

## Assessing Park-and-Ride Impacts

*Requested by*

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*The Caltrans Division of Research and Innovation (DRI) receives and evaluates numerous research problem statements for funding every year. DRI conducts Preliminary Investigations on these problem statements to better scope and prioritize the proposed research in light of existing credible work on the topics nationally and internationally. Online and print sources for Preliminary Investigations include the National Cooperative Highway Research Program (NCHRP) and other Transportation Research Board (TRB) programs, the American Association of State Highway and Transportation Officials (AASHTO), the research and practices of other transportation agencies, and related academic and industry research. The views and conclusions in cited works, while generally peer reviewed or published by authoritative sources, may not be accepted without qualification by all experts in the field.*

### **Executive Summary**

#### **Background**

Efficient transportation systems are vital to quality-of-life and mobility issues, and an effective park-and-ride (P&R) network can help maximize system performance. Properly placed P&R facilities are expected to result in fewer calls to increase capacity by widening roadways, reduced congestion, increased transit ridership, promotion of multimodal transport and cleaner air for all of us to breathe.

This Preliminary Investigation aims to expand on a 2005 Caltrans project that considered P&R and high-occupancy vehicle (HOV) transit enhancements<sup>1</sup>. We compile existing and current research and national and state activities related to quantifying the positive impacts that P&R lots have on the transportation system to highlight:

- Best practices for measuring and improving the performance of existing P&R lots.
- Factors that affect the success of P&R lots, including an assessment of where P&R lots should be placed to achieve the greatest benefit.
- Effective practices for attracting P&R users.

#### **Summary of Findings**

The first P&R facilities in the United States were developed in the early and mid-1970s. This Preliminary Investigation presents a selection of relatively recent research and publications. We gathered information in six topic areas related to assessing the impact of P&R facilities:

- Measuring and Improving the Performance of Existing Park-and-Rides.
- Locating Park-and-Ride Lots for Maximum Benefit.
- Attracting Park-and-Ride Users.
- Park-and-Ride Planning Documents.
- Informal Survey of State Practice.
- Projects in Process.

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<sup>1</sup> Caltrans Park & Ride and HOV Transit Enhancement Project, Caltrans, Final Report, July 2005. Available at <http://www.dot.ca.gov/hq/MassTrans/Docs-Pdfs/BRT/BRT-Buspool-Final-Rpt.pdf>.

Following is a summary of findings by topic area.

### **Measuring and Improving the Performance of Existing Park-and-Rides**

- A 2005 *Transportation Research Record (TRR)* article describes the results of the first large-scale study of P&R facilities and users in the San Francisco region.
- Technical solutions for New Jersey's overcrowded P&Rs—including parking monitoring and guidance systems, a prototype parking information and reservation system, and an intermodal transportation planning model—are presented in a 2007 Federal Highway Administration (FHWA) report.
- A 2006 conference paper suggested that investing in transit-oriented development rather than subsidized P&Rs may produce higher ridership and higher revenue.
- The international perspective is provided in two TRB Annual Meeting papers. Lessons learned from 40 years of experience with P&Rs in the U.K. are offered in a 2008 paper. In a 2007 paper, a planning model that simulates driver actions is applied to a P&R in Toronto to evaluate different P&R design layouts.

### **Locating Park-and-Ride Lots for Maximum Benefit**

- National guidance is available from a 2009 FHWA report that encourages the placement of properly sited P&Rs to accommodate increased use of transit that results from congestion pricing. The fundamentals of P&R planning and design are provided in the 2004 AASHTO publication, *Guide for Park-and-Ride Facilities*.
- A 2010 TRB Annual Meeting paper described a quantitative analytical approach to locating P&R facilities and illustrates results with an implementation in the New York City area.
- A discussion of preliminary research for TCRP H-36, *Reinventing the Interstate: A "New Paradigm" for Multimodal Transportation Facilities*, is described in a 2010 TRB Annual Meeting paper. The research suggests that the more complementary a freeway and transit corridor is—when the transit system and freeway sustain different travel markets and land uses—the more total patrons the corridor will carry.
- A 2008 journal article presents a model that integrates three key factors in siting P&Rs—covering potential demand, locating the P&R as close to major roadways as possible and siting the P&R in the context of the existing system. Researchers apply the model in Columbus, OH, to show how the trade-offs can be quantified when siting P&R facilities.
- In September 2008, the state of Washington opened its first P&R located in a south Everett freeway median. Planners expected use of the new facility to cut up to six minutes off a round-trip bus ride to Seattle from south Everett.
- A geographic information systems (GIS)-based model to delineate market areas for P&R facilities is presented in a 2005 journal article. Results of the model, which accounts for P&R facility accessibility and user direction, showed a more realistic representation of market areas than other modeling approaches.
- Seven shared-use P&R facilities in Florida are examined in a 2004 report by Florida Department of Transportation (DOT). Survey results indicated that P&R users at the survey sites really are shopping at the shopping centers when parking at the P&R.
- Providing the international perspective, a 2007 conference paper presented by Chinese researchers described a calculating method to determine the optimal location of a P&R facility, and a collaboration of Hong Kong and Canadian researchers investigates optimal location and pricing of P&R facilities in a 2004 journal article.

### **Attracting Park-and-Ride Users**

- Advanced parking management systems, which provide directional and space availability information to P&R patrons, are examined in two reports—a 2008 final evaluation report of transit applications by U.S.

DOT and a 2007 FHWA report that looks at systems in airports, central business districts and transit P&R locations.

- A 2004 Transit Cooperative Research Program (TCRP) report includes a chapter that addresses travel demand and the characteristics that make a P&R attractive. Also provided are user and usage characteristics and effects on energy, air quality and costs.
- The application of parking user fees in San Francisco's Bay Area Rapid Transit (BART) district is considered in a 2009 *TRR* article and a 2008 study.
- Integrating bicycling and public transit is addressed in a 2009 journal article that concludes more high-quality bike parking is needed, with more sheltered and secure spaces. A related resource provides best practices for developing bike parking.
- A 2009 TRB Annual Meeting paper described a model that measures P&R preferences. The model suggests that P&R measures that make the car less attractive will be more effective than measures aimed at improving the quality of the P&R.
- Thirty transportation agencies in the United States and Canada responded to a 2006 survey conducted by *The Urban Transportation Monitor* that investigated the characteristics of the most successful P&R lots in the United States and Canada.
- Four studies provide the international perspective: a 2009 conference paper on a smart P&R project in Sweden; findings from a Canadian P&R user survey presented in a 2007 conference paper; forecasting P&R demand in a 2007 Land Transport New Zealand report; and a 2004 *TRR* article that examines the effect of travel time uncertainty on the potential use of P&R facilities in the Netherlands.

