ITS UCDAVIS
INSTITUTE OF TRANSPORTATION STUDIES

Year 2007 UCD-ITS-RR-07-36

Commercial Vehicle Parking In California: Exploratory Evaluation of the Problem and Possible Technology-Based Solutions

2007-08-01

Authors

Caroline J. Rodier, Susan A. Shaheen

Institute of Transportation Studies ◦ University of California, Davis
One Shields Avenue ◦ Davis, California 95616
PHONE: (530) 752-6548 ◦ FAX: (530) 752-6572
WEB: http://www.its.ucdavis.edu

CALIFORNIA PATH PROGRAM
INSTITUTE OF TRANSPORTATION STUDIES
UNIVERSITY OF CALIFORNIA, BERKELEY

Commercial Vehicle Parking In California: Exploratory Evaluation of the Problem and Possible Technology-Based Solutions

Caroline J. Rodier,
Susan A. Shaheen

California PATH Research Report
UCB-ITS-PRR-2007-11

This work was performed as part of the California PATH Program of the University of California, in cooperation with the State of California Business, Transportation, and Housing Agency, Department of Transportation, and the United States Department of Transportation, Federal Highway Administration.

Final Report for Task Order 6101

August 2007

ISSN 1055-1425

CALIFORNIA PATH PROGRAM
INSTITUTE OF TRANSPORTATION STUDIES
UNIVERSITY OF CALIFORNIA, BERKELEY

COMMERCIAL VEHICLE PARKING IN CALIFORNIA: EXPLORATORY EVALUATION OF THE PROBLEM AND POSSIBLE TECHNOLOGY-BASED SOLUTIONS

Draft Final Report

T.O. 6101

Caroline J. Rodier, Ph.D.
Assistant Researcher Engineer, California PATH
University of California, Berkeley
1357 S. 46th Street. Bldg 190; Richmond, CA 94804-4648
510-665-3467 (O); 916-451-8188 (F); cjrodier@path.berkeley.edu

and

Susan A. Shaheen, Ph.D.
Policy & Behavioral Research Program Leader, California PATH
University of California, Berkeley
1357 S. 46th Street. Bldg 190; Richmond, CA 94804-4648
510-665-3483 (O); 510-665-3537 (F); sashaheen@path.berkeley.edu

May 2007

ABSTRACT

The U.S. is experiencing dramatic growth in commercial vehicle truck travel on our nation's roadway system as well as critical shortages in truck parking. California ranks first in the nation in overall (private and public) commercial vehicle parking shortage (Fleger et al., 2006). Recent estimates of the demand for truck parking in California indicate that demand exceeds capacity at all public rest areas; this is the case at 88 percent of private truck stops on the 34 corridors in California with the highest volumes of truck travel (Caltrans, 2001). Nationwide, shortages of public truck spaces, however, are considered to be more severe than shortages of private spaces. In 2002, 71 percent of states reported public shortages, but only 16 percent report private shortages (Chen et al., 2002). The truck parking shortage in California and the U.S. has a number of serious consequences that threaten our roadway safety, public health, and economic productivity.

This report begins with a literature review of the commercial vehicle truck parking problems in California and the U.S. including the distribution and frequency of current and expected truck parking shortages and illegal parking, available evidence on truck drivers' parking preferences, and a description and evaluation of current and future approaches to the truck parking problem. The results of this literature review indicated that the provision of parking information-related services may be a promising near-term solution to the truck parking problem. As a result, the authors worked with researchers at the University of California, Davis to include questions related to truck parking information services in a statewide survey of truckers conducted for the California Air Resources Board. The results indicated that almost 70 percent of the truckers surveyed would use up-to-the-minute information about parking areas and spaces when planning their next rest. Among these respondents, most indicated that road signs, mobile phones, and radio were their preferred method of accessing this information, and almost half indicated that they would reserve a parking spot in advance, most preferably, by mobile phone.

KEY WORDS: commercial vehicle travel, truck parking, ITS

TABLE OF CONTENTS

INTRODUCTION

The United States is experiencing dramatic growth in commercial vehicle truck travel on our nation's roadway system as well as critical shortages in truck parking. California ranks first in the nation in overall (private and public) commercial vehicle parking shortage (Fleger et al., 2006). Recent estimates of the demand for truck parking in California indicate that demand exceeds capacity at all public rest areas; this is the case at 88 percent of private truck stops on the 34 corridors in California with the highest truck travel volumes (Caltrans, 2001). Nationwide, shortages of public truck spaces, however, are considered to be more severe than shortages of private spaces. In 2002, 71 percent of states reported public shortages, but only 16 percent report private shortages (Chen et al., 2002). The truck parking shortage in California and the U.S. has a number of serious consequences that threaten our roadway safety, public health, and economic productivity.

This report begins with a literature review of the commercial vehicle truck parking problems in California and the United States, available evidence on truck drivers' parking preferences, and a description and evaluation of current and future approaches to the truck parking problem. Next, the results of a statewide trucker survey conducted in 2006, which included questions related to truck parking information services—a promising solution to the truck parking problem suggested in the literature—are presented. The study concludes by summarizing key findings.

