



Office of Research, Development, and Technology

**Fiscal Year 2004
PERFORMANCE
REPORT**

Research that is Essential, Indispensable, and Connected to our Customers.

Turner-Fairbank Highway Research Center

FY 2004

PERFORMANCE REPORT

Welcome	3	Appendix A: R&D Research Project Status	A-1
I. Who We Are and What We Do	5	Appendix B: RD&T Services	B-1
Innovators For a Better Future	5	R&D Technical Services	B-2
RD&T Workforce	6	Corporate Support Services	B-9
RD&T Organization	8	Organizational Support Services	B-15
RD&T Around the Community	10	Appendix C: RD&T Customer Outreach Activities	C-1
Outreach and Special Events	11	Coastal Storm Runoff	C-2
II. The Strategic Framework	15	FHWA Bridge Leadership Council	C-2
The FHWA R&T Program	15	FHWA Partnership with South Dakota to Improve Culvert Design	C-2
Vision and Mission	15	FHWA and the National Concrete Bridge Council (NCBC) Annual Meeting	C-2
FHWA Strategic Goals for FY 2004	16	The Next Generation Simulation	C-2
The Vital Few	16	FHWA Researchers Visit Virginia's Smart Road	C-2
RD&T Corporate Missions and Functions	16	Roundabout Workshops	C-3
III. Our Business Results	19	Safety Partnership Report Helps Shape Agenda	C-3
RD&T Challenges, Commitments, and Achievements	19	Self-Consolidating Concrete (SCC) Beam Test	C-3
Effectively Deliver Needed Products and Services	20	Technical Expertise for Security	C-3
Improve Business and Administrative Processes	20	The Office of Infrastructure R&D Technical Seminar Series	C-4
Develop and Recognize Employees	22	Appendix D: Market-Ready Technologies	D-1
Communicate the FHWA R&T Story and Future Agenda	24	FHWA List of Market-Ready T&Is	D-2
2004 Research Project Status Summary	26	AASHTO Technology Implementation Group Approved Technologies	D-4
Lab Assessments	26	Appendix E: FHWA RESEARCH AND TECHNOLOGY PARTNERSHIPS	E-1
RD&T Success Stories	27	The Transportation Pooled Fund (TPF) Program	E-2
IV. RD&T Performance Management	37	Small Business Innovation Research Program	E-3
Performance Management Framework	37	International Involvement	E-3
Performance Management Workgroup	40	Concrete Pavement Technology Program (CPTP)	E-6
RD&T Research Benefits Case Studies	40	Abbreviations: Appendix F	F-1
Customer Feedback	40		
RD&T Lab Assessment Process	41		

Welcome

I am pleased to share with you our third annual performance report to the American public and our stakeholders in the transportation community. As each year progresses, the Federal Highway Administration (FHWA) Office of Research, Development, and Technology (RD&T) seeks out new and improved ways to provide high quality research products and technology services to our customers.

It is important to realize that research is not an end in itself, but an investment. There are significant transportation challenges that face our Nation today, and we at RD&T conduct research aimed at improving safety and security on our highways, enhancing mobility, and improving the condition and performance of our roads and bridges. The FHWA research and technology (R&T) program directly supports the goals of the Agency and the U.S. Department of Transportation (USDOT).

Fiscal year (FY) 2004 was eventful, and everyone in the R&T program can attest to many challenges and accomplishments. It was a challenge to carry out the work we planned without a budget and long-term authorization in place. However, RD&T researchers and staff made a number of accomplishments and notable achievements that are highlighted in this report. Also, over 60 multiyear program plans were developed to provide direction for future R&T activities, and a new exhibit showcased FHWA's Priority Market-Ready Technologies at the Transportation Research Board's Annual Meeting and the American Association of State Highway and Transportation Officials (AASHTO) National Research Advisory Committee (RAC) meeting.

There will be some exciting new developments in the upcoming year for the FHWA R&T program. I am pleased to announce that Debra Elston will be the Director of the new Office of Corporate Research and Technology. This office will facilitate the FHWA R&T Leadership Team's effort to carry out the 26 agency commitments under the *Corporate Master Plan*.

It is the goal of our office to serve you by providing high quality research products and technology services. We encourage you to provide us with feedback on this report through the Turner-Fairbank Highway Research Center Web site at <http://www.tfhrc.gov>. As always, we hope that this report encourages you to learn more about RD&T's people, labs, services, and research.