#### **Park-and-Ride Planning Documents**

- Two reports produced in connection with U.S. DOT's Integrated Corridor Management Initiative describe Concepts of Operations for the I-15 corridor in San Diego and the I-394 corridor in Minneapolis. Both reports address P&Rs as part of the overall corridor plan.
- First published in 1989 and updated in 1996 and 2001, Florida DOT's planning manual for P&R facilities provides detailed information on site selection, demand estimates, P&R promotion, evaluation of the performance of existing facilities, and economic analyses and project justification.
- New York State DOT's Highway Design Manual includes a chapter that addresses P&R site selection, lot layout and shared-use lots.
- A section of the Texas DOT's Roadway Design Manual provides P&R location criteria and typical design features.

#### **Informal Survey of State Practice**

We spoke to P&R coordinators at Florida, New Jersey and Washington State DOTs to gather additional information about their P&R programs.

- No new P&R facilities are planned by Florida DOT; New Jersey DOT has a few projects in the pipeline, but it is unclear when those projects will proceed. The statewide focus in Washington is on expansion of high-use lots.
- Tying the P&R project to transit is one of the key factors for Florida DOT in prioritizing P&R projects. Locating P&R facilities with transit is also key for Washington State DOT.
- New Jersey DOT has a strong shared-use program, leasing spaces from malls, churches, movie theaters and other private entities. Washington State DOT emphasizes partnership opportunities in developing the state's P&R network.

- Limited funding was a common theme in our discussions.
  - In Florida, the lack of assured funding limits the research required to update P&R policies and procedures. Typically, Florida DOT receives \$1 million annually for allocation to P&Rs, but finds that this funding is sometimes redirected to other needs. Annual calls for potential P&R projects often result in requests that account for six to seven times the amount of funding available.
  - In New Jersey, lack of funding limits the application of technology and other changes that could retrofit existing P&Rs to better meet user needs.
  - In Washington, P&R facilities are funded through capital funding provided by the state Legislature, not with assured state program funding.
- New Jersey DOT is working with a consultant to develop a model to optimally place P&Rs. Still in development, the model may be made available to other state DOTs when completed.

We also contacted representatives from AASHTO and FHWA to get their sense of best practices and exemplary state DOT P&R programs.

- The liaison for AASHTO's Standing Committee on Public Transportation notes that the best source of information about P&R best practices is AASHTO's Guide for Park-and-Ride Facilities.
- The contact in FHWA's Office of Operations notes that FHWA has done relatively little recent work related to P&Rs and suggests a review of NCHRP and TCRP publications.

### **Projects in Process**

- A New York State DOT project expected to conclude this summer seeks to develop guidance for P&R development.

### **Gaps in Findings**

We noted a number of informational gaps when researching this topic:

- While the 2004 AASHTO publication Guide for Park-and-Ride Facilities provides the basics of P&R planning and design, with the exception of the Florida DOT planning manual, there appears to be a dearth of documented, highly detailed P&R planning guidance available from state DOTs.
- Modeling, while extensively used to manage traffic, appears to be less often used in managing P&Rs. However, there are promising signs that models are gaining favor to effectively locate and manage P&R facilities.
- As one of the authors cited in this Preliminary Investigation notes, relatively few studies address vehicle movements within P&R facilities. This lack of research data makes it difficult for P&R facility managers to forecast demand and evaluate alternative P&R designs.
- Our research did not locate an extensive body of P&R user survey results that can help Caltrans identify the P&R features and amenities most preferred by P&R users.
- The P&R coordinator for Washington State DOT has offered to provide documents relating to P&R utilization and funding but was unable to provide the documents at the time of publication of this Preliminary Investigation.

### **Next Steps**

Caltrans might consider the following related to assessing the impact of P&Rs:

- Modeling can be helpful to Caltrans in its efforts to optimally locate new P&Rs.
  - The models demonstrated in recent studies in New Jersey, New York and Ohio may provide good starting points for Caltrans' own modeling efforts.
  - Also of interest is the model in development by New Jersey DOT, which is expected to assist in prioritizing P&R locations. No completion date was available at the time of this Preliminary

Investigation; Caltrans may want to check back with New Jersey DOT in late summer to get an update on the model's progress.

- Caltrans might consider using the standardized set of formulae in Florida DOT's P&R program manual to compute a cost/benefit ratio of a planned P&R facility.
- The technical solutions recommended in a 2007 study to address overcrowding in New Jersey's P&R facilities, while not yet implemented in New Jersey, may be relevant for application in some P&Rs within the Caltrans network.
- Following up on the 2005 study of P&R users in the San Francisco area, Caltrans might consider employing more user surveying to gather information about the P&R features and amenities most appealing to California's P&R users. Caltrans might also consider expanding on other California-specific research to further explore the application of fees and smart parking.
- Given the 2008 implementation of the first P&R in a freeway median in Washington, Washington State DOT may be a good contact to investigate P&R placement in alternative locations.
- Caltrans might consider consulting with New Jersey DOT to learn more about its shared-use P&R program and how a valet parking system could be used for some of California's P&R facilities.
- Caltrans might wish to contact the Washington State DOT P&R coordinator to request documents related to funding P&Rs and monitoring P&R use.

## Contacts

During the course of this Preliminary Investigation, we spoke to or corresponded with the following individuals:

### State Agencies

#### **Florida**

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## **Measuring and Improving the Performance of Existing Park-and-Rides**

In the publications below we highlight the first large-scale study of P&R facilities and users in the San Francisco region, and recommended solutions for New Jersey's overcrowded P&Rs. We also cite a Canadian study that describes a model which simulates vehicle movement within P&Rs and allows for evaluation of different P&R design layouts, and recommendations for successful P&Rs gleaned from 40 years of experience in the U.K.

### **California's Experience**

**“Study of Park-and-Ride Facilities and Their Use in the San Francisco Bay Area of California,”** Manish Shirgaokar, Elizabeth Deakin, *Transportation Research Record*, Vol. 1927, 2005: 46-54.

Citation at <http://dx.doi.org/10.3141/1927-06>

In this article, the authors describe the results of the San Francisco region's first large-scale, detailed study of P&R facilities and users. Most of the P&R lots studied are located along major freeway corridors in the region, used by both express bus and carpool commuters, and owned by Caltrans. The study also included a survey of three of Bay Area Rapid Transit's (BART's) 32 station lots. Researchers used three methods to assess P&R issues and options: an occupancy and site survey at all Caltrans-owned P&R facilities in the region, user surveys at 35 parking facilities, and focus groups at which issues raised by the site and user surveys were explored in depth.

Results include:

- Many lots are oversubscribed or fast approaching capacity, and there is a need to create new ways to increase parking supply.
- User survey results showed that almost all the parking users were commuters; at the freeway lots, half were transit users and the remainder were organized and casual carpoolers.
- Users had concerns about cleanliness, lot security, the lack of lighting and the quality of transit services offered.
- Analysis of focus group data determined that schedule adherence rather than frequency was the cause of most concerns.
- Participants expressed a willingness to pay for parking that was fenced, security-patrolled and lighted, with shelters for waiting.

