was then added to the estimated operating costs to represent the total revenue for the railroad, which would also be the total cost to the shipper. To estimate long-haul railroad freight rates, we used the Surface Transportation Board 2021 Carload Waybill Sample. Also included in rail costs is the cost of using the Alameda Corridor for both a loaded and empty container. Finally, the transloading costs comprise the average cost of transloading a 40-foot marine container to a 53-foot domestic container.

Exhibit B-12: Estimated shipper costs for scenarios

Inland Empire routes ($ per FEU)

Category	Direct to door, 100-mile dray	Inland port shuttle, 0-mile dray	Inland port shuttle, 10-mile dray	Inland port shuttle, 40-mile dray
Port costs	234	234	234	234
Trucking costs	800	0	150	300
Railroad costs	0	640	640	640
Transloading costs	0	0	0	0

Regional routes ($ per FEU)

Category	On-dock IPI	Direct to door, 300-mile dray
Port costs	234	234
Trucking costs	150	1,800
Railroad costs	857	0
Transloading costs	0	0

Inland Empire routes ($ per FEU)

Category	On-dock IPI	Off-dock IPI	Transload in Inland Empire, train to Chicago	Transload in Inland Empire, truck to Chicago	Inland port shuttle, 0-mile dray	Inland port shuttle, 10-mile dray	Inland port shuttle, 40-mile dray
Port costs	234	234	234	234	234	234	234
Trucking costs	700	820	1,310	4,216	560	710	860
Railroad costs	2,311	2,329	1,836	0	2,363	2,363	2,365
Transloading costs	0	0	350	350	350	350	350

Source: Oliver Wyman analysis

APPENDIX C. METHODOLOGY

C.1 Operating economics analysis

C.1.1 Defining the model and underlying assumptions

This cost model is designed to estimate the direct costs that a shipper could expect to pay for the transportation of two TEUs (equivalent to one 40-foot marine container) worth of cargo entering the United States through the LA/LB ports to different locations, under a variety of different circumstances. This model is designed to reflect the pure operational costs of moving a container in the current operating environment. Not included in this model is: 1) the cost of ocean transportation to the LA/LB ports, which would be the same for every scenario, and 2) the charges incurred due to equipment dwell, such as chassis and container dwell at a shipper's warehouse. These charges are largely dependent on the actions of the shipper, rather than the operations of the port, drayage, railroad, or transload facility.

The cost assumptions that feed into each transportation scenario are based on figures from publicly available datasets, which include government agencies, drayage load boards, and academic and industry reports. In addition to publicly available sources, interviews with industry experts within and outside of Oliver Wyman were conducted to provide context around current and anticipated economic and political conditions, as well as to provide insights into data points not available to the public, such as contracted drayage rates.

To account for differences in consumption (local vs. inland), possible destinations for an inland port, and shipper preferences, the analysis was broken in three difference categories and a total of 13 different scenarios. The three categories are defined as follows: 1) Inland Empire scenarios, defined as a 40-foot marine container moving from the ports to a shipper facility 100 miles away (i.e., the outer regions of the Inland Empire); 2) regional scenarios, defined as a 40-foot marine container moving from the ports to a shipper facility 300 miles away, such as Phoenix or Las Vegas; and 3) transload scenarios, defined as a 40-foot marine container moving from the ports to transloading (into a 53-foot domestic container), and the transloaded domestic container continuing on to a shipper facility in the Midwest.

C.1.2 Trucking data

The basis of most of the drayage estimations came from publicly available quotes on the popular drayage load board "the Drayage Directory," which shows the 2,000 most recent drayage quotes to and from designated areas. These quotes include distance and price of the dray move (including the price of fuel). We used this platform as the starting point for both our drayage moves originating in LA, as well as our drayage moves originating in Chicago. However, the quotes on these load boards reflect the spot price of a drayage move instead of the more applicable and typically lower contracted rates. To account for this, we

interviewed industry contacts that are directly or indirectly involved in the drayage business. They provided the current differences in contract and spot rates for their business. These differences were then applied to the spot rates from the load boards to estimate contracted rates for the different routes.

The estimation for drayage moves at the proposed inland port are derived from Oliver Wyman experience and expertise. Because the figures are being used for currently nonexistent facilities and at an unspecified location, there is no applicable data that could be used for this calculation.

C.1.3 Railroad data

The switching costs applied to scenarios utilizing on-dock rail were provided by the Pacific Harbor Line (PHL), the short line railroad that operates the LA/LB port's on-dock rail capabilities. The figure is calculated based on PHL's hourly cost structure and the average number of containers it moves per hour.

The shipper costs for the shuttle service and the crane lifts were estimated using the Uniform Rail Costing System (URCS), a general-purpose costing model developed by the US Surface Transportation Board (STB) to estimate unit and variable costs for US Class I railroads. This model allows for the creation of several different scenarios, based on distances, types of cars used, the type of rail service provided, and other detailed parameters. This model breaks out the expected operating costs for each different type of rail operation, allowing crane costs and transportation costs to be segmented separately. Using this model, we estimated the operating costs to the railroad for providing an intermodal shuttle service, based on the number and type of operations required for each specific scenario. Using these operating costs, we then divided that number by a likely operating ratio target of 60% to estimate the total costs that a shipper would expect to be charged by a railroad.