Dennis C. Judycki

Associate Administrator for Research, Development,
and Technology

I. Who We Are and What We Do

The Federal Highway Administration (FHWA) Office of Research, Development, and Technology (RD&T) is organized into 6 offices with 15 teams of experts in more than 30 transportation-related disciplines. Three research and development (R&D) offices—Operations, Safety, and Infrastructure—conduct R&D to provide continual improvement in their areas of expertise. The Office of Program Development and Evaluation develops and executes policy, budget, program management, and administrative mechanisms to help FHWA carry out a nationwide research and technology (R&T) program. The Office of Research and Technology Services develops and executes a comprehensive RD&T communications strategy and marketing plan that supports FHWA R&T programs and technology transfer and delivery. The Office of Resource Management provides administrative services for RD&T.

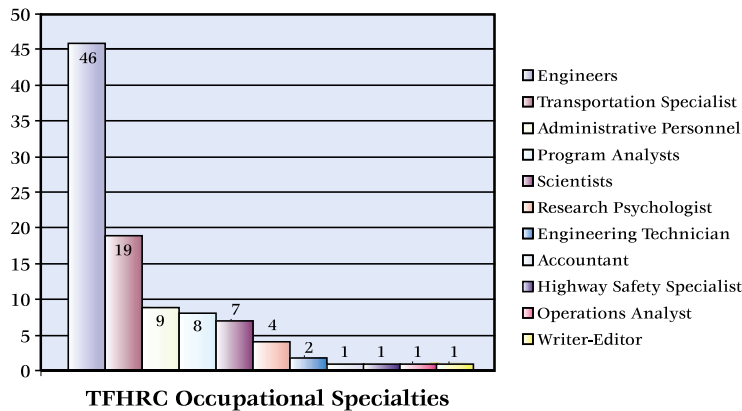
RD&T is located at the Turner-Fairbank Highway Research Center (TFHRC), a federally owned and operated research facility in McLean, VA that contains more than 24 indoor and outdoor laboratories (labs) and support facilities. RD&T employs more than 300 Federal and contract transportation researchers, students, and support personnel. RD&T coordinates and collaborates extensively with other FHWA and the U.S. Department of Transportation (USDOT) offices, State and local government partners, academic organizations, companies in the industry, military research offices, and professional organizations. In addition, RD&T serves as the focal point for FHWA participation in cooperative research activities, such as the National Cooperative Highway Research Program (NCHRP) and the Transportation Pooled Fund (TPF) Program.

Innovators For a Better Future

To support the FHWA role of “innovators for a better future,” FHWA management is committed to:

- ▶ Investing in and conducting transportation research with and on behalf of partners and stakeholders.
- ▶ Creating an environment for and delivering innovation in the transportation community through the development of tools, technology transfer, training, and technical assistance.
- ▶ Continually reevaluating and improving the effectiveness and efficiency of technology and innovation deployment.

In an effort to facilitate and better support the achievement of agency goals in research and technology, a new Office of Corporate Research and Technology is being established.



We continually seek to promote partnerships with State and local governments, academia, and the private sector to quickly and cost-effectively transform new technologies, concepts, and ideas into better transportation systems, processes, and services.

The organizational change will enable a corporate focus and strategy for investing in and conducting research, and will provide leadership in implementing the *Corporate Master Plan for Research and Deployment of Technology & Innovation*. As part of a broader communication plan, the Office of Corporate Research and Technology will publish an annual report on agency-wide, corporate R&T activities and initiatives. The RD&T Performance Report provides specific focus on research, development and technology at the TFHRC.