BACKGROUND

Public rest areas were built along Interstate Highways as part of the federal-aid highway program and are maintained by state Departments of Transportation (DOT). These spaces were built to accommodate the physically smaller trucks on the highways in the mid-20th century. As the trucking industry has evolved and truck sizes have increased dramatically, space availability has decreased as trucks may occupy multiple spaces. Private truck stops gained momentum during the building of the Interstate Highway system and the National Association of Truck Stop Operators (NATSO) was formed in 1960 (NTSO, 2003). Private truck stops offer more parking spaces and amenities than public rest areas. Public rest areas are generally located along major highways, and private truck stops are typically located nearby, but not adjacent, to highway facilities.

The Federal Hours-of-Service (HOS) regulations, originally instituted in 1937, have contributed to the demand for both private and public truck parking. These regulations mandate the number of hours a truck driver can operate a commercial vehicle before taking a rest. The rules prior to 2003 change allowed a driver to drive a maximum of 10 hours after 8 consecutive hours off duty, which was changed in 2003 to 11 hours after 10 consecutive hours off duty. Another 2003 change included not allowing an operator to drive beyond the 14th hour after coming on duty, following 10 consecutive hours off duty; this was changed from allowing 15 hours after coming on duty, following 8 consecutive hours off duty.

Congressional mandates related to truck parking studies began with the National Transportation Safety Board (NTSB) (1990) estimate that 31 percent of fatal truck

collisions and crashes were fatigue-related and analysis that a major contributor to fatigue was the lack of safe and available truck parking on or near Interstate highways. In 2000, with help from the NTSB, Congress recommended the Federal Motor Carrier Safety Administration (FMCSA) create a guide to inform truck drivers of the locations of parking and parking availability. Congress continued to place importance on truck parking through the Transportation Equity Act for the 21st Century (TEA-21), setting aside funding to investigate the adequacy of truck parking and rest areas. Section 4027 of TEA-21 mandated a study to determine the location and quantity of parking facilities at both commercial truck stops and public rest areas. This study inventoried the current facilities and examined shortages.

Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), Section 1305 further emphasized the importance of investigating truck parking availability. SAFETEA-LU authorizes $6.25 million for the four years starting in 2006 to establish the Truck Parking Facilities Pilot Program. This program provides funding to address the shortage of long-term parking for commercial vehicles on the National Highway System. The funds are available for projects that both improve currently operational facilities (improving facility access and reconfiguring parking spaces to accommodate truck maneuvers) and increasing the number of facilities (constructing new facilities and utilizing parking available at other facilities). SAFETEA-LU emphasizes the importance of highway safety, congestion reduction, and air quality improvements by giving priority to projects that will address these issues (FHWA, 2005).

SAFETEA-LU further supports improvements to current rest areas by identifying two new programs that address the problem of idling emission issues and the truck parking shortage. The Interstate Oasis Program and Idling Reduction Facilities on Interstate Rights-of-Way Program are designed to establish standards for rest facilities along the Interstate system and to encourage decreasing emission levels from idling trucks. The goal of the Interstate Oasis Program is to establish service standards for designating certain facilities near the Interstate System as “Interstate Oases.” These areas must offer products and services to the public, provide 24-hour access to restrooms, supply parking for heavy trucks and automobiles, and have a clean appearance with accessibility to the Interstate system. The goal of the Idling Reduction Facilities in Interstate Rights-of-Way is to provide facilities that allow commercial vehicle operators to reduce truck idling or provide alternative power to support driver comfort while parked in a public rest area (FHWA, 2005).

TRUCK PARKING SHORTAGES

Nationwide

The United States is experiencing dramatic growth in commercial vehicle truck travel on our nation’s roadway system. Tight “just-in-time” commercial vehicle delivery schedules and hours-of-service rules have contributed to significant nationwide shortages in truck parking spaces (Trombly, 2003). Shortages of public truck spaces, however, are

considered to be more severe than shortages of private spaces. In 2002, 71 percent of states reported public shortages, but only 16 percent reported private shortages (Chen et al., 2002). This trend is expected to continue: the annual demand for public rest area spaces is projected to be 1.7 percent greater than the growth in supply, while the annual increase in private spaces is expected to exceed demand (Fleger et al., 2006).

California and Contiguous States

California ranks first in the nation in overall (private and public) commercial vehicle parking shortage (Fleger et al., 2006). Recent truck parking demand estimates in California indicate that demand exceeds capacity at all public rest areas and at 88 percent of private truck stops on the 34 corridors in California with the highest volumes of truck travel (Caltrans, 2001). Table 1 provides an overview of supply and demand for truck parking based on the results of surveys and demand estimates conducted by Caltrans and the United States DOT. The California Highway Patrol has identified 198 illegal truck parking locations, most of which are around existing public rest areas and private truck stops (Caltrans, 2001). Moreover, it is estimated that by the year 2020 average daily truck travel will increase by approximately 50 percent; the demand for public rest area parking will increase by 53 percent, and demand for private parking will increase by 100 percent (Caltrans, 2001).

Table 1. Overview of the Supply and Demand for Truck Parking in California.[1]

Attribute	Public Rest Area	Private Truck Stop	Other Private Location	Illegal Parking Locations
Ownership	Public	Private	Private	Public
Legal parking time	Typically, a few hours	Unlimited	Unlimited	Zero (illegal to park)
Number of Facilities	88	33	Unknown	198[2]
Spaces per Location	Maximum: 205 Minimum: 0 Average: 85	Maximum: 420 Minimum: 0 Average: 53	Unknown	Undefined
Number of Spaces Overall	7,496	1,106	Unknown	Undefined
Space Shortage as of 2000	8,057	6,106	Unknown	Undefined
Location Convenience	High	Moderate	Varies	High
Parking Convenience	Varies	Varies	Varies	High
Safety from Crime	Varies	Varies	Perceived as Moderate to Low[3]	Varies
Safety from Crashes	Safe	Safe	Safe	Not as safe

[1] United States Department of Transportation, 2004; California Department of Transportation, 2001.
[2] Based on California Highway Patrol's observations of unauthorized parking locations.
[3] Federal Highway Administration, 2002b.