For long-haul railroad rates, defined as a round trip from LA to Chicago, we used the STB's 2021 Public Waybill Sample. This file shows a sample of actual rail moves that took place on this route in 2021, which includes the number of cars and the amount charged by the railroads for that move. We looked at both the average cost of sending a loaded container from LA to Chicago, as well as the cost of sending an empty container from Chicago back to LA. For the cost of sending a loaded container from LA to Chicago, we used the average shipper costs incurred for a container traveling from LA (BEA region 160, Los Angeles-Riverside-Orange County, CA-AZ) to Chicago (BEA region 64, Chicago-Gary-Kenosha, IL-IN-WI) and subtracted the cost of the of crane operations from URCS, to avoid double counting. For empty return trips, we found that only 30% of the containers shipped to Chicago returned to Los Angeles empty. The rest are assumed to have been shipped back loaded, shipped to a region other than LA, or shipped as a non-revenue move. None of these situations would affect the shipper's cost for the original shipment. To account for this, we only applied 30% of the estimated cost of moving an empty container from Chicago to LA to the shipper costs.

C.1.4 Port data

Port costs refer to the cost of the operations at the port, such as the use of a landside crane and stacking operations, but do not include the cost of wharfage or the costs incurred from the container ship, which are assumed to be the same for each scenario, or the cost of on-dock rail operations, which have been included in railroad costs. Rather than using the average stevedoring rates as the basis of costs for each scenario, we interviewed and utilized the expertise of an operator at the Port of Los Angeles who explained the differences in truck and rail operations at the port and the costs associated with each of those moves. This allowed for the differentiation of costs incurred by the shipper for scenarios where the container leaves the port by truck or by rail.

C.1.5 Transload data

This category refers to the price of transloading the contents of a 40-foot marine container to a 53-foot domestic container. This expected cost was sourced from online quotes of transloading facilities that were representative of the type of facility that would be located at the proposed inland port. There was some variance around the different online sources, but they average around $25 per pallet moved. With an assumed 20 pallets per 40-foot container, we arrived at our estimated transloading costs of $350 per FEU.

C.2 Societal cost impacts

C.2.1 Defining the model and underlying assumptions

The calculations associated with the societal benefits come directly from the Cal-B/C models, a suite of models created by CalTrans to estimate the benefits and costs for a proposed change in transportation infrastructure. The societal benefits that the models are capable of providing are shipper costs, emissions costs, and traffic safety. Because we built our own model for calculating shipper costs, the B/C models were only used for calculating emissions costs and traffic safety. The specific model used for this analysis was the “IF” model, which was designed specifically for intermodal freight projects. This model provides default assumptions for emissions by different modes of transportation, as well as societal costs for different types of emissions, which are provided by CARB.

Each model looks at the societal benefits or losses attributable to two TEUs worth of cargo, equivalent to one 40-foot marine container. Each scenario lists the project location as Southern California and has a project start date of 2023, to show how the societal benefits change between now and 2030. In general, the average weight per TEU, highway safety statistics, emissions per mode of transportation, and the societal costs associated with highway accidents and emissions remained unchanged from the default values provided by CalTrans. The only exception is the emissions attributable to rail in 2030, which were brought down to zero in the “2030 Air Quality Regulations with a Zero Emission Rail Shuttle” scenario.

In addition to the default values provided by CalTrans being mostly unchanged, there are also two user inputs that remain unchanged across scenarios: 1) each truck has a capacity of two TEUs per trip, and 2) each railcar has a capacity of four TEUs per trip, representing two 40-foot containers in a double-stack configuration.

C.2.2 Air quality regulations beginning 2030 with a zero-emissions rail shuttle

The "2030 air quality regulations with a zero-emissions shuttle" scenario reflects the societal benefits of replacing a single 100-mile one-way drayage trip for a 40-foot container, traveling at an average speed of 50 mph, with a 100-mile one-way rail trip using a zero-emissions locomotive. We then calculated the societal benefits regarding traffic safety and the societal costs of CO_2 specifically. Then, because the CO_2 figures are only broken out using the present value of future costs, this number was converted to constant dollars, using a discount rate of 4%, which is the default value used by CalTrans. After converting the societal costs of CO_2 emissions to constant dollars, the societal costs of other emissions can be found by taking the cost of all emissions and subtracting the societal costs of CO_2.

REPORT QUALIFICATIONS/ASSUMPTIONS & LIMITING CONDITIONS

Oliver Wyman and Leachman and Associates were commissioned by Anacostia Rail Holdings and Pacific Harbor Line to assess at a high level the operational, service, and economic feasibility of the rail shuttle-inland port concept for Southern California. Oliver Wyman and Leachman and Associates shall not have any liability to any third party in respect of this report or any actions taken or decisions made as a consequence of the results, advice, or recommendations set forth herein. This report does not represent investment advice or provide an opinion regarding the fairness of any transaction to any and all parties. This report does not represent legal advice, which can only be provided by legal counsel and for which you should seek advice of counsel. The opinions expressed herein are valid only for the purpose stated herein and as of the date hereof. Information furnished by others, upon which all or portions of this report are based, is believed to be reliable but has not been verified. No warranty is given as to the accuracy of such information. Public information and industry and statistical data are from sources Oliver Wyman and Leachman and Associates deem to be reliable; however, Oliver Wyman and Leachman and Associates make no representations as to the accuracy or completeness of such information and have accepted the information without further verification. No responsibility is taken for changes in market conditions or laws or regulations and no obligation is assumed to revise this report to reflect changes, events or conditions, which occur subsequent to the date hereof.