RD&T Workforce

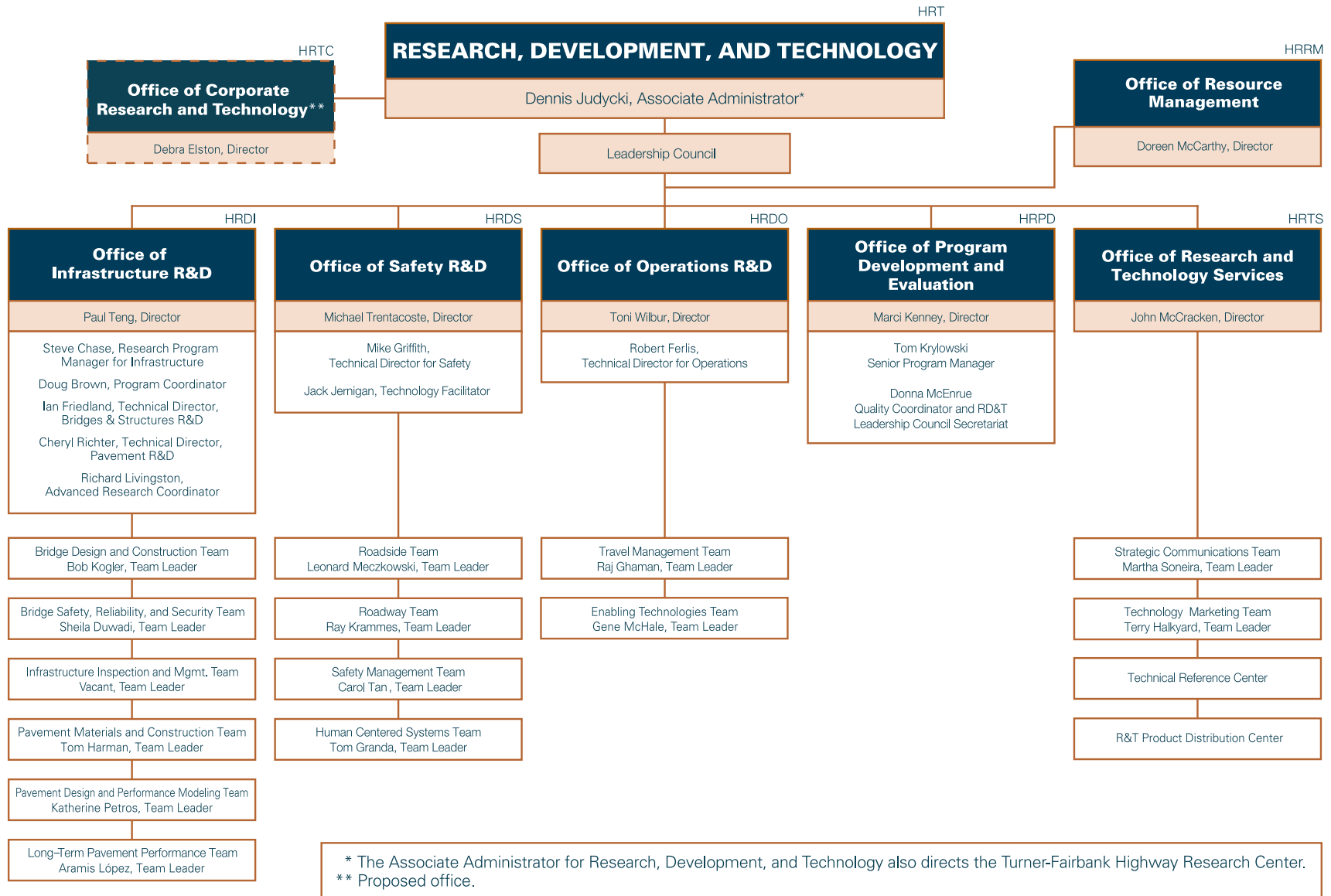
RD&T staff embodies a great deal of specialized scientific and engineering expertise, complemented by a valuable understanding of customer needs. The current workforce consists of 105 Federal employees. The positions represented in this number include: 46 engineers, 19 transportation specialists, 9 administrative personnel, 8 program analysts, 7 scientists, 4 research psychologists, 2 engineering technicians, 1 accountant, 1 highway safety specialist, 1 operations research analyst, 1 writer-editor, and 5 senior executive service managers.

Over the years the makeup of the workforce has shifted as RD&T has increased its use of contractor support to accomplish its mission. Since the early 1980s RD&T has reduced the number of Federal staff performing research and research support activities to around half of the original number of employees, while increasing the number of onsite contractors to approximately 200. In FY 2004, RD&T conducted an analysis of its responses on the FHWA All Employee Survey in order to compare and contrast RD&T responses to overall FHWA employee responses and perceptions, and to provide useful input to the annual RD&T Self Assessment process. The analysis revealed several organizational strengths and areas for improvement. RD&T scored high, 85.2 percent, in the area of customer focus (responsiveness to customer needs). Other strengths were workgroup management, job quality, and com-

munication flow. Items tied to resources (equipment, travel funds, facilities) and staffing levels received lower ratings.



The Federal researchers and staff at TFHRC



January 2005

RD&T Organization

Infrastructure R&D

The Office of Infrastructure R&D (HRDI) focuses on improving the performance of highway infrastructure and significantly reducing associated long-term costs. The comprehensive and coordinated infrastructure research program conducts R&D that cuts across the boundaries of asset management, pavements, and structures. In the structures arena, researchers employ a systems approach to integrate design, construction, durability, maintenance, inspection, and long-term performance into the bridge systems of the future. They work to ensure that highway structures are safe and reliable for all service conditions including potential structural, environmental, and human-generated threats. Structural researchers also study and develop technologies to detect, measure, assess, and control all processes and mechanisms that limit the useful life of highway structures. They develop applications to better preserve, maintain, and manage the Nation's highway bridges. In the pavement area, researchers develop models, procedures, and processes that help transportation specialists predict pavement performance and select designs to optimize pavement performance and life cycle costs. They pursue increased pavement life by developing a better understanding of asphalt and portland cement concrete paving materials and the pavement construction process, and by developing better predictive tools for use in the laboratory and on the roadway. The Long-Term Pavement Performance (LTPP) program aims to increase the understanding of why some pavements perform better than others. This information is key to building and maintaining a cost-effective highway system. Advanced infrastructure research focuses on nanoscience technology and computational structural mechanics to improve highway materials and structural performance.