States that are contiguous to California have a shortage in public rest areas but a surplus of private truck stops (see Table 2). To summarize, parking capacity exists in private

truck stops in California and contiguous states. Thus, there is potential to better manage use of existing spaces through availability and guidance information, as well as reservations.

Table 2. Demand/Supply Ratio of States Contiguous to California.[1]

State	Public	Private	Overall
Nevada	2.62	0.46	0.57
Oregon	1.89	0.67	0.79
Arizona	1.88	0.43	0.53
Utah	1.64	0.54	0.62

[1] Fleger et al., 2006

THE CONSEQUENCES OF TRUCK PARKING SHORTAGE

Illegal Truck Parking

Not surprisingly, nationwide incidences of illegal truck parking have increased with the shortage of commercial vehicle parking. A recent survey of states indicates that 17 have observed illegal truck parking at freeway interchange ramps, 14 at freeway interchanges ramps, eight on conventional highway roadsides, and eight on local streets near freeways. Illegal truck parking is dangerous: "(1) it limits the ability of parked vehicles to accelerate safely into the traffic stream from their parked position; (2) the presence of parked vehicles creates a conflict between existing and parked vehicles; and (3) errant vehicles may stray into the shoulder area and strike parked vehicles" (Trombly, 2003, p. 3).

Roadway Safety

All too often, the only alternative to truck drivers parking illegally is to continue driving while fatigued. Fatigue is a major contributing factor to truck collisions: eight percent of all fatal collisions and 16 percent of all truck collisions (Quan, 2006). The inability of drivers to find public or private truck parking may contribute to the fatigue that causes these crashes.

Air Quality

Diesel emissions from trucks contribute significantly to air pollution and are known to lead to severe health damage. Out of the top metropolitan areas in the U.S. with the greatest health impacts due to diesel, four are in California: Los Angeles, San Francisco-Oakland-Fremont, San Diego-Carlsbad-San Marcos, and Riverside-San Bernardino-Ontario, ranking second, seventh, 21st, and 25th respectively (GAO, 2004; American Lung Association, 2000). Navigational waste due to a trucker's search for parking, illegal truck traffic, and parking on neighborhood streets can contribute unnecessarily to poor air quality and adverse health effects. For example, children living in West Oakland, California, where illegal truck traffic and parking is common, have a seven-fold higher

likelihood of hospitalization due to asthma than an average child living in California (Palaniappan, 2006).

Trucking Industry

The shortage of truck parking spaces also has a number of negative consequences to the trucking industry (Smith et al., 2004). First, illegal parking and driving while fatigued can result in significant liability in a crash. Second, driver productivity is lower due to the time and money lost searching for parking. Third, "the poor choices given to drivers (parking illegally or driving while fatigued) may lead to increased job dissatisfaction; this is an industry with high driver turnover" (Smith et al., 2004, p. 2).

LESSONS LEARNED FROM RECENT TRUCK DRIVER SURVEYS

The characteristics of truckers, truck parking behavior, and parking needs are explored in two relatively recent surveys. The first is the nationwide survey of 2,000 truck drivers sponsored by the Federal Highway Administration (FHWA) (Chen et al., 2002). The second is a smaller survey of 338 truckers at six Travel Centers of America private truck stops (Lutsey et al., 2000), conducted to explore truck parking and idling-related issues.

Parking Locations

The results of both surveys indicate that private truck stops are preferred for long-term rests and that a sizeable number of truckers regularly park in unauthorized areas. According the FHWA survey, 90 percent park in private truck stops for long-term rest (four times a week on average); 67 percent use rest areas (two times a week on average); and 67 percent park in illegal spaces for long-term parking (two times a week on average), including entrance or exit ramps (33 percent), other parking lots (21 percent), and highway shoulders (11 percent). According to the Lutsey et al. survey, 90 percent of respondents had used a truck stop for at least one overnight rest, 53 percent had used a public rest area, and 25 percent parked in an unauthorized location.

Parking Decisions

Results of both surveys indicate that truck drivers (not their carrier) decide where they will park—98 percent according to the FHWA survey and 84 percent according to the Lutsey et al. survey. Truck drivers' parking decision making can be conceptualized as follows: "(1) 12 to 24 hours in advance; (2) an hour or so prior to a planned rest, typically within a 100-mile radius; and (3) at the end of the day, a driver decides whether or not to pull off when approaching a rest area" (Smith et al., 2004, pp. 10-11).

Among those drivers who make their own parking decisions, 21 percent do so before they start driving and 83 percent decide en-route (Chen et al., 2002). Among those who park illegally and make their own parking decisions (97 percent), 89 percent decide en-route and 16 percent do before driving (FHWA, 2002). The FHWA survey found that: (1) owners and leasers are more likely to plan their own parking than company drivers; (2)

company drivers are more likely than owners and leasers to select truck stops before they start driving; and (3) owners and leasers are more likely to decide where to park en-route (Chen et al., 2002).