### **Other Domestic Publications**

**Technical Solutions to Overcrowded Park and Ride Facilities,** New Jersey Department of Transportation, FHWA, Report No. FHWA-NJ-2007-011, May 2007.

<http://www.nj.gov/transportation/refdata/research/reports/FHWA-NJ-2007-011.pdf>

The goals of this project were to improve the operation and efficiency of the present P&R system and identify potential technological solutions that could address the issue of anticipated demand for P&R parking. Results include:

- A summary of parking monitoring and guidance systems and recommendations that include a cost analysis of three technologies used in a typical parking installation—magnetometer, video image processing and inductive loop detectors.
- A prototype parking information and reservation system through the web and cell phone that includes a parking reservation algorithm and solution methodology, a web-based parking reservation system and a cell phone-based parking reservation and information system. The establishment of a web- and cell phone-based parking information and reservation system is recommended as the main technology to efficiently allocate the parking spaces from overcrowded to underutilized P&R facilities.
- A prototype P&R intermodal transportation planning model that, if fully developed and calibrated, has the capability to analyze travel patterns in an intermodal network that includes P&R facilities. The model estimates changes in the network travel patterns that result from different information provided to travelers, alternative pricing and operating policies, changes in transit and P&R systems, and future increases in travel demand. Potential uses of the model include measuring the effect of changing the location of P&R facilities and evaluating the potential consolidation of multiple P&R facilities within a geographical area to one facility.

**“Parking for Transit-Oriented Development,”** Jeffrey Tumlin, Adam Millard-Ball, *2006 ITE Annual Meeting and Exhibit Compendium of Technical Papers*, 2006.

Citation at <http://tris.trb.org/view.aspx?id=793228>

*Abstract:* This paper describes how Transit Oriented Development (TOD) requires a different parking approach than conventional development. For transit agencies, investing in TOD rather than subsidized park-and-ride lots may produce higher ridership and higher revenue. TOD projects themselves will have inherently lower parking demand than conventional development, so municipalities should adjust their parking requirements to take advantage of more transit accessible locations. This paper offers case studies of transit agencies and municipalities that have taken innovative approaches to parking at TODs and examines how these strategies have helped achieve local economic development, transit ridership and quality of life goals.

### **International Perspective**

**“Park and Ride: Lessons from the UK Experience,”** Stuart Daniel Meek, Stephen Ison, Marcus Paul Enoch, *TRB 87th Annual Meeting Compendium of Papers DVD*, Paper #08-0730, 2008.

Citation at <http://tris.trb.org/view.aspx?id=847642>

With over 40 years’ experience with P&R facilities, the U.K. is in a unique position to evaluate the effectiveness of these facilities. Initially, P&Rs were placed in medium-size historic centers experiencing traffic congestion and with limited opportunity for expanding infrastructure in the urban core. With encouragement at the national level, P&Rs are applied today in many more types of settings. In this paper, the authors conclude that although P&R facilities are popular among motorists, their presence has also attracted users of existing public transport services and has generated additional trips, resulting in a counterproductive effect. For P&Rs to be successful, the authors recommend that they be implemented in tandem with other supply-side measures and used with rigorous restraint measures that discourage automobile use.

**“Cellular Automaton Simulation of Vehicle Dynamics in Park-and-Ride Facilities,”** Langston Lai, Amer S. Shalaby, *TRB 86th Annual Meeting Compendium of Papers CD-ROM*, Paper #07-1755, 2007.

Citation at <http://tris.trb.org/view.aspx?id=801852>

The authors note that while there are relatively few studies that address vehicle movements within P&R facilities, a thorough understanding of vehicle dynamics could assist transportation planners in forecasting demand and making objective evaluations of alternative P&R designs. In this study, researchers developed a microscopic P&R simulation model using the cellular automata (CA) approach. The authors describe CA models in this way:

In CA models, the physical setting being modelled is represented by a discrete lattice,  $L$ , of cells of the same size. These cells usually have regular shapes such as squares and rectangles and form a grid of cells. Each cell is described by a state,  $s$ , from a finite set of states,  $\mathcal{S}$ . The states of cells are updated as time progresses, as a function of the cell’s neighborhood ( $N$ ) and the local transition rules ( $R$ ).

The P&R model simulates a variety of driver actions such as surveying the environment, making parking choice decisions, and steering and controlling vehicles. Researchers compared current lot design with a slightly modified design using the Kipling Station South lot in Toronto to illustrate how the model evaluates different design layouts. Using the model, a modified design proposed to address bottleneck problems at entrance gate areas was found to reduce average queuing time by 37 percent.



## Locating Park-and-Ride Lots for Maximum Benefit

In the publications we highlight below, a 2009 FHWA report encourages the placement of properly sited P&Rs to accommodate increased transit demand resulting from congestion pricing, and a 2004 AASHTO guide provides the fundamentals of P&R planning and design. Other articles and studies explore the use of modeling and geographic information systems to site P&R facilities, the innovative siting of a P&R in a Washington state freeway median and the impact of shared-use P&Rs in Florida.

### National Guidance

**Transit and Congestion Pricing: A Primer**, FHWA, Report No. FHWA-HOP-09-015, April 2009.

<http://www.ops.fhwa.dot.gov/publications/fhwahop09015/fhwahop09015.pdf>

This report reviews the potential impacts that congestion pricing may have on public transit. Key lessons learned from U.S. and international experiences with congestion pricing include this from page 21 of the PDF:

Insufficient development of park-and-ride facilities has greatly limited transit's involvement in the domestic-pricing deployments. If mode shift is a project goal, properly sited parking must be developed to accommodate increased transit demand.

**Guide for Park-and-Ride Facilities**, AASHTO, Second Edition, 2004.

Table of contents at <https://bookstore.transportation.org/imageview.aspx?id=319&DB=3>

Information presented in this guide is intended to provide a general knowledge of the P&R planning and design process. Chapter content includes defining the park-and-ride system; park-and-ride planning process; operations and maintenance of park-and-ride facilities; design considerations for park-and-ride facilities; and architecture, landscape and art: integral parts of the park-and-ride facility.

### Other Domestic Publications

**“Facility Location Methodology for Optimal Placement of Park-and-Ride Facilities,”** Jhael Isa, Satish V. Ukkusuri, Kien Doan, Wilfredo Fernando Yushimito, *TRB 89th Annual Meeting Compendium of Papers DVD*, Paper #10-3301, 2010.

Citation at <http://tris.trb.org/view.aspx?id=911000>

In this paper, the authors describe a methodology for locating P&R facilities that takes qualitative measures which affect the accessibility and connectivity of P&R facilities and compiles them into quantitative analytical techniques. Measures of effectiveness were created to account for effects of emissions, congestion, connectivity, accessibility and demand. The results demonstrate the interrelationship between different objectives to obtain an optimal set of P&R sites. The model is implemented in the New York City area to illustrate results in a complex urban environment that can possibly be replicated in other cities.