Operations R&D

The Office of Operations R&D (HRDO) conducts research to mitigate congestion and improve safety through better man-

agement and operation of the surface transportation system. The Travel Management Team produces various hardware and software tools to analyze operational improvements, reduce congestion on surface streets and freeways, and mitigate delays in work zones. The Enabling Technologies Team is developing infrastructure-based and vehicle-infrastructure cooperative systems to warn motorists of potential intersection collisions; promoting safety by developing decision-support tools for winter weather maintenance; and supporting the development and use of safety-enabling technologies such as Dedicated Short-Range Communications and Nationwide Differential Global Positioning Systems (NDGPS).

Safety R&D

The Office of Safety R&D (HRDS) aims to reduce highway crashes and related fatalities and injuries by developing and implementing a program of safety innovations through a nationally coordinated R&T partnership. The focus is on FHWA's priority highway safety improvement objectives related to preventing and mitigating roadway departures, safety management, improving intersections, and protecting pedestrians. This office provides transportation officials and practitioners with improved understanding, information, and state-of-the-art tools to aid informed decisions on highway safety improvements. The office also conducts advanced research to determine new ways to solve highway safety problems and challenges.

Program Development and Evaluation

The Office of Program Development and Evaluation (HRPD) champions the research, development, and technology program and those it serves by developing and executing policy, budget, program management, and evaluation tools to further FHWA's R&T program. HRPD is the focal point for FHWA's participation in cooperative research activities, such as the National Cooperative Highway Research Program (NCHRP) and the Transportation Pooled Fund Program (TPF). HRPD also manages the FHWA Small Business Innovation Research

(SBIR) Program and works with the Research and Special Programs Administration (RSPA) to support the University Transportation Center (UTC) program.

Resource Management

The Office of Resource Management (HRRM) provides critical management support services that contribute to RD&T's research and deployment of technology and innovation (T&I) activities. HRRM staff provides advice, assistance, and support for financial management of R&T and general operating expenses funding; acquisition planning and contract administration for research programs and research support activities; human resource management and employee development; information technology support for research and business applications; accountable property management and disposition; and RD&T facilities management—including emergency planning, FHWA continuity of operations support, and physical security.

Research and Technology Services

The Office of Research and Technology Services (HRTS) leads in leveraging T&I deployment, one of the Agency's key business processes. HRTS also provides various marketing and communication services Agencywide, as well as within RD&T. These include planning and executing the FHWA exhibit program; administering the R&T Products Distribution Center;

editing, publishing, and distributing RD&T research reports; overseeing RD&T Web pages; and publishing periodicals, like PUBLIC ROADS, that reach customers worldwide. HRTS also supports the implementation of the *Corporate*



The Performance Management Workgroup

Master Plan for Research and Deployment of Technology & Innovation (Corporate Master Plan).

Director for Corporate Research and Technology

In July 2004, Ms. Debra Elston was appointed as the new Director for Corporate Research and Technology (changed from Director for Research, Technology, and Innovation Deployment). This function provides key support to the Associate Administrator for RD&T and the FHWA R&T Leadership Team, primarily through leadership in implementing the *Corporate Master Plan*. Appendix D provides a list of Market-Ready Technologies and Innovations, one of several corporate strategies intended to raise awareness and speed delivery of proven technologies and innovations.

RD&T Leadership Council



The RD&T Leadership Council

The mission of the RD&T Leadership Council is to continuously improve the RD&T organization and its achievement of the FHWA strategic goals. The Council works on a wide range of issues related to the

effective management of RD&T and serves in an advisory capacity to the RD&T Executive Committee (comprised of the Associate Administrator for RD&T, the Director for the Office of Corporate Research and Technology, and the RD&T Office Directors).

Council Goals and Objectives

Develop innovative technologies and approaches to R&T:

- ▶ Set a research agenda that meets customer requirements.
- ▶ Conduct quality research that efficiently and effectively delivers products.
- ▶ Deliver high-value work that is relevant to FHWA and USDOT missions.
- ▶ Balance effectively the cost, time, and risk of R&T projects managed by RD&T.
- ▶ Support dissemination of best practices, solutions, and success stories.

Workgroups Reporting to the Leadership Council:

- ▶ Performance Management.
- ▶ Customer Survey.
- ▶ Information Technology.
- ▶ Communications.
- ▶ Corporate Focus.



Lab Assessment participants receiving a briefing on the hydraulics program.