Approximately 300 respondents to the FHWA survey provided additional comments. These are summarized as follows, drivers: "(1) often try to plan their parking stops but circumstances arise that prevent them from parking when or where they had planned; (2) frequently become tired before they thought they would, experience delays at shippers/receiver locations, and fail to find available parking spaces at their pre-planned destinations; (3) decide where to park as their on-duty hours elapse based on how far they think they can drive in the remaining hours of service; and (4) often do not plan ahead but simply park whenever they find an available space" (Chen et al., 2002, p. 13).

Illegal Parking

The FHWA and Lutsey et al. surveys found that a sizable percent of respondents do park in unauthorized parking locations (97 and 25 percent, respectively). The FHWA survey found that the two top reasons cited by trucker for parking illegally were: (1) no empty spaces at nearby facilities (94 percent of respondents) and (2) no nearby parking facilities (83 percent of respondents). In many instances, these responses may reflect lack of knowledge about available parking rather than actual knowledge. For example, interviews conducted with truck drivers in unauthorized spaces by the Maryland State Police in 2004 indicate that many drivers park illegally because they are unsure of the nearest authorized parking area, and trucks were parked illegally very near facilities with available parking capacity (Maryland DOT, 2005). Moreover, "almost 40 percent of drivers who park in these unconventional locations indicated that alternative parking, if made available, would improve the parking situation" (Chen et al., 2002, p. 12). The FHWA study concludes that: "there may be some connection between poor planning and parking on shoulders and ramps" (Chen et al., 2002, p. 15).

Parking Needs and Preferences

According to the FHWA study, most drivers indicate that more truck parking is needed during overnight hours, near metropolitan areas, and in specific regions: the northeast, the northwest, and Southern California (Chen et al., 2002). In general, drivers indicate that important attributes of long-term rest locations are food, fuel, restrooms, phones, showers, nearby highway, well-lighted parking lots, and security (Chen et al., 2002). Drivers also commented that "big parking spaces that allow trucks to maneuver in and out" were important attributes of truck parking locations (Chen et al., 2002, p.15).

LESSONS LEARNED FROM PARKING GUIDANCE INFORMATION FOR AUTOS

Smart parking management systems for automobiles have been implemented throughout Europe, the United Kingdom, and Japan since the early 1970s and provide information on available parking locations. Parking guidance information (PGI) systems, and more

recently transit-based smart parking systems, provide real-time information to motorists regarding available parking spaces and locations. Lessons learned by evaluating and modeling these systems suggest that awareness and understanding can be relatively high, but that people who are less familiar with the area (i.e., visitors rather than commuters) tend to be the most frequent users (Thompson and Bonsall, 1997). Truckers, however, may be more like visitors and use en-route parking information more frequently because they often cannot or do not plan their parking in advance and/or lack parking information knowledge due to high driver turnover. PGI systems also tend to reduce parking facility queue lengths and provide modest system-wide reductions in travel time and vehicle travel (Thompson and Bonsall, 1997). Recommendations to improve these systems include: (1) targeting messages to the information needs, decision points, and knowledge levels of market segments early on in the system development process; (2) making messages conspicuous and providing some reinforcement; and (3) providing messages that are consistently credible (Thompson and Bonsall, 1997).

SOLUTIONS

The alternatives available to address the truck parking shortage problem generally include increasing the supply of spaces and better matching supply and demand. In general, the literature suggests that the latter is the most practical and cost-effective, near-term solution, particularly in metropolitan areas where land prices are high. Moreover, as new parking supply becomes available, technologies that better match supply and demand can continue to maximize the effectiveness of new truck parking investments. Some opportunities for expanding supply where land prices are high include allowing overnight parking at park-and-ride lots and weigh stations.

Truck Driver Recommendations

Improving truck parking information and methods of communicating this information were explored in the FHWA survey (Chen et al., 2002). Seventy-three percent of respondents indicated that they would like to receive information by the radio in their vehicle; 40 percent preferred to use their vehicle's electronic visual display; and 12 percent preferred the Internet (Chen et al., 2002). Respondents also indicated a desire for the following real-time information: "(1) location of truck parking facilities along the road being traveled (84 percent); (2) features (e.g., showers, hot meals) that are available at upcoming parking facilities (77 percent); (3) number of truck parking spaces available at upcoming parking facilities (6 percent); and (4) length of time limits on upcoming truck parking spaces (46 percent)" (Chen et al., 2002, p. 19). From the over 200 written comments, respondents also expressed interest in obtaining information about: "(1) the layout and size of parking spaces at upcoming facilities and (2) whether a parking facility can accommodate trucks that are oversized, hauling hazardous materials, or multiple–trailer loads" (Chen et al., 2002).

Recommendations from Highway Maintenance Engineers in 49 States

The National Cooperative Highway Research Program (NCHRP) surveyed highway maintenance engineers from 49 states to identify effective and feasible solutions to truck parking problems (Trombly, 2003). Using "ITS to expand the amount of information available to truckers" ranked first (among a list of improvements including building new rest areas and truck stops) when evaluated against *effectiveness and feasibility* criteria (Trombly, 2003, p. 17). Moreover, it was reported that "…the responses reflect a belief among agencies that the most effective and feasible way to reduce shortages is to make better use of existing resources, combined with a prudent expansion of existing public spaces. Because all of the respondents work in the public sector, it can be speculated that their responses reflect recognition that a public role is appropriate—but the resources to meet all needs are not available, and that the private sector is in a better position to provide these resources" (Trombly, 2003, p. 17). Two specific recommendations made by the states include: (1) developing ITS deployments that provide drivers with real-time information on the location and availability of parking spaces. For example, investigating the use of mobile phones and radio frequencies to broadcast parking locations and availability to drivers; and (2) distributing a "truckers' map" that pinpoints parking facilities for drivers (Trombly, 2003, p. 19).