**“Concepts for Coordinating Freeways and Transit in Multimodal Corridors,”** Christopher Erin Ferrell, Michael Carroll, Herbert S. Levinson, *TRB 89th Annual Meeting Compendium of Papers DVD*, Paper #10-3618, 2010.

Citation at <http://tris.trb.org/view.aspx?id=911183>

This paper introduces two key concepts to clarify the relationship between the auto and transit modes of travel along corridors. The first is corridor orientation, which broadly covers the degree to which a corridor is designed or has developed to encourage travel patterns by either auto or transit. This includes consideration of the access conditions, provision for P&R or kiss-and-ride, land use along the corridor, and the corridor's placement geographically in the region. The second concept is multimodal coordination, which is either complementary or supplementary:

- Complementary coordination occurs where the transit and a freeway facility sustain different travel markets, activity patterns and land uses within a defined corridor.
- Supplementary coordination occurs when the transit capacity provides additional support to the markets, activity patterns and land uses that are typically supported by the freeway.

Preliminary research for this project, which is funded under TCRP H-36, Reinventing the Interstate: A “New Paradigm” for Multimodal Transportation Facilities, suggests that the more complementary a freeway and transit corridor is, the more total patrons (freeway and transit) the corridor facilities will carry, while supplementary-designed facilities carry fewer total passengers.

**“Siting Park-and-Ride Facilities Using a Multi-objective Spatial Optimization Model,”** Bilal Farhan, Alan T. Murray, *Computers & Operations Research*, Vol. 35, No. 2, February 2008: 445-456.

Citation at [doi:10.1016/j.cor.2006.03.009](https://doi.org/10.1016/j.cor.2006.03.009)

This research focuses on three major siting/modeling concerns that must be addressed when siting P&R facilities: covering as much potential demand as possible, locating P&R facilities as close as possible to major roadways and siting these facilities in the context of an existing system. Existing models do not permit simultaneous analysis of each of these factors. This paper presents a model for integrating these considerations and applies the model for finding a compromise siting configuration for P&R facilities in Columbus, OH, from many available alternatives. Application results show how the inherent trade-offs when siting P&R facilities—for example, maximizing coverage of P&R users and siting P&R facilities as close as possible to major roadways—can be quantified and used in the siting analysis. The authors note that extensions of the model could address facility capacities, site costs and regional spacing.

**“Washington State's First Park-and-Ride in a Freeway Median,”** *The Urban Transportation Monitor*, Vol. 20, No. 17, September 29, 2006: 8.

Citation at <http://tris.trb.org/view.aspx?id=796462>

This article discusses plans for a P&R facility located in a freeway median in south Everett, WA.

Related resources:

- **“Innovation Meets Efficiency for South Everett’s New Median Park-and-Ride Lot,”** Sound Transit, September 11, 2008.  
<http://www.soundtransit.org/News-and-Events/News-Releases/News-Archive/SEVT-Ribboncut.xml>  
This online article describes the \$31.2 million south Everett P&R facility. The P&R, which opened on September 21, 2008, offers more than 400 parking spots for commuters plus direct access ramps for transit and HOV to the northbound and southbound lanes of I-5. The project includes new northbound and southbound HOV on- and off-ramps and an extended northbound HOV lane, which will allow buses, carpools and vanpools to enter and exit the freeway without weaving through three lanes of traffic. Planners estimate that use of the facility could cut up to six minutes off a round-trip bus ride to Seattle from south Everett.
- **Park and Ride Program,** Washington State Department of Transportation.  
<http://wsdot.wa.gov/TDM/parkRide.htm>  
*From the web site:* There is no dedicated state funding for park and rides. Park and ride lots in Washington are built, owned, and operated by multiple transit agencies, jurisdictions, and governmental agencies. Washington’s park and ride network has developed incrementally based on partnership opportunities, funding availability, and need. By the end of 2000, there were roughly 270 park and ride lots in Washington offering more than 30,000 parking spaces. WSDOT proposes development of a comprehensive statewide Park and Ride Program to plan, coordinate, develop, and implement partnerships for park and ride facilities.

#### **What is WSDOT’s proposed budget for the Park and Ride Program?**

The department is proposing \$150 million in funding for the Park and Ride Program over the next 10 years. The funding would:

- Integrate safety and security enhancements into park and ride facilities.
- Develop financial partners to acquire, expand and enhance lots.
- Target: Add 4,500 parking stalls.

**“A GIS-Based Approach for Delineating Market Areas for Park and Ride Facilities,”** Bilal Farhan, Alan T. Murray, *Transactions in GIS*, Vol. 9, No. 2, 2005: 91-108.

<http://cura.osu.edu/research/publications/data/farhan-murray2005.pdf>

Current approaches for identifying P&R market areas fall into three broad categories: methods that assume a geometric shape for the market area, methods based on travel cost comparison between travel modes and methods identifying current or past users. This paper develops an alternative to these methods—a GIS-based approach for delineating market areas for P&R facilities. The new approach simultaneously accounts for P&R facility accessibility and user travel direction. A visual comparison among the market areas proposed by the model showed

that the accessibility and travel direction approach is more realistic than other approaches used to identify market area.

**Evaluation of Shared Use Park & Ride Impact on Properties**, Florida Department of Transportation, U.S. DOT, Report No. NCTR-527-10, April 2004.

<http://ntl.bts.gov/lib/24000/24900/24999/527-10.pdf>

The purpose of this study is to document the effects of the presence of a shared-use P&R on shopping behavior patterns, whether it generates revenues for P&R providers, and whether the P&R generates ridership for transit service providers. Researchers administered a survey to P&R users at seven shared-use P&Rs throughout Florida. The survey included questions about frequency of use of the P&R, reason for parking in the P&R, alternative mode choices if the P&R was not available and a variety of questions related to shopping patterns. Results of the survey indicate:

- P&R users at the survey sites really are shopping at the shopping centers when they park at the P&R.
- Almost half of all of the survey respondents reported that they would have driven their cars all the way to their destination if the P&R lot had not been there, indicating that the presence of a shared-use P&R generates ridership for transit service providers.
- Other implied impacts include relief on local traffic congestion and decrease on demand for parking at destination sites.

### **International Perspective**

**“Optimal Location of Park and Ride Facility,”** Xiaoning Zhang, Haijun Huang, *International Conference on Transportation Engineering 2007*: 2753-2758.

Citation at <http://cedb.asce.org/cgi/WWWdisplay.cgi?157981>

*Abstract:* In this paper, we investigate the optimal location of a park-and-ride facility in a traffic corridor with a transit line and a freeway that [connects] a city center and a suburban area. With a fixed-point iterative calculating method, we can simultaneously determine the traffic pattern in equilibrium and cutting points of mode selection. In order to minimize the system wide travel expense, we can determine the optimal location of “park-and-ride” facility.