RD&T Around the Community

Not only does this report highlight our accomplishments and success stories in the field of highway research over the past year, but it also conveys how the employees in our organization strive to “give back” by volunteering for important causes and conducting outreach and educational activities that enhance the quality of life for others. Here are a few highlights of the types of activities we participated in over the past year:

RD&T supports the annual Combined Federal Campaign (CFC) with several creative fundraising and social events, such as the Chili Cook-Off, bake sales, and auctions. Proceeds go to many worthy causes and a special donation is made to the Oklahoma City Scholarship Fund,

which benefits the family members of FHWA employees who lost their lives in the Murrah Building tragedy. In December, RD&T was recognized for exceeding 100 percent of its monetary goal for the CFC.

Throughout the year RD&T employees are involved in various community service projects sponsored by civic and religious organizations. An RD&T team leader, Aramis



A TFHRC employee led a student volunteer group that helped to repair homes for families in southeastern Virginia during “Work Camp 2004.”



Carl Andersen sorts through shoe donations for children in Afghanistan. The donations were made at the request of his brother, who is deployed there.



López, was nominated for the prestigious USDOT Secretary's Award for Volunteer Service as a result of his work to help provide safe wood burning stoves for impoverished families in Guatemala. Other RD&T employees are involved in charitable activities

A TFHRC employee helped build safe wood burning stoves for families in Guatemala that previously used unventilated indoor cooking fires, which led to health complications from smoke inhalation.

such as collecting donations for a Washington, DC area senior center and conducting blood drives to support the American Red Cross of the National Capital Area. Examples such as the "Work Camp 2004" project, which helped to repair homes for families in southeastern Virginia and a highly successful clothing drive for children in Afghanistan, demonstrate just some of the ways that RD&T employees strive to improve the quality of life in their communities and beyond, help develop and mentor youth, and provide vital services to those in need.



TFHRC employee working at annual "CFC Chili Cook-off" fundraiser.

Outreach and Special Events

Outreach to Students

James Arnold (Office of Operations R&D) was recognized by the Institute of Navigation for his outreach to students visiting

ThorpeWood, an environmental center located in Thurmont, MD. Jim educated the students on the benefits of NDGPS. He also demonstrated how NDGPS enhances the ability of transportation engineers and planners to survey and map, develop route guidance and collision avoidance technologies, and even predict weather more accurately. Jim's outreach helped give a vision of the future to what may be the next generation of transportation professionals.



Students at ThorpeWood learned GPS navigation.

Future Cities Competition

As part of the annual Future City Competition, FHWA sponsors a special award for the Best Transportation System, which goes to the team that best incorporates transportation elements of moving people and freight in and out of its prototypical future city. FHWA announced the winner of its special award at the Future City national finals during National Engineers Week (February 22–27, 2004) in Washington, DC. A team from the Valley Middle School in Oakland, NJ, was the winner of the 2004 FHWA award. The Valley students named their city "Glacialis," after its frigid location in Antarctica.



Martha Soneira (far left) and Debbie Curtis (far right) at Future Cities award presentation.

Student Volunteer Program

The Student Volunteer program at RD&T focuses on establishing partnerships with local universities that help students to obtain practical experience and conduct meaningful research. The program has been expanded to include a formal agreement with the George Washington University in Washington,

DC. Volunteer opportunities have also been set up with students from the University of Maryland in College Park, MD and the Catholic University of America in Washington, DC.

Summer Transportation Internship Program for Diverse Groups (STIPDG)

The Summer Transportation Internship Program for Diverse Groups (STIPDG) is an important part of the USDOT inter-modal effort to promote the entry of women, persons with disabilities, and members of diverse groups into transportation careers. The internship program offers interns an exciting 10-week agenda of transportation research and work experience to introduce them to the many aspects of the field of transportation. RD&T hosted the entire class of 80 STIPDG students for a briefing and tour of the labs in August. Two of the STIPDG students, Shanea Dangerfield and Megan Mowday, completed 10-week internships with the Office of Program Development and Evaluation.

Western Washington Students Demo Cutting-Edge Vehicle Technology



Working with AJ Nedzesky of the Office of Safety R&D, Western Washington University students exhibit the Viking 32 natural gas and electric hybrid at USDOT headquarters, Nassif Building.

FHWA helped sponsor a Western Washington University student project to design and build a four passenger, four-wheel drive hybrid vehicle that is able to achieve 21.26 kilometers per liter (50 miles per gallon) average fuel consumption. The vehicle was designed to demonstrate new principles of energy management through



The Viking motor and compressed gas cylinder.