National Transportation Safety Board Recommendations

The National Transportation Safety Board published a special report on truck parking-related problems in May 2000. Following are the major conclusions:

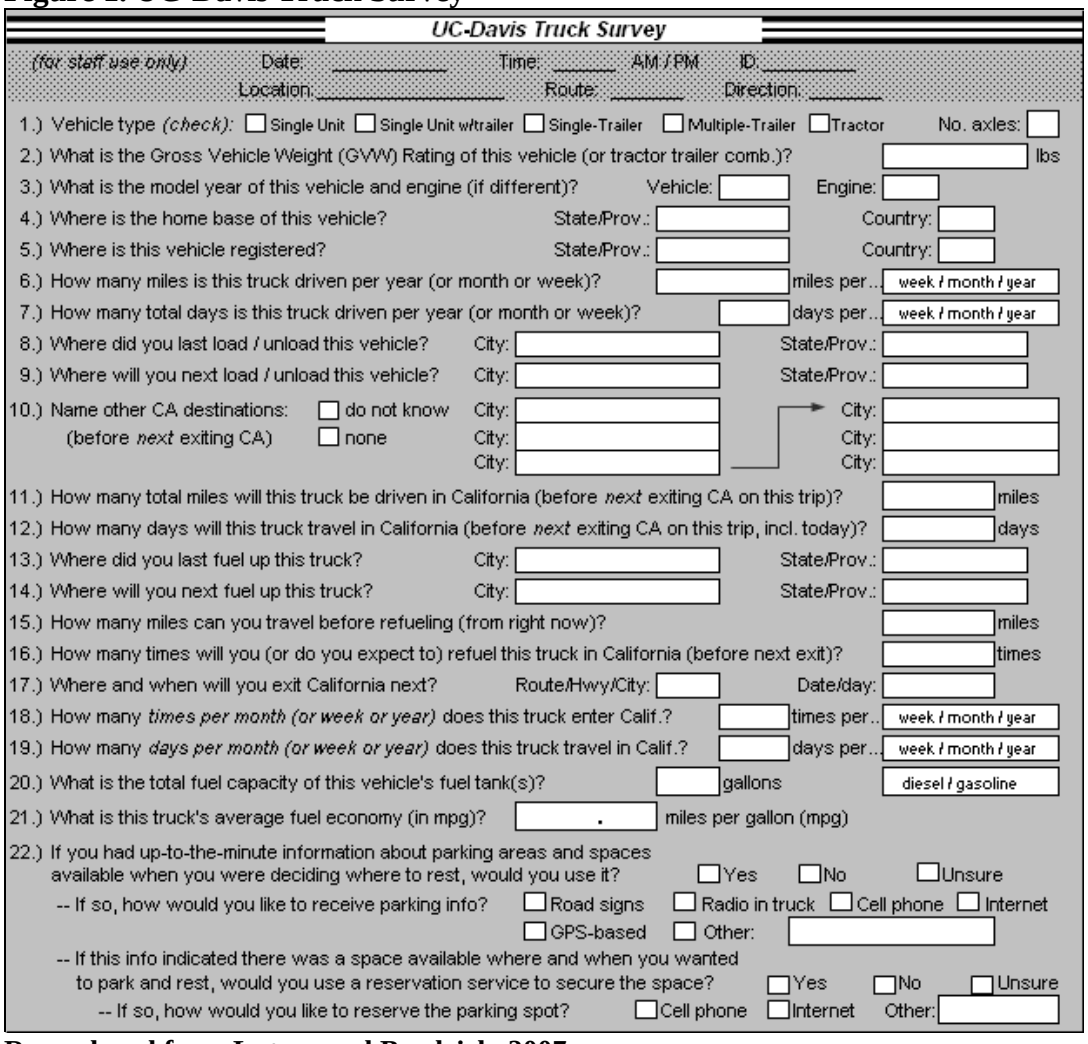
- While guides and mapping programs may list the private truck stops and public rest areas, they are not all-inclusive of available truck parking, such as alternative locations like park-and-ride lots and weigh stations. Also, the Safety Board concludes that some truck drivers do not have enough information on parking locations and need access to all available parking in advance and during trips.
- In many large trucking companies, trucks are equipped with global positioning systems (GPS) that enable dispatchers to tell drivers where to pick up a load, drop off, and get fuel, based on the truck's precise location. GPS, combined with electronic guidance, could enable dispatchers to notify truck drivers of the nearest parking facility. (NTSB, 2000, p. 23)

TRUCK SURVEY AND DATA ANALYSIS

As described in the previous section, the analysis of the available literature suggest that that the provision of parking information related services may be a promising near-term solution to the truck parking problem. As a result, the authors worked with researchers at the University of California at Davis (Drs. Nicholas Lutsey and Christie-Joy Brodrick) to include questions related to truck parking information services in a statewide survey of truckers conducted for the California Air Resources Board. Figure 1 documents the survey instrument, and Figure 2 indicates the location where truckers were surveyed

during the summer and fall of 2006. In total, 433 surveys were collected through in-person administration at various locations throughout the State.