**“Locating and Pricing Park-and-Ride Facilities in a Linear Monocentric City with Deterministic Mode Choice,”** Judith Y. T. Wang, Hai Yang, Robin Lindsey, *Transportation Research Part B: Methodological*, Vol. 38, No. 8, September 2004: 709-731.

Citation at <http://trb.org/view.aspx?id=704714>

This paper investigates the optimal location and pricing of a P&R facility in a linear city with a highway and rail line that can be accessed at all points along the travel corridor, with all trips directed to the city center. In the paper’s conclusion, the authors note that use of a model similar to the one in this study found that a single cordon toll can be an effective tool for congestion pricing, suggesting that P&R facilities may lose much of their value if congestion pricing eventually becomes widespread. The authors acknowledge that most cities will not apply such pricing in the near future, and P&R facilities remain a “fertile topic for research.”

## Attracting Park-and-Ride Users

Transportation agencies continue to look for ways to encourage motorists to get off the highways and into P&Rs. A 2004 TCRP report looks at the parameters that make successful P&Rs attractive and the traveler decisions involved. One of the newest strategies to encourage P&R use is the smart parking system that uses technology to help motorists locate, reserve and pay for parking. The publications below highlight smart parking pilot programs in California, Illinois and Maryland. Other papers, articles and reports offer information on integrating bicycles with public transit and offer more general observations on motorist preferences and the factors that make for a successful P&R, both in the United States and abroad.

### National Guidance

**Evaluation of Transit Applications of Advanced Parking Management Systems—Final Evaluation Report**, U.S. DOT Research and Innovative Technology Administration (RITA), Report No. FHWA-JPO-08-052, May 9, 2008.

<http://ntl.bts.gov/lib/30000/30500/30588/14432.pdf>

This report presents the results of an independent national evaluation of two transit applications of parking management systems: one that was deployed in conjunction with two Metra stations in suburbs southwest of Chicago and the other deployed in conjunction with two Metro stations in Montgomery County, MD. Researchers conducted passenger surveys of transit riders and staff interviews, and gathered data on transit ridership and archived system data on in and out counts at the lots. Study results indicate that it is unclear whether the parking management systems increased parking utilization or transit ridership, or whether they reduced circulation within and between P&R lots.

**Advanced Parking Management Systems: A Cross-Cutting Study; Taking the Stress Out of Parking**, FHWA, Report No. FHWA-JPO-07-011, January 2007.

[http://www.its.dot.gov/jpodocs/repts\\_te/14318\\_files/14318.pdf](http://www.its.dot.gov/jpodocs/repts_te/14318_files/14318.pdf)

This study examines advanced parking management systems (APMSs) in three venues: airports, central business districts and transit P&R locations. The systems examined in this study provide directional and space availability information to patrons as they proceed to the parking facility. Among the case studies included in the report is an examination of the Chicago Metra P&R. Specific benefits found in visits to sites with APMSs include reduced frustration, increased venue accessibility, increased facility occupancy and improved traffic flow.

**Traveler Response to Transportation System Changes: Chapter 3, Park-and-Ride/Pool**, *TCRP Report 95*, 2004.

[http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp\\_rpt\\_95c3.pdf](http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_95c3.pdf)

This chapter of *TCRP Report 95* covers travel demand and related aspects of providing and supporting P&R and park-and-pool facilities. The chapter begins with a categorization and description of the characteristics of the various approaches to P&R development. Traveler response by type of P&R facility is presented with usage characteristics, related travel data and descriptions of response to the facility. The chapter also explores the parameters that make successful P&R and park-and-pool facilities attractive, and the mode choice mechanisms and decisions involved. Information about P&R/pool user and usage characteristics, and effects on energy, air quality and costs is also provided. The chapter closes with four case study examples of P&R/pool facilities ranging from metropolitan systems to individual lots.

### California's Experience

**“Response of Regional Rail Park-and-Ride Users to Parking Price Changes: Systemwide Results and a Detailed Study of Two Stations,”** Sarah Syed, Aaron Golub, Elizabeth Deakin, *Transportation Research Record*, Vol. 2110, 2009: 155-162.

Citation at <http://dx.doi.org/10.3141/2110-19>

This study investigated traveler response to the introduction of parking user fees at heavily patronized P&R facilities within California's San Francisco BART district. Researchers conducted detailed research at two stations using mail and license plate surveys and focus groups. Results indicate modest overall effects from the price increase. The increased availability of parking resulting from new reserved spaces and the introduction of fees made parking available later and pushed back morning arrival times. New, higher-fee, daily reserved spaces were more popular than the monthly reserved spaces they replaced. Researchers concluded that “as long as service, cleanliness,

security, and convenience are maintained or improved for parkers, as other access modes are also supported and improved, most riders appear more than willing to pay the new fees.”

**Smart Parking Management Field Test: A Bay Area Rapid Transit (BART) District Parking Demonstration; Final Report,** Caroline J. Rodier, Susan A. Shaheen, Charlene Kemmerer, California PATH Program, Institute of Transportation Studies, University of California, Berkeley, Report No. UCD-ITS-RR-08-32, June 2008.

PDF available for download at [http://pubs.its.ucdavis.edu/publication\\_detail.php?id=1237](http://pubs.its.ucdavis.edu/publication_detail.php?id=1237)

This report presents an evaluation of the first transit-based smart parking project in the United States at the San Francisco BART district station in Oakland, CA. The authors broadly define “smart parking” as the use of advanced technologies to help motorists locate, reserve and pay for parking. Launched in December 2004, the project used a survey to identify participants’ demographic attributes, response to the service and changes in travel patterns. Since the 2004 project launch, two other transit-based smart parking systems have been implemented at Metro stations in Montgomery County, MD, and at three Metra stations in Chicago. Analysis of the user response indicated:

- Most respondents used smart parking to travel to their on-site work location one to three days per month.
- Most respondents used the advanced reservation service via phone or Internet to access the smart parking system.
- Thirty-seven percent of respondents had seen one or more of the changeable message signs with smart parking information, but only 32 percent of those used this information to decide whether to continue driving or take BART instead.

In terms of changes in travel patterns, survey results indicated:

- Increases in BART modal share and reductions in drive-alone mode share.
- Reductions in carpooling and bus modes.
- Increased driving to the BART station.
- Decreased average commute time.
- Reduction in total vehicle miles traveled.

Researchers also noted that the majority of participants continued to use the service when fees were implemented, and commented that the revenues obtained from the smart parking system may provide the funds needed to expand BART station parking facilities and allow for further ridership expansion.

### **Other Domestic Publications**

**“Integrating Bicycling and Public Transport in North America,”** John Pucher, Ralph Buehler, *Journal of Public Transportation*, Vol. 12, No. 3, 2009: 79-104.

<http://www.nctr.usf.edu/jpt/pdf/JPT12-3Pucher.pdf>

This article describes current approaches to integrating bicycling and public transit with case studies of bike-transit integration in six large American cities (San Francisco; Portland, OR; Minneapolis; Chicago; Washington, D.C.; and New York) and two Canadian cities (Vancouver and Toronto).