The Viking's electric power source.

the use of composite materials, carbon fiber, and monocoque structural design. Given the name Viking 32, the hybrid vehicle utilizes a compressed natural gas (CNG) and electric hybrid power train and can accelerate from 0 to 60 in 5.2 seconds. It has a top speed of 161 kilometers per hour (km/h) (100 miles per hour (mi/h)). The Viking 32 received the "Grand Award" for light duty vehicles at the 2004 Tour de Soul competition, sponsored by The Northeast Sustainable Energy Association (NESEA).

Partnerships to Promote Awareness of Technology

RD&T hosted the Department of Energy/Society of Automotive Engineers Ride-n-Drive event May 11 and 12, 2004. The Ride-n-Drive was an opportunity for the public to experience firsthand the advanced technologies that are either currently being used or contemplated for future production vehicles. Vehicles from manufacturers throughout the world



Visitors examine alternative fuel vehicle.

were available for test drives, and each manufacturer had representatives onsite to answer questions concerning the new vehicle technologies.

Pedestrian Accommodation and Delineation Device Demo

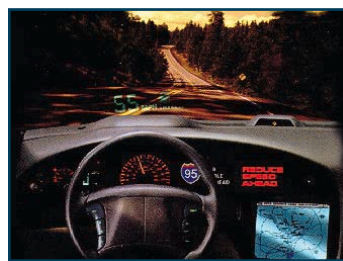
TFHRC hosted a Pedestrian Accommodation and Delineation Devices Demonstration. This was an all-day event that included an outdoor demonstration at TFHRC. The demonstration included a variety of innovative delineation devices in a simulated work zone walkway. The U.S. Access Board obtained several volunteers with visual disabilities to walk through the work zone and comment on the effectiveness of the devices. The study helped assess the effect of various delineation and



International visitors toured the TFHRC labs.

barrier devices on visually impaired pedestrians.

Facility Tours
RD&T conducts facility tours, which create awareness among critical audiences and deliver the message that RD&T research provides innovative, real-world solutions to a number of highway-



Research vehicle instrumentation.

related problems. Each year, RD&T offers tours to hundreds of guests, such as senior legislative and USDOT decision makers, congressional staffers, international research colleagues, FHWA State and local partners, and members of professional organizations and associations. Guests visit the labs and learn about research projects that benefit our Nation's transportation system.

TFHRC on Discovery Science Channel

The Discovery Science Channel filmed a show at TFHRC for its educational television series

called "Techknowledge." The segment, called "Safe Highways," featured Michael Trentacoste, Office of Safety R&D staff, and Joseph Hartmann of the Office of Infrastructure R&D. The show highlighted TFHRC's instrumented Field Research



Field Research Vehicle featured on Discovery Channel.

Vehicle, a completely self-contained laboratory that provides the ability to take human-centered-systems research on the road. In addition, the segment highlighted the Office of Infrastructure R&D's recent testing of high performance concrete beams. The show also featured footage of the Highway Driving Simulator. Additional footage and interviews were shot in the Structures Laboratory, highlighting innovative research on the full-size curved bridge girder in the TFHRC Structures Lab. Other background material filmed included the Hydraulics Laboratory and the Accelerated Loading Facility. The show titled "Driven by Design" aired on the Discovery Science Channel in March.

Fairfax County Fire and Rescue Training

For the past 7 years, firefighters from two Fairfax County, VA Fire and Rescue Departments used crash dummies to practice removing pinned and trapped motorists from automobile crash



Fairfax County firefighters practice extraction techniques using TFHRC crash test vehicles.

tests at the TFHRC Federal Outdoor Impact Lab (FOIL). Normally, these firefighters and rescue workers practice their rescue techniques on junked cars at the Fairfax County Fire and Rescue Academy. However, using crash-test vehicles from the FOIL provides them with a more challenging training exercise, because the FOIL better

simulates actual crash conditions. As a result, firefighters who train at the FOIL improve their equipment skills and their rescue techniques in preparation for real-life emergencies.

Serving in our Nation's Armed Forces

A number of RD&T employees are active members of the military reserves. We are proud to support their service to our country.



TFHRC employee with his unit on the National Mall.

II. The Strategic Framework

The FHWA R&T Program

FHWA's mission is enhancing mobility through innovation, leadership, and public service. FHWA faces the continuous challenge of enhancing the movement of people and goods from one place to another, while ensuring the safety and security of the traveling public, promoting the efficiency of the transportation system, and protecting the environment.

Major FHWA programs include the Federal-Aid Highway Program, which provides Federal financial assistance to the States to construct and improve the National Highway System (NHS), urban and rural roads, and bridges. In addition, the Federal Lands Highway Program provides access to and within national forests, national parks, Indian reservations, and other public lands by preparing plans and contracts, supervising construction of facilities, and conducting bridge inspections and surveys. FHWA manages a comprehensive R&T program in support of the above.

FHWA places a very high value on new technologies, materials, and innovations to improve the Nation's roadways.