Figure 1. UC-Davis Truck Survey



UC-Davis Truck Survey

(for staff use only) Date: _____ Time: _____ AM / PM ID: _____
Location: _____ Route: _____ Direction: _____

1.) Vehicle type *(check)*: ☐ Single Unit ☐ Single Unit w/trailer ☐ Single-Trailer ☐ Multiple-Trailer ☐ Tractor No. axles: ☐

2.) What is the Gross Vehicle Weight (GVW) Rating of this vehicle (or tractor trailer comb.)? ☐ lbs

3.) What is the model year of this vehicle and engine (if different)? Vehicle: ☐ Engine: ☐

4.) Where is the home base of this vehicle? State/Prov.: ☐ Country: ☐

5.) Where is this vehicle registered? State/Prov.: ☐ Country: ☐

6.) How many miles is this truck driven per year (or month or week)? ☐ miles per.. week / month / year

7.) How many total days is this truck driven per year (or month or week)? ☐ days per.. week / month / year

8.) Where did you last load / unload this vehicle? City: ☐ State/Prov.: ☐

9.) Where will you next load / unload this vehicle? City: ☐ State/Prov.: ☐

10.) Name other CA destinations: ☐ do not know City: ☐ City: ☐
(before *next* exiting CA) ☐ none City: ☐ City: ☐
City: ☐ City: ☐

11.) How many total miles will this truck be driven in California (before *next* exiting CA on this trip)? ☐ miles

12.) How many days will this truck travel in California (before *next* exiting CA on this trip, incl. today)? ☐ days

13.) Where did you last fuel up this truck? City: ☐ State/Prov.: ☐

14.) Where will you next fuel up this truck? City: ☐ State/Prov.: ☐

15.) How many miles can you travel before refueling (from right now)? ☐ miles

16.) How many times will you (or do you expect to) refuel this truck in California (before next exit)? ☐ times

17.) Where and when will you exit California next? Route/Hwy/City: ☐ Date/day: ☐

18.) How many *times per month (or week or year)* does this truck enter Calif.? ☐ times per.. week / month / year

19.) How many *days per month (or week or year)* does this truck travel in Calif.? ☐ days per.. week / month / year

20.) What is the total fuel capacity of this vehicle's fuel tank(s)? ☐ gallons diesel / gasoline

21.) What is this truck's average fuel economy (in mpg)? ☐ miles per gallon (mpg)

22.) If you had up-to-the-minute information about parking areas and spaces available when you were deciding where to rest, would you use it? ☐ Yes ☐ No ☐ Unsure

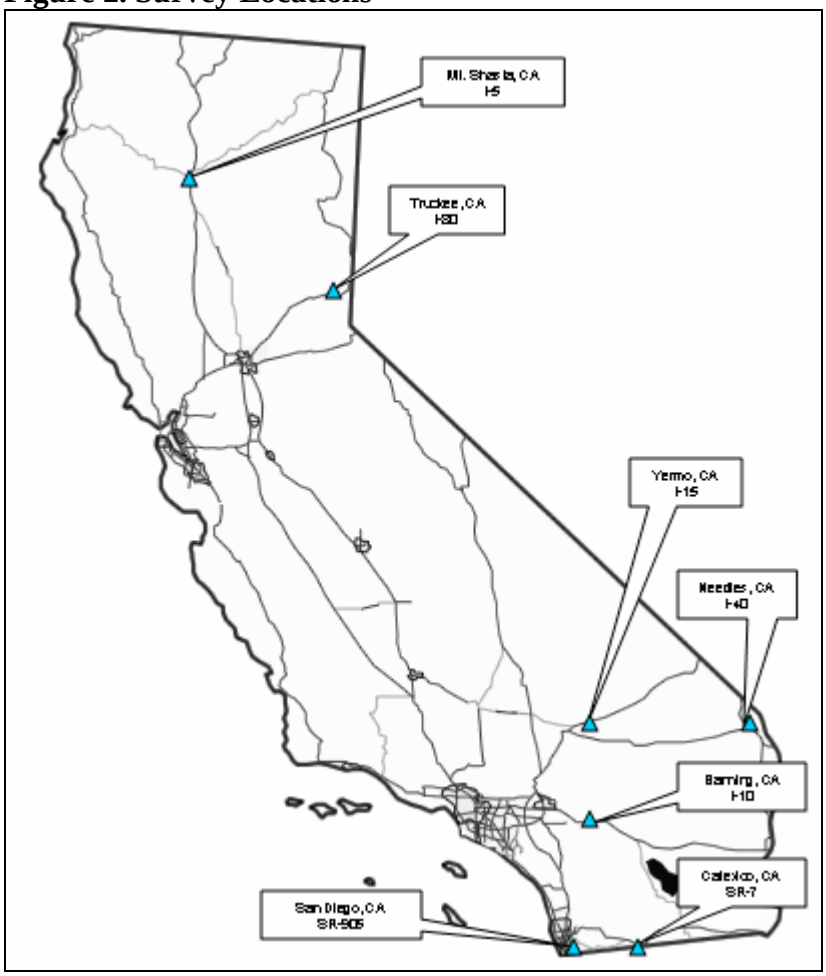
-- If so, how would you like to receive parking info? ☐ Road signs ☐ Radio in truck ☐ Cell phone ☐ Internet ☐ GPS-based ☐ Other: ☐

-- If this info indicated there was a space available where and when you wanted to park and rest, would you use a reservation service to secure the space? ☐ Yes ☐ No ☐ Unsure

-- If so, how would you like to reserve the parking spot? ☐ Cell phone ☐ Internet Other: ☐

Reproduced from Lutsey and Brodrick, 2007.