From the article’s conclusion:

Paradoxically, bike-and-ride can become problematic where it is most successful. Capacity problems are most likely to arise in cities with well-used public transport and high levels of cycling. That is why the European approach to bike-and-ride has favored the provision of ample, sheltered, secure bike parking at transit stops instead of accommodating bikes on transit vehicles. Similarly, in North American cities with overcrowding of rail vehicles during rush hours, the focus should probably be on providing improved bike parking at rail stations. Not only is more parking needed, but it should be of higher quality, with more sheltered and secure spaces. Major transit terminals should include multi-service bike stations, such as those in northern Europe. Similar to the concept of “complete streets,” an appropriate goal of transit systems in North America should be to provide “complete stations,” which fully accommodate the needs of cyclists.

Related resource:

- *Bicycle Parking, Storage and Changing Facilities*, Online TDM Encyclopedia, Victoria Transport Policy Institute, updated January 2010.  
<http://www.vtpi.org/tdm/tdm85.htm>  
This web site provides best practices for bike parking, links to state standards, and a selection of references and additional resources.

**“Exploring Heterogeneity in Park-and-Ride Preferences: Latent Class Model,”** Eric Molin, Ilona Bos, *TRB 88th Annual Meeting Compendium of Papers DVD*, Paper #09-1066, 2009.

Citation at <http://tris.trb.org/view.aspx?id=880975>

This paper describes models developed by researchers using data from an experiment where participants stated a preference when presented with P&R, car and public transport alternatives. Based on the results, five segments could be identified: a *public transport lover*, two *P&R lover* segments, and two *car lover* segments. Results indicate that the *P&R lover* segments are less affected by P&R attributes than by car attributes. This suggests that policy measures aimed at improving the quality of the P&R will probably not result in many additional P&R users. Conversely, measures that negatively affect use of the car—such as increasing parking costs within city centers, introducing tolls within city centers and limiting the number of parking places—are likely to be more effective.

**“Characteristics of the Most Successful Park-and-Ride Lots in North America: This Week's Survey Results,”** *The Urban Transportation Monitor*, Vol. 20, No. 12, 2006: 9-12.

Citation at <http://tris.trb.org/view.aspx?id=786215>

The survey consists of responses from 30 public transportation agencies on the characteristics of the most successful P&R lots in the United States and Canada, including:

- Capacity.
- Maximum number of cars on average weekday.
- Distance to closest highway, central business district and the outer edge of urban development.
- Predominant land use in market area and surrounding the P&R.
- Amenities present.
- Parking charge.
- Mode(s) serving the P&R lot.
- Peak period headway of transit serving the P&R.
- Major reasons provided by respondents as to why their P&R lot is a success.

### **International Perspective**

**“Smart Park&Ride—Conceptualising and Demonstrating Intelligent P&R Service in Stockholm,”** Vesna Lucassi, Niklas Johansson, Ake Lindstrom, *16th ITS World Congress and Exhibition on Intelligent Transport Systems and Services*, 2009.

Citation at <http://tris.trb.org/view.aspx?id=906756>

The Sickla Smart Park&Ride Project is a two-year project sponsored by Stockholm Public Transport Authority, Swedish National Road Administration and the owner of the Sickla Galleria Mall in Stockholm. The project’s premise is that a P&R location that combines the general attractiveness of public transport with the attractiveness of a shopping center increases the total attractiveness of a P&R facility. The project is also examining smart P&R design, new technologies and intelligent data information bundling.

**“Park & Ride User Path Problem: Findings from On-Board Surveys,”** Martin Trepanier, Catherine Morency, Isabelle Gossman, *11th World Conference on Transport Research*, 2007.

Citation at <http://tris.trb.org/view.aspx?id=877113>

*Abstract:* This paper presents findings on the behavior of park-and-ride users that were obtained from commuter rail on-board surveys in the Greater Montreal Area (Canada). The datasets are used to estimate a disutility function for the Park-and-Ride User Path Problem. Results show that access to the train station, by car, is the more important parameter in deciding the park-and-ride path; actually, nearest train station predicts more than 50 percent of the observed path. Other significant parameters are travel time (in the train), walk time at the parking lot and transit fare (monthly pass).

**Park and Ride: Characteristics and Demand Forecasting**, Land Transport New Zealand, Research Report 328, September 2007.

<http://www.nzta.govt.nz/resources/research/reports/328/docs/328.pdf>

This report examines the characteristics of P&R usage and suggests demand modeling methodologies based on these characteristics for changes in demand at existing sites, and estimation of demand at new sites. It reviews New Zealand and international evidence on the nature of P&R usage and the factors that influence it. The report then examines potential P&R modeling methodologies and identifies the most appropriate models for New Zealand.

**“Modeling Effect of Travel Time Uncertainty and Traffic Information on Use of Park-and-Ride Facilities,”**

Ilona Bos, Dick Ettema, Eric Molin, *Transportation Research Record*, Vol. 1898, 2004: 37-44.

Citation at <http://dx.doi.org/10.3141/1898-05>

The authors present an approach to determine the effect of travel time uncertainty and traffic information on mode choice in general and on the potential patronage of P&R facilities in particular. Simulations using a P&R facility in the Netherlands suggest that providing travelers with travel time information increases the patronage of P&R facilities. (The authors conclude that this is because use of the car is avoided in the case of heavy congestion.) However, the effect of providing information is limited when compared with other factors such as the quality of the P&R option in terms of travel time, facilities and costs.

## Park-and-Ride Planning Documents

P&R planning manuals and related documents from Florida, New York and Texas DOTs are presented below. We also include recent FHWA publications that describe Integrated Corridor Management (ICM) studies in California and Minnesota, which consider the application of P&Rs within a broader regional context.

### California

**Concept of Operations for the I-15 Corridor in San Diego, California**, U.S. DOT RITA, Report No. FHWA-JPO-08-009, March 31, 2008.

[http://www.itsdocs.fhwa.dot.gov/JPODOCS/REPTS\\_TE/14395\\_files/14395.pdf](http://www.itsdocs.fhwa.dot.gov/JPODOCS/REPTS_TE/14395_files/14395.pdf)

This project—to be deployed along the I-15 corridor and including the cities of San Diego, Poway and Escondido—is one of three Concept of Operations (ConOps) developed in connection with the U.S. DOT's ICM Initiative. This document provides an overview of the San Diego region's ICM System (ICMS) concept, describes current operations in the corridor, explains how they will function in the near term once the ICMS concept is operational, and identifies current and future responsibilities of San Diego regional stakeholders. Page 95 of the PDF provides the vision statement for the I-15 ICMS transportation corridor, including:

To facilitate HOV use, travelers will be able to use Park and Ride facilities equipped with smart parking technologies at BRT stations along the corridor, and buses will have efficient access from the BRT stations to the Managed Lanes through DARs. The Managed Lanes, while also promoting HOV use, will serve multiple modes of transportation and operate as limited-access lanes in which carpools, vanpools, and buses have first priority and travel free of charge. Single occupancy vehicles will be able to legally use these lanes by paying a fee and physically gain access to them from general purpose lanes through ingress-egress points. The Managed Lanes will maintain free-flow conditions, and the volume of traffic will be controlled by regulating the toll fee through dynamic variable pricing.