Due to FHWA efforts, applications of advanced technology to the Nation's highways are yielding impressive returns in safety, mobility, productivity, and environmental quality. FHWA strategically invests in R&T to improve the transportation system. The Agency's approach emphasizes partnership with a broad range of organizations, including other DOTs and Federal agencies; State, local, and county governments; and international organizations. The goal is to identify, develop, and accelerate the transformation of new ideas into better transportation systems, processes, and services.

Vision and Mission

The FHWA research approach emphasizes cooperation, information sharing, and research agenda development with State and local governments, academia, and the private sector. Research conducted at TFHRC supports the Agency's vision, mission, and goals and is strategically aligned with the USDOT.

FHWA's research approach emphasizes cooperation, information sharing, and formal research agenda development.

<p>DOT Vision (FY 2003) Safer, simpler, smarter transportation solutions.</p>	<p>FHWA Vision Improving transportation for a strong America.</p>	<p>RD&T Vision An RD&T organization that is essential, indispensable, and connected to our partners in advancing R&T.</p>
<p>DOT Mission Develop and administer policies and programs that contribute to providing fast, safe, efficient, and convenient transportation at the lowest cost consistent with the national objectives of general welfare, economic growth and stability, the security of the United States, and the efficient use and conservation of the resources of the United States.</p>	<p>FHWA Mission Enhancing mobility through innovation, leadership, and public service.</p>	<p>RD&T Mission Leads in developing a nationally coordinated R&T Program; champions the advancement of highway technological innovation in support of FHWA strategic goals and performance objectives; advances knowledge through research, development, testing, and evaluation services; and provides support and assistance throughout FHWA in matters relating to RD&T.</p>

FHWA Strategic Goals for FY 2004

Six strategic goals—Safety, Mobility and Productivity, Global Connectivity, Environment, National Homeland Security, and Organizational Excellence—are addressed in the FY 2004/2005 plan.

- ▶ Safety—Continually improve highway safety.
- ▶ Mobility and Productivity—Preserve, improve, and expand the Nation's highway transportation system while, at the same time, enhancing the operation of the existing highway system and intermodal connectors.
- ▶ Global Connectivity—Promote and facilitate a more efficient domestic and global transportation system that enables economic growth.
- ▶ Environment—Protect and enhance the natural environment and communities affected by highway transportation.
- ▶ National Homeland Security—Improve highway security and support national defense mobility.
- ▶ Organizational Excellence—Advance FHWA's ability to manage for results and innovation.

The Vital Few

The Vital Few are the key areas with performance gaps that must be addressed for FHWA to be successful in the short-term. Achieving performance improvements in the following areas was a priority during FY 2004:

- ▶ Safety.
- ▶ Congestion Mitigation.
- ▶ Environmental Stewardship and Streamlining.

RD&T Corporate Missions and Functions

RD&T performs several key functions to champion the advancement of highway technological innovation. The following examples illustrate some of the unique functions carried out by RD&T in its effort to support the Agency's role as "innovators for a better future."

Highway Research and Development

- ▶ Research and innovation.
- ▶ Technical assistance.
- ▶ Forensic evaluation.

Implementation of the *Corporate Master Plan*

- ▶ Supporting FHWA R&T Leadership Team in the implementation of the *Corporate Master Plan for Research and Deployment of Technology & Innovation*.
- ▶ Supporting the Associate Administrator for RD&T as FHWA champion for R&T.

Strategic Planning and Budget

- ▶ R&T budget development.
- ▶ Legislative monitoring and analysis of R&T issues.
- ▶ Agency input into USDOT RD&T Plan.

R&T Performance Measurement

- ▶ R&T Performance Measure Framework.
- ▶ Implementing the President's Investment Criteria for R&D.
- ▶ Lab Assessment Program.
- ▶ Sharing Best Practices.

Outreach, Communication, and Consultation

- ▶ Research liaison and partnership activities (American Association of State Highway and Transportation Officials (AASHTO) Standing Committee on Research (SCOR), AASHTO Research Advisory Committee (RAC), Transportation Research Board (TRB) Research and Technology Coordinating Council (TRB RTCC), USDOT Research and Technology Coordinating Committee (DOT RTCC), etc.).
- ▶ Research and technology marketing.
- ▶ FHWA-wide media publications.
- ▶ RD&T facility tours.

III. Our Business Results

RD&T Challenges, Commitments, and Achievements

To guide our business and performance plan, the RD&T Leadership Council's vision is to conduct research and provide products and services that are essential, indispensable, and connected to our customers and partners. We are committed to continuing our Quality Journey (the process that FHWA uses to regularly assess its management practices); initiating program, process, and quality-of-worklife improvements; conducting outstanding research; and providing services that drive the achievement of FHWA strategic goals, and exceed customer and partner expectations. Our top four challenges and commitments for FY 2004/2005 are listed below, followed by sections containing exemplary achievements and notable progress made in each area.

Effectively Deliver Needed Products and Services

- ▶ Develop quality research products and services that address the needs of our internal customers and external partners in a timely manner.
- ▶ Improve R&T collaboration and communication with the FHWA Resource Center and Division offices.

Improve Business and Administrative Processes

- ▶ Implement the *Corporate Master Plan* within RD&T and support the RD&T Associate Administrator in guiding the FHWA R&T Leadership Team in its oversight of the *Corporate Master Plan* implementation for the Agency.
- ▶ Refine and implement the lab assessment process to provide regular, independent feedback to improve the quality of lab-based research and services.

- ▶ Use research resources effectively and ensure efficient RD&T facility, organization, and program operations.
- ▶ Define and implement methodologies/tools to evaluate projects and measure performance.
- ▶ Advance information technologies and systems to address the unique needs of a world-class research organization.

Develop and Recognize Employees

- ▶ Mentor employees and encourage training and professional development to build skills and add to capabilities and competencies.
- ▶ Improve the award and recognition program to value achievements, link directly to team accomplishments, and advance the RD&T Leadership Council's Action Agenda.

Communicate the FHWA R&T Story and Future Agenda

- ▶ Improve the communication of FHWA R&T initiatives and focus areas to stakeholders.
- ▶ Collaborate with FHWA headquarters and field offices to gather and disseminate information about achievements in FHWA T&I delivery.
- ▶ Identify national research program priorities, resources, and funding needs with our partners.
- ▶ Build a common advocacy to enhance the national R&T Program and legislative agenda.

We have developed a lab assessment process that will allow routine expert peer review of the research conducted at TFHRC.

Effectively Deliver Needed Products and Services

Commitment: Develop Quality Research Products and Services that Address the Needs of Our Internal Customers and External Partners in a Timely Manner.

RD&T Products

Information regarding RD&T research products, as well as ongoing projects, is available in the R&D Research Project Status table located in Appendix A.

RD&T Services

The types of services we provide include forensic and specialized engineering services, technical assistance, and workshops. A detailed listing of RD&T services can be found in appendix B.

Commitment: Improve R&T Collaboration and Communication with the FHWA Resource Center and Division Officers.

RD&T staff recognizes the importance of building and maintaining close relationships with the Resource Center and Division offices for the purpose of delivering technology and innovation to our customers. RD&T researchers serve as members of the Resource Center Technical Service Teams (TSTs) to facilitate technology deployment efforts and better serve FHWA customers. The TSTs were created to provide unified and coordinated assistance nationwide. Ten specialized teams were created which are based out of the Agency's four Resource Center locations in Atlanta, GA; Olympia Fields, IL; Baltimore, MD; and San Francisco, CA.

Other efforts to improve R&T collaboration and communication over the past year have been led by groups such as the Design Guide Implementation Team, chaired by an RD&T member, and the Traffic Analysis Tools Team. In addition, a

collaborative meeting with representatives from the Office of Bridge Technology, the National Steel Bridge Alliance, several State DOTs, the steel industry, and academia was held to discuss new technologies designed to improve the condition of steel bridges in the United States.

Resource Center and Division offices have also been involved in developing Technology Facilitation Action Plans for implementation of research results.

Improve Business and Administrative Processes

Commitment: Implement the *Corporate Master Plan* within RD&T and Support the RD&T Associate Administrator in Guiding the FHWA R&T Leadership Team in its Oversight of the *Corporate Master Plan* Implementation for the Agency.

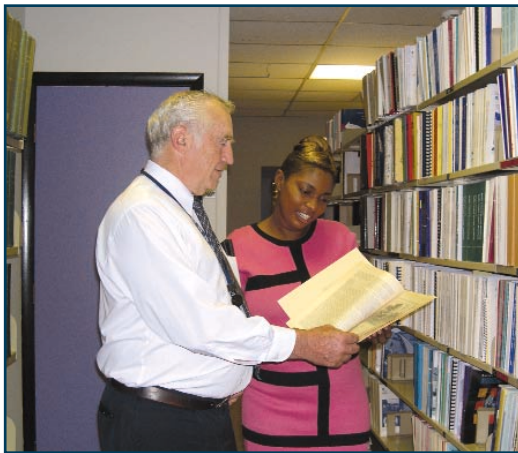
Key accomplishments toward the goal of implementing the *Corporate Master Plan* for Research and Deployment of Technology & Innovation included: adopting a performance measurement framework for FHWA R&T; developing more than 60 multiyear program plans to provide guidance and direction for future R&T activities; identifying and promoting Agency priority market-