Figure 2. Survey Locations



Reproduced from Lutsey and Brodrick, 2007.

As documented in Figure 1, respondents were asked "If you had up-to-the-minute information about parking areas and spaces available when you were deciding to rest, would you use it.? The survey results are presented in Table 3 below. These results indicated that 67.9 percent of respondents would use such a service, 19.9 percent said they would not, 6 percent were unsure, and the remainder declined to answer the question.

Table 3. Survey Responses on Use of Hypothetical Parking Information Service.

Origin State	Highway	Nearby City	Surveys Collected	Regarding Question #22a, the percent of survey respondents who….			
				Would use parking info	Would not use parking info	Are unsure about use of parking info	[blank]
Oregon	I-5	Mt. Shasta, CA	68	77.9%	11.8%	8.8%	1.5%
Nevada	I-80	Truckee, CA	66	72.7%	16.7%	10.6%	0.0%
	I-15	Yermo, CA	50	60.0%	30.0%	6.0%	4.0%

Arizona	I-40	Needles, CA	72	70.8%	22.2%	4.2%	2.8%
	I-10	Banning, CA	73	64.4%	20.5%	9.6%	5.5%
Mexico	SR-7	Calexico, CA	33	57.6%	15.2%	0.0%	27.3%
	SR-905	San Diego, CA	71	64.8%	22.5%	0.0%	12.7%
All Trucks			433	67.9%	19.9%	6.0%	6.2%

Reproduced from Lutsey and Brodrick, 2007.

Among those respondents who indicated that they would use up-to-the-minute information about parking areas and spaces, most indicated that road signs (47.2 percent), mobile phones (21.6 percent), and radio (18.8 percent) were their preferred method of accessing this information, as shown in Table 4. Respondents indicated less interest in accessing this information by the Internet or GPS.

Table 4. Survey Responses on Preferred Method of Receiving Parking Information.

Origin State	Highway	Nearby City	The percent of survey respondents who might use parking info ("yes" or "unsure" to #22a) that would opt to receive such info by [a] …					
			Road Signs	Radio	Mobile Phone	Internet	GPS	"Other"
Oregon	I-5	Mt. Shasta, CA	50.8%	30.5%	13.6%	6.8%	10.2%	15.3%
Nevada	I-80	Truckee, CA	54.5%	16.4%	14.5%	10.9%	9.1%	12.7%
	I-15	Yermo, CA	60.6%	21.2%	6.1%	9.1%	3.0%	30.3%
Arizona	I-40	Needles, CA	70.4%	20.4%	13.0%	9.3%	7.4%	9.3%
	I-10	Banning, CA	50.0%	27.8%	20.4%	9.3%	7.4%	35.2%
Mexico	SR-7	Calexico, CA	21.1%	0.0%	31.6%	26.3%	0.0%	21.1%
	SR-905	San Diego, CA	4.3%	0.0%	58.7%	4.3%	0.0%	32.6%
All Trucks			47.2%	18.8%	21.6%	9.4%	6.3%	21.6%

[a] *More than one response to this question was allowed per survey*

Reproduced from Lutsey and Brodrick, 2007.

Among those respondents who indicated that they would use up-to-the-minute information about parking areas and spaces, 45.9 percent indicated that they would use the service to reserve a parking spot (see Table 5) most preferably by mobile phone (56.6%), by Nextel(24.6 percent), and by the Internet (9.7 percent) (see Table 6).

Table 5. Survey Responses on Willingness to Use Parking Place Reservation Service.

Origin State	Highway	Nearby City	For survey respondents who would use parking info ("yes" or "unsure" to #22a), the percent of respondents who…			
			Would reserve a parking spot in advance	Would not reserve a spot	Are Unsure	[blank]
Oregon	I-5	Mt. Shasta, CA	49.2%	32.2%	13.6%	5.1%
Nevada	I-80	Truckee, CA	41.8%	52.7%	5.5%	0.0%
	I-15	Yermo, CA	39.4%	48.5%	3.0%	9.1%
Arizona	I-40	Needles, CA	25.9%	59.3%	9.3%	5.6%
	I-10	Banning, CA	33.3%	33.3%	18.5%	14.8%

Mexico	SR-7	Calexico, CA	68.4%	31.6%	0.0%	0.0%
	SR-905	San Diego, CA	80.4%	15.2%	2.2%	2.2%
All Trucks			45.9%	39.7%	8.8%	5.6%

Reproduced from Lutsey and Brodrick, 2007.