### Florida

**State Park & Ride Lot Program: Planning Manual**, Florida Department of Transportation, September 1996.

<http://www.dot.state.fl.us/transit/Pages/StateParkandRideLotPlanningManual.pdf>

First published in 1989 and revised in 1996, this detailed planning manual includes information on:

- Planning process.
- Site selection (system and project levels).
- Estimating demand and facility size.
- Impact assessments.
- Economic analysis and project justification.
- Conceptual design considerations.
- Promotion.
- Planning ancillary services.
- Evaluating performance of existing facilities.
- Program performance evaluations.
- Private participation.

Related documents:

- **Park and Ride Lot Program**, Procedure Topic No. 725-030-002-f, Florida Department of Transportation, May 14, 2001.  
<http://www2.dot.state.fl.us/proceduraldocuments/procedures/bin/725030002.pdf>  
This document provides the procedures applicable to the planning, implementation, promotion, maintenance and monitoring of P&R facilities by Florida DOT.
- **Update of FDOT State Park & Ride Lot Program Planning Manual: Chapters 3, 4 and 6**, Florida Department of Transportation, April 2001.  
<http://www.dot.state.fl.us/transit/Pages/StateParkandRideUpdatestoChapter34and6.pdf>  
This limited revision of Florida DOT's P&R manual updates the chapters on site selection, demand and facility size estimation, and economic analysis and project justification.



## Minnesota

**Concept of Operations for the I-394 Corridor in Minneapolis, Minnesota**, U.S. DOT RITA, Report No. FHWA-JPO-08-006, March 31, 2008.

[http://ntl.bts.gov/lib/30000/30300/30310/14392\\_files/14392.pdf](http://ntl.bts.gov/lib/30000/30300/30310/14392_files/14392.pdf)

This ConOps is for the I-394 Corridor that serves the more than 1 million residents of Hennepin County, MN. This corridor is served by a combination of three interrelated networks—a freeway network, a series of arterial highways and a transit system operated by three transit agencies. Corridor problems and needs to be addressed by ICM include (from page 25 of the PDF):

**4. The need to assemble and disseminate park-and-ride availability.** The ICMS needs to assemble and disseminate information to travelers about parking availability at various park-and-ride facilities. Travelers need this information to decide if transit is a viable option. This assembly of information will support traveler information systems dissemination of the information. This ultimately will allow travelers to not only understand if transit is a viable option, but if they can park their car at a nearby lot and join the transit network.

## New York

**Highway Design Manual, Chapter 24—Mobility Measures, Revision 32**, New York State Department of Transportation, May 4, 1998.

[https://www.nysdot.gov/divisions/engineering/design/dqab/hdm/hdm-repository/chapt\\_24.pdf](https://www.nysdot.gov/divisions/engineering/design/dqab/hdm/hdm-repository/chapt_24.pdf)

See page 73 of the PDF for Section 24.3, Commuter Transfer Facilities, which addresses site selection; interior lot layout; pavement and shoulders; drainage and snow removal; signing and pavement markings; lighting; furnishings; landscape development; security; and maintenance and operation. Shared-use and park-and-pool lots are also addressed.

## Texas

**Roadway Design Manual, Chapter 7, Miscellaneous Design Elements; Section 4: Parking**, Texas Department of Transportation, March 2010.

See page 225 of the PDF at <http://onlinemanuals.txdot.gov/txdotmanuals/rdw/rdw.pdf>

This section of the Roadway Design Manual provides location criteria and design features for typical P&R lots.

## **Informal Survey of State Practice**

We contacted P&R coordinators in Florida, New Jersey and Washington—states that have developed P&R program manuals, conducted recent P&R-related research or developed innovative P&R facilities—to gather additional information about their respective P&R programs. We also contacted two national transportation organizations to get their thoughts on exemplary state DOT P&R programs.

### **State Agencies**

#### **Florida**

Contact: Jon M. Ausman, Federal Grants Manager, Public Transit Office, Florida Department of Transportation, (850) 414-4519, [jon.ausman@dot.state.fl.us](mailto:jon.ausman@dot.state.fl.us).

Given its present funding situation, Florida DOT's 105 P&R facilities are not expected to grow in number, but individual facilities may be expanded. Florida DOT is considering updates to its P&R program planning manual, which was last updated in 2001 (see page 15 of this Preliminary Investigation), but there are no plans—or funding—to update the manual this year.

Florida DOT tries to push P&R linkages with transit and typically has limited state-level funding available each year (approximately \$1 million). Key factors in selecting P&R projects include:

- A local funding match exists.
- The project is tied to transit.
- Funds for the project are expended as quickly as possible, preferably in the same fiscal year as the allocation.
- The expected occupancy rate is 60 percent or higher.

Mr. Ausman notes the tendency for Florida DOT districts to “park” P&R funding for years and then divert the P&R funding to another program after accumulating additional funding from other sources. This has led Florida DOT to encourage use of funding during the fiscal year in which it is allocated.

Florida DOT requires its seven districts and the Turnpike Enterprise to conduct semiannual surveys of P&R facilities. The surveys evaluate occupancy rate, security, signage, ingress/egress, lighting, striping and other P&R characteristics. The surveys do not include user surveys and are typically conducted by district staff.

Mr. Ausman notes that Florida DOT districts have different emphases when it comes to their P&R facilities:

- District 3 (includes the cities of Pensacola and Tallahassee) has mostly rural P&R lots. The district has established relationships with local governments and private entities to provide P&R facilities.
- District 4 (counties of Broward, Indian River, Martin, Palm Beach and St. Lucie; includes the cities of Fort Lauderdale and Boca Raton) has focused on marketing its P&Rs as a way to hook into Tri-Rail—a commuter rail system between West Palm Beach and Miami—and encourage motorists to get off the I-95 corridor.
- District 6 (counties of Miami-Dade and Monroe) has the most occupied P&R lots, with some lots at 120 percent capacity. (Cars are parking on the grass surrounding the lots.) This district uses consultants for most P&R-related activities, including the required semiannual surveys.

Additional information about P&Rs maintained by Florida DOT district offices is available from:

- District 3: Kathy Rudd, (850) 415-9549.
- District 4: Larry Merritt, (954) 777-4683.
- District 6: Ed Carson, (305) 470-5255.

## **New Jersey**

Contact: William Piedra, Director, Park and Ride Program, New Jersey Department of Transportation, (609) 530-5936, [william.piedra@dot.state.nj.us](mailto:william.piedra@dot.state.nj.us).

Mr. Piedra estimates that New Jersey has more than 350 P&R facilities, which includes facilities owned or leased by the state and those maintained by municipalities or private entities. A web-based P&R locator is available at <http://www.state.nj.us/transportation/commuter/rideshare/prlocate.shtm>. Of the overall P&R inventory, New Jersey DOT leases 14 facilities and owns 30. A few new P&R projects are in the pipeline, but it is unclear when these projects might come to fruition.

Periodic inventories of P&R facilities gather data for entry in a central database. New Jersey's eight Transportation Management Associations (TMAs) assist in the data-gathering effort. The TMAs are nonprofit, public/private partnerships between businesses and local government to provide commuter information and services. (See <http://www.state.nj.us/transportation/commuter/rideshare/tma.shtm> for information about New Jersey's TMAs.)

New Jersey DOT's best practices to attract P&R users include:

- Effective advertising and appropriate signage in the P&R facilities.
- Developing partnerships with all interested parties (bus companies, TMAs, etc.).

Mr. Piedra notes that proximity of the P&R facility to highways and the availability of amenities such as shopping, Laundromats, food and reading material improve P&R usage as do how well the P&R is lit and how safe users feel in the facility. Most state-owned P&Rs are patrolled by local police officers, and signs in the facilities indicate how often the site is patrolled. Some P&R lots are never patrolled or are poorly lit, and these lots typically have lower usage.

Use of a P&R facility is free to commuters if New Jersey DOT maintains it; Mr. Piedra notes that use of these lots is high. State or federal funding used for New Jersey DOT P&R facilities precludes the charging of fees or restricting parking to make it available for local residents. There are a few P&R facilities owned by New Jersey DOT but managed by a local government, and these lots may charge fees if the municipality has contributed land or funding to the P&R project.

Shared-use P&Rs are widely used in New Jersey and have been for some time, with New Jersey DOT leasing spaces from malls, churches, bowling alleys, restaurants, movie theaters and office complexes. New Jersey DOT typically seeks a three- to 10-year lease.

Mr. Piedra notes that many of the recommendations included in the 2007 study that considered technical solutions for New Jersey's overcrowded P&Rs (see page 7 of this Preliminary Investigation) have yet to be implemented. New Jersey DOT is more likely to employ a less cost-intensive approach than those recommended in the 2007 study by modifying striping in the P&R lot to accommodate more commuters. Some New Jersey P&Rs are experimenting with valet parking as a way to accommodate more vehicles. One lot with 150 spaces has been able to accommodate between 225 and 250 cars with the use of a valet attendant to move vehicles throughout the day. Mr. Piedra notes that valet parking is not an option for New Jersey's state-owned P&Rs.

A project is under way to create a GIS-based model to determine optimal location of new P&R facilities. New Jersey DOT has high expectations for the model, and hopes that the result of the consultant's efforts will be published and available for use by other state DOTs. At this time there is no target date for completion of the model.

## **Washington**

Contact: Evan Olsen, Federal Programs Planner, Public Transportation Division, Washington State Department of Transportation, (360) 705-6929, [olsene@wsdot.wa.gov](mailto:olsene@wsdot.wa.gov).

Mr. Olsen estimates that the state of Washington has approximately 350 P&R facilities; 70 percent of these facilities are in the Puget Sound area. Information about statewide P&R locations is available at <http://www.wsdot.wa.gov/choices/parkride.htm>.

P&R facilities are funded through capital funding provided by the state Legislature and not through guaranteed Washington State DOT program funding. Mr. Olsen notes a current funding limitation: Motor Vehicle Fund revenue is protected by the 18th Amendment to the state constitution and can only be used for highway purposes. Any transit amenity added to a P&R facility or a shared-use lot means that Motor Vehicle Fund revenue cannot be applied. This has led local governments like King County to purchase state-owned land for a P&R and convert the facility to mixed-use. Policy discussions that began two years ago at Washington State DOT in an attempt to get a better handle on P&R program management have stalled.

Washington's P&R network developed incrementally based on partnership opportunities, funding availability and need. Leftover right of way that was available after the Interstate was developed has been used for P&Rs, and Washington State DOT works with transit agencies in cooperative agreements for further P&R development. In Washington's decentralized process, state transit agencies apply for and receive funding for P&R facilities through Washington State DOT's Regional Mobility Grant Program. (See <http://www.wsdot.wa.gov/tdm/mobility/> for more information.) As in Florida, P&Rs in Washington tend to develop in association with transit access. Shared-use lots are supported by Washington State DOT, but the specifics of securing the land are left to the local agencies.

Innovation in the P&R program is seen in the south Everett freeway median P&R, built through a partnership between Sound Transit, Washington State DOT and the city of Everett. (See page 10 of this Preliminary Investigation for more information about the freeway median P&R.) Mr. Olsen notes that local taxes funded part of the construction of the south Everett P&R.

Mr. Olsen notes a statewide preference to expand existing lots rather than build new ones, commenting that it is more cost-effective to expand a high-use lot. Local agencies seeking to site new facilities look to their own planning departments to evaluate densities and travel patterns. Mr. Olsen is not aware of modeling that may be used in siting new facilities. The primary issue now is how to add capacity or shift demand. At this point, only one lot in the Tacoma area is charging fees, but other P&R facility owners are looking at the possibility of charging fees for P&R use.

P&R facilities along Washington's freeway system are the best used, with older lots in the freeway right of way showing 70 percent usage rates. Metro P&Rs also show good use. Utilization data is collected by transit agencies either monthly or quarterly, and quarterly reports are generated and provided to Washington State DOT. (These reports are not publicly available but may be available from Washington State DOT upon request.)

## **National Organizations**

### **AASHTO**

Contact: Shayne H. Gill, Liaison for AASHTO Standing Committee on Public Transportation, (202) 624-3630, [sgill@aaashto.org](mailto:sgill@aaashto.org).

Mr. Gill advised that the best source of information is AASHTO's Guide for Park-and-Ride Facilities. (See page 9 of this Preliminary Investigation.)

### **FHWA**

Contact: Wayne Berman, Office of Operations, (202) 366-4069, [wayne.berman@dot.gov](mailto:wayne.berman@dot.gov).

Mr. Berman noted that FHWA has not done much work on P&Rs in a long time—at least 10 years—and recommended a review of recent NCHRP and TCRP publications.

## **Projects in Process**

A New York study, scheduled to conclude this summer, is expected to result in guidance for P&R project development.

**“New York City Park and Ride Study,”** Rensselaer Polytechnic Institute, expected completion date: July 31, 2010.

<http://www.utrc2.org/research/projects.php?viewid=187>

This project, co-sponsored by the New York State Department of Transportation and U.S. DOT RITA, is not intended to advocate for a specific transportation solution. Rather, the study results will provide guidance to assure that if development of a P&R facility is recommended, the best possible system and projects are developed. The project’s investigators note that the transportation problem in parts of New York City and its surrounding areas is associated with the cost of travel, traffic congestion and limited downtown parking opportunities rather than the lack of P&R facilities.