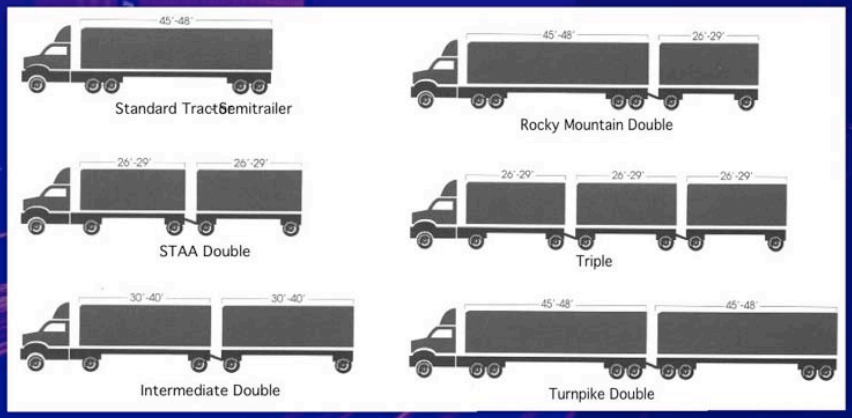
What Are LCVs?



Oakland – Valleys Toll Truckway

Ports - Nevada Toll Truckway

Urban Toll Truckways

[excerpted from "Building for the Future: Easing California's Transportation Crisis with Tolls and Public-Private Partnerships," Robert W. Poole, Jr., Peter Samuel, and Brian F. Chase, Reason Foundation Policy Study No. 324, January 2005; available at www.rppi.org/ps324.pdf]

Both greater Los Angeles and the Bay Area face major challenges in handling heavy trucks. Rail, air, and barge or ship handle parts of many freight trips – generally the "wholesale" parts of transport transactions. But the pickup and delivery of most freight has to be by truck because few supermarkets, residences, offices, or even factories or warehouses have a rail siding, a dock, or an airfield alongside.

Just-in-time delivery makes truck the only feasible mode for the overwhelming proportion of freight movements. Most Americans, whether at their workplace or home, are used to being able to order goods for delivery in two or three days, if not overnight from anywhere in the country – impossible if the goods have to change modes and be gotten onto freight trains that are broken down and made up at a number of classification yards along the way. On runs over 1,000 miles long with large enough volume for regular trains, container and trailer-on-flat-car operations are often competitive with long-distance trucking – as in Oakland or Long Beach to Chicago. But much of this freight already goes by rail, so those who hope to reduce truck traffic by substituting trains for trucks are likely to be disappointed.

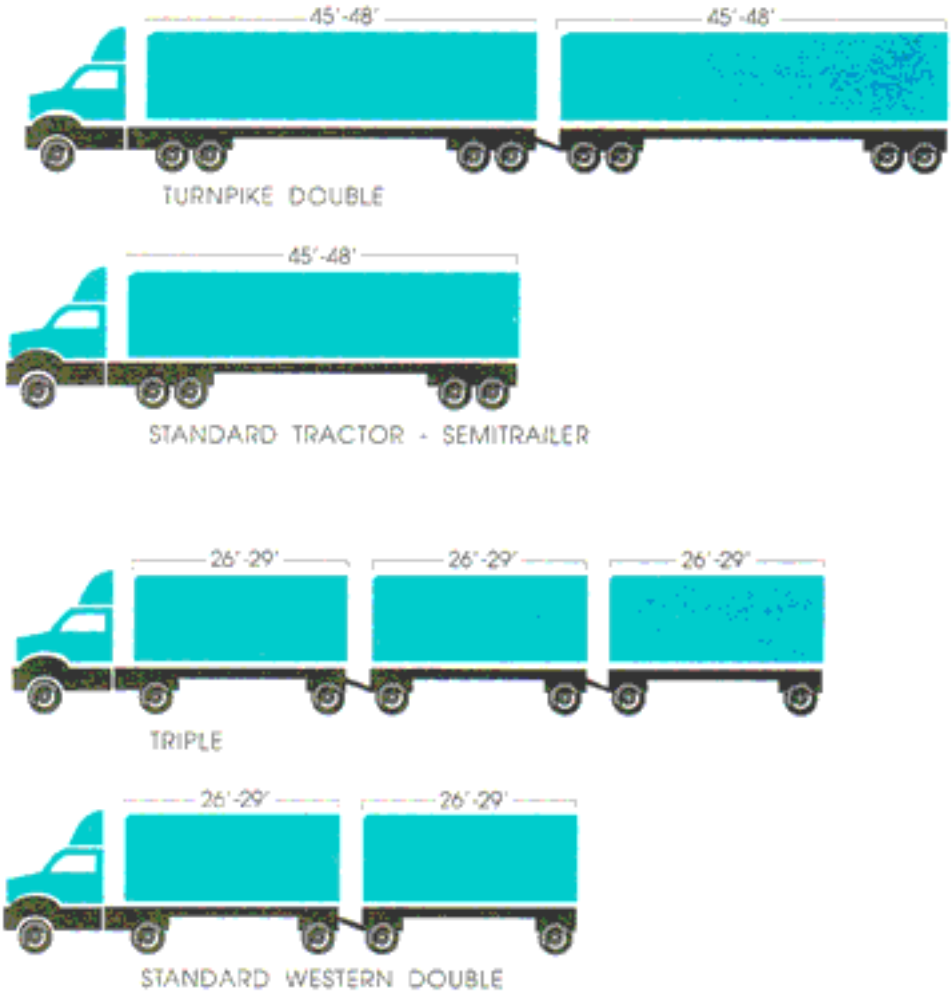
Realism demands that we look at ways to make trucking operations serve our needs better. It is the intermixing of big rigs and cars that creates many of the present problems. Cargos worth a half million dollars are delayed by visiting tourists, or someone going to the supermarket, joining the traffic stream and overloading the freeway. Collisions are virtually inevitable because of the different handling characteristics of trucks and cars, and those collisions are often deadly to the car occupants. On major routes it would be desirable to separate bigger trucks from cars.

Under federal and California law, long doubles and triples are not permitted on existing highways, and that is not likely to change. The existing freeways and approach roads usually aren't designed for such big rigs and there is strong public opposition to mixing them with regular traffic. But on newly designed self-contained truckways – barrier-separated from mixed traffic lanes -- these longer combination vehicles (LCVs) should be welcomed. They are a key way to lower costs, reduce accident rates, and cut emissions. The lower costs and emissions arise from the economy of pulling larger loads behind the one tractor and its driver. As a result, payload represents a larger proportion of total weight moved.

By allowing two long trailers, twice the volume can be hauled by one driver and his tractor as compared with a regular tractor-semitrailer (18-wheeler). A similar configuration would involve a single tractor hauling two 40-foot containers on chassis. Likewise, with the presently permitted short-trailer doubles, the addition of a third trailer

to make up a triple combination would add 50 percent to productivity. And a version of this type of rig could handle three 20-foot containers on chassis.

Longer Combination Vehicles Compared with Conventional Truck Rigs



So the first major productivity increase is in allowing greater volume and weight to be hauled by the one tractor in the closed environment of the truckway.

The second major source of improved productivity can arise from management of traffic flow in the truckway. By varying the toll rate by time blocks, or even dynamically according to congestion level, it is possible for the tollway operator to prevent overloading of the truckway such as would cause congestion and breakdown in flow. Once flow has broken down in any traffic lane, throughput drops precipitously – on average to about 60 percent of free-flow throughput. Then it can take hours to re-establish free flow. Toll rates can be used as a metering mechanism to discourage some truckers from traveling at the busiest time. Of course high tolls will also encourage the

truckway managers, longer term, to provide extra capacity where needed. A truckway will have an hourly capacity of about 800 trucks/lane/hour so long as free flow is maintained.

With a toll truckway permitting free flow at speeds up to 75 mph (average speed of 60 mph) and operating long doubles, trucking productivity per tractor-driver could be increased as much as threefold, compared with regular tractor/semi-trailers in unmanaged mixed lanes at average speeds in the range 35 to 40 mph range. There would also be major benefits to reliability of delivery, freight rates, vehicle emissions, and safety. Concrete barriers would be designed to contain any errant big rigs within the truckway, virtually eliminating the possibility of heavy truck/car collisions.

Every long double operating in the toll truckway will be two fewer tractor-trailers operating in mixed traffic lanes and every two short triples in the truckway will be three less short doubles mixing it in the freeway lanes, with resulting benefits of lower emissions and reduced congestion in the regular lanes.

Potential Earning Power

To estimate the potential earning power of operating on a truckway we considered present trucking rates in California metro areas. A leading online service (www.freightquote.com) provides competitive quotes from scores of carriers. The cheapest quote for about 100 miles of travel with a fully laden tractor/semi-trailer within the urban areas of California works out at about $6/mile. (In New York the rates are $10/mile, but for long-distance routes, for example California to Chicago, only $1.15/mile.)

Most truckers quote on a truckload (45,000 lbs. of payload) based on about $100 to cover overhead and profit at the pickup and another $100 for the drop-off of any given trip and $3/mile on urban trips in California. So a 100-mile urban trip will be $500. A truckload trip from Long Beach to the rail yards on the south side of Los Angeles, about 25 miles, is about $300.[i] We took the $500 for a 100-mile truckload delivery as representative of the kind of freight trips most likely to be attracted to urban truckways in the extended metro areas of southern and northern California. A tractor and loaded semi-trailer can presently generate about $1,140 gross revenue per daily shift based on six hours on the road at an average speed in mixed traffic on the freeways of 38 mph, doing 228 miles.

By operating that same rig (either a tractor/semi-trailer or a double short trailer combination) on a truckway where free-flow speeds are maintained, the six hours of driving will produce 360 revenue miles, a 58 percent gain. We have assumed costs remain the same since the bulk of costs are the driver's salary and benefits and the costs of the rig and insurance. Insurance costs should drop because of greater safety of operations in free-flow traffic and the closed environment with only other professional drivers. It is unclear whether fuel costs would rise because hours of engine operation would remain the same. Steady speed driving produces better per-mile fuel consumption than the erratic speeds forced on trucks by congestion, but of course daily mileage is up substantially. The benefits from extra revenue mileage are quite large. Based on the

above assumptions, the trucker's surplus over variable costs for covering overhead, profit, and tolls is more than doubled by operating in the truckway as compared to present operations on congested freeways, as shown in the table.

Toll Truckway Productivity

	Mixed Freeway	Mixed Freeway	Truckway	Truckway	Truckway	Truckway
LA/SF rates for 20 tons	Semi-trailer	Double-short	Semi-trailer	Double-short	Triple-short	Double-long
Payload	45,000 lbs	45,000 lbs	45,000 lbs	45,000 lbs	67,500 lbs	90,000 lbs
Metric tons	20T	20T	20T	20T	30T	40T
100-mi. price/2004	$500	$500	$500	$500	$750	$1,000
Avg. mph	38	38	60	60	60	60
Miles/shift (6 hrs driving)	228	228	360	360	360	360
Rev/shift	$1,140	$1,140	$1,800	$1,800	$2,700	$3,600
Variable cost/shift	$684	$684	$684	$684	$1,007	$1,165
Net for overhead, profit, toll	$456	$456	$1,116	$1,116	$1,693	$2,435
Extra due to using truckway			$660	$660	$1,237	$1,979
Split 3 ways			$220 ea.	$220 ea.	$412 ea.	$660 ea.
Shipper savings on 100 miles			$61 (12.2%)	$61 (12.2%)	$76 (15.2%)	$91 (18.3%)
Added trucker OH, profit/shift			$220 (43%)	$220 (43%)	$412 (90%)	$660 (145%)
Avail. for toll, $/mi.			$0.61	$0.61	$1.15	$1.83

Even larger benefits arise from operating longer combination vehicles (LCVs) in the truckway. Adding a third short trailer for truckway operations adds another 50 percent to payload, taking earnings per shift/day to $2,700 at present freight rates. And of course adding a second long trailer to a regular tractor/semi-trailer doubles potential revenue/day to $3,600 based on the same pricing.

The extra equipment and load per rig obviously increase costs, but less than proportionately, because the driver/tractor costs at the front-end remain much the same. We have assumed a nearly 50 percent increase in variable costs from operating the triple short as compared with the conventional double short combination that operates on freeways now, and a 70 percent increase in variable costs for the double long trailer combination as compared to the regular long semi-trailer operation. Very large surpluses of revenue over variable costs are generated as seen in the last two columns of the table.

Competition

In practice, competitive forces would drive freight rates down on these kinds of freight movements passing on some of the productivity gain to shippers. And it would exert pressure on single-semi operators on the freeways to adapt their operations to twin trailer runs on the truckway. Similarly truckers running double short combinations on mixed traffic freeways would be under competitive pressure to convert their runs into triple short combinations on the truckway.

It is not possible to precisely predict how competition would reshape trucking operations. What is clear is that the improved productivity potential of operating LCVs in free flow in their own lanes is very substantial, and that this will provide major profits for truckers, and the opportunity for substantial improvements in safety and in cost savings to shippers, as well as providing a new revenue stream to help fund the facility.

For simplicity we assume that there is a three-way split of the surplus from truckway operations: a third going to shippers, a third to truckers and a third to the truckway operator in tolls. And in the lower part of the table we show the order of magnitude of possible benefit to each from the different truckway operations.

For conventional rigs, the extra mileage made possible by free-flow operations on the truckway provides a potential 12 percent reduction in freight charges, adds 43 percent to the trucker surplus for overhead and profit, and supports tolls of 61c/mile on the truckway.

Quite dramatic potential benefits are shown for all three parties from the adoption of longer rigs (LCVs) in the free-flow environment of the truckway. Long doubles, for example, produce up to 18 percent reduction in freight rates, more than double present coverage for overhead and profit, and tolls of $1.83/mile.

Now for some words of caution. First, different trucking operations have different cost structures. Our numbers derive from quoted prices from the jobbers who specialize in intra-urban trucking, because we think they are the ones who set prices at the margin. Large for-hire long-distance carriers have very different cost structures, with much higher variable costs (because of driver benefits and pay per mile), and have lower fixed costs.

Second, only a portion of truck trips in the truckway corridors will be suited for operations on the truckway. The truckways will have fewer access/egress points than the

freeway, so local trips will still tend to be made in the mixed lanes except in times of very severe congestion in the mixed lanes. Many loads will not be large enough to justify the longer combinations. Over time, the economic advantages of consolidating loads, operating in free flow, and running longer combinations will see ingenuity used to take advantage of cost savings for loads previously deemed "unsuitable" for the truckway.

We think that drivers of existing rigs should be able to choose whether to use the truckway or not. Truckers should only use the truckway when they perceive the benefits from using it to be greater than the toll being charged. Based on the numbers above, we think many will find it beneficial and will use the toll truckway. Obviously to operate LCVs, which are not allowed in regular lanes, truckers will have to be in the truckway. In this case they will also have to make use of make-up/break-down yards at entry and exit, picking up the extra trailer on entry to make up the triple or long double and dropping off the extra trailer on exit, so that they only operate in currently legal configurations on local streets. The exception to the use of make-up/break-down yards by the bigger rigs will be where the truckway has direct ramps in and out of a trucking-only area such as a seaport, an air cargo facility, a rail yard, or distribution center.

Eventually it should be possible for freight-intensive businesses to congregate around truckway interchanges (nodes) with their own private ramps allowing the biggest rigs access and egress without stopping at the truckway make-up/break-down yards. This use of make-up/break-down yards is an established and successful practice along a number of state turnpikes including the Ohio Turnpike, the Indiana Toll Road, the Massachusetts Turnpike, the New York State Thruway, Florida's Turnpike, and several others where such LCVs are allowed, but prohibited off the pike.

Design Features

The truckway would have the following features:
(1) Two lanes each way (2x2) of 14 ft. each;
(2) Fully separated from regular lanes with concrete barriers (minimum 42" high) to contain accidents[ii];
(3) Its own access/egress ramps (no trucks crossing regular lanes) at interchanges;
(4) Dedicated spur connections to major facilities such as ports and airports;
(5) Wired for ITS services including in-cab signs, automatic lanekeeping, intelligent cruise control, dynamic dispatching, in-vehicle navigation, etc.
(6) Tolls to be collected by transponder only (no on-site cash transactions);
(7) Variable toll rates for management of traffic;
(8) Guaranteed free-flow conditions or "your money back";
(9) Adjacent make-up/break-down yards and truck parking at key interchanges;
(10) Engineered for heavier axle weights;
(11) Generally located inside the existing Interstate right of way, either elevated, depressed, or with widening as determined best segment by segment or on separate alignment;
(12) Walls to contain sound and provide wind protection for trucks;
(13) Truck tow services provided;

(14) Full monitoring by sensors and pan/tilt/zoom cameras and full-time dispatching of help.

Costs

SCAG estimated the costs in the Los Angeles area of a 2x2 lane truckway of the kind we envisage here at $27.5 million per lane-mile, or $110 million per route-mile.[iii] This allows for the truckway to be built on structure with full seismic protection, and for dedicated ramps and land acquisition where that is more economical than structure. How far these costs can be financed requires consideration of the proposed corridors in northern and southern California in the case studies that follow.

Enforcement

There is understandable concern among auto clubs and highway safety groups that permitting LCVs on truck-only lanes could be the camel's nose under the tent for legalizing LCV operations on other highways—or for less than rigorous enforcement of laws prohibiting their off-truckway use. Clearly, the credibility of a legislative decision to permit LCV-serving toll truckways depends on serious enforcement of laws prohibiting the use of LCVs on other highways. California is known nationwide for providing serious penalties ($271 fine) for violation of the restrictions on HOV lanes. At a minimum, there should be proportionally serious fines for trucking companies that violate subsequent laws on the use of LCVs only on designated truckways.

Emissions

As noted above, a gradual shift from hauling freight and containers from conventional rigs to double and triple-trailer configurations means that more freight will be hauled by fewer tractors. The Environmental Protection Agency has recognized the beneficial effects of shifts of this kind. Its recently launched SmartWay Transport Partnership intends to apply innovative strategies to increase fuel efficiency and reduce emissions in goods movement. By 2012 this initiative aims to reduce between 33 and 66 million tons of carbon dioxide (CO2) emissions per year and up to 200,000 tons of nitrogen oxides (NOx) per year, while saving up to 150 million barrels of oil annually.

Cheryl Bynum of the SmartWay team at EPA has specifically addressed the role of LCVs in achieving these goals:

> *If a [trucking] fleet uses longer trailers and/or multiple trailers, total ton-miles are improved for that trip, and there are fewer trips. This also provides—in addition to the fuel and GHG savings—criteria pollutant savings. The actual environmental benefits depend upon the input the fleet enters into the FLEET Performance model, since it is specific to mileage, equipment type, mpg, and payload.*[iv]

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[i] Telephone conversation with Tracy Kenison, the sales leader at Freightquote June 9, 2004.

[ii] Peter Samuel, "Truck Barriers—Thoughts After MD I-95/895 Fireball," www.tollroadsnews.com, Jan. 16, 2004.

[iii] Southern California Association of Governments, "User-supported Regional Truckways in Southern California," Los Angeles: SCAG, Briefing paper, January 5, 2004, page 3.

[iv] Cheryl Bynum email to the authors, Jan. 22, 2004. For further details about the SmartWay program, go to http://epa.gov/smartway.