Table 6. Survey Responses on Preferred Method of Reserving Truck Parking Place. (Lutsey and Brodrick, 2007)

Origin State	Highway	Nearby City	For survey respondents who might use parking info ("yes" or "unsure" to #22a) and might reserve a parking spot ("yes" or "unsure" to #22c), the preferred means of making a reservation are…				
			Mobile Phone	Internet	Nextel [a]	Other	Blank
Oregon	I-5	Mt. Shasta, CA	86.5%	5.4%	0.0%	5.4%	2.7%
Nevada	I-80	Truckee, CA	88.5%	3.8%	0.0%	0.0%	7.7%
	I-15	Yermo, CA	85.7%	0.0%	0.0%	0.0%	14.3%
Arizona	I-40	Needles, CA	84.2%	10.5%	0.0%	0.0%	5.3%
	I-10	Banning, CA	57.1%	21.4%	0.0%	0.0%	21.4%
Mexico	SR-7	Calexico, CA	0.0%	30.8%	69.2%	0.0%	0.0%
	SR-905	San Diego, CA	0.0%	5.3%	89.5%	5.3%	0.0%
All Trucks			56.6%	9.7%	24.6%	2.3%	6.9%

[a] *walkie-talkie-type mobile phone service*

Reproduced from Lutsey and Brodrick, 2007.

CONCLUSIONS

This report began with a literature review of the commercial vehicle truck parking problems in California and the U.S., including the distribution and frequency of current and expected truck parking shortages and illegal parking, available evidence on truck drivers' parking preferences, and a description and evaluation of current and future approaches to the truck parking problem. The results of this literature review indicated that the provision of parking information-related services may be a promising near-term solution to the truck parking problem. As a result, the authors worked with researchers at the University of California at Davis to include questions related to truck parking information services in a statewide survey of truckers conducted for the California Air Resources Board. The results indicated that almost 70 percent of the truckers surveyed would use up-to-the-minute information about parking areas and spaces when planning their next rest. Among these respondents, most indicated that road signs, mobile phones, and radio were their preferred method of accessing this information, and almost half indicated that they would reserve a parking spot in advance, most preferably, by mobile phone.

ACKNOWLEDGMENTS

The authors would like to thank the California Department of Transportation and California PATH for their support of this research. Matt Hanson and Nader Ebrahimi of Caltrans and Steve Sowers, formerly of Caltrans, provided valuable expertise. A special thanks to the California Air Resources Board and Nicholas Lutsey and CJ Brodrick for

allowing the inclusion of questions on parking information in their statewide trucker survey. The authors would also like to acknowledge the assistance of Megan Smirti. The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein.

REFERENCES

American Lung Association. (2000). *Diesel exhaust and air pollution.* Retrieved July 20th, 2006, from http://www.lungusa.org/site/pp.asp?c=dvLUK9O0E&b=36089.

California Department of Transportation. 2001. *Partners for Adequate Parking Facilities Initiative Final Status Report*. Received from Caltrans on March 3, 2006.

Chen, K.J., K.K. Pecheaux, J. Farbry, Jr., and S.A. Fleger. (2002).Federal Highway Administration. *Study of Adequacy of Commercial Truck Parking Facilities – Technical Report*.

Clean Air Task Force.(2006). *Diesel and health in America: the lingering threat.* Retrieved October 1, 2006,
from http://www.catf.us/publications/view/83.

Fleger, S. A, R. P. Haas, J. W. Trombly, R. H. Cross III, J. E. Noltenius, K. K. Pécheux, and K. J. Chen.(2002). *Study of Adequacy of Commercial Truck Parking Facilities – Technical Report*. Publication FHWA-RD-01-158. Federal Highway Administration, U.S. Department of Transportation.

Lutsey, N, C.J. Brodrick, D. Sperling, and C. Oglesby. Heavy-Duty Truck Idling Characteristics. (2004). In *Transportation Research Record: Journal of the Transportation Research Board, No.* 1880, TRB, National Research Council, Washington, D.C., 2004, pp. 23-33.

Lutsey, N. and C.J. Brodrick, 2007. *Assessment of Out-of-State Heavy-Duty Trucks Activity Trends in California*. Institute of Transportation Studies, University of California, Davis. *Forthcoming*.

Maryland Department of Transportation. (2005). *Maryland Truck Parking Study*, Federal Highway Administration, U.S. Department of Transportation.

National Transportation Safety Board. (2000). *Truck Parking Areas*. Highway Special Investigation Report NTSB/SIR-00/01. Washington, DC. National Transportation Safety Board.

NATSO's History Homepage. National Association of Truckstop Operators, 2005. www.natso.com. Accessed April 27, 2006.

Palaniappan, M. Ditching diesel: community-driven research reduces pollution in West Oakland. *Race, Poverty, and the Environment.* Retrieved October 1, 2006, from http://urbanhabitat.org/node/163.

Quan, K. (2006).Truck Parking Issues and Programs. Presented at Talking Freight Seminar, Federal Highway Administration, United States Department of Transportation, July.

Smith, S.B., W. Baron, K. Gay, and G. Ritter. (2004).United States Department of Transportation. *Intelligent Transportation Systems and Truck Parking*. Federal Motor Carrier Safety Administration. Washington, D.C. October.

Thompson, R.G. and P. Bonsall. Drivers' response to parking guidance and information systems.(1997). *Transport Reviews, Vol. 17,* No. 2, pp. 89-104.

Trombly, J.W. (2003). *Dealing with Truck Parking Demands.* National Cooperative Highway Research Program, Synthesis 317, National Research Council, Washington, D.C.

U.S. Government Accountability Office. (2004). *EPA could take additional steps to help maximize the benefits from the 2007 diesel emissions standards* (GAO report GAO-04-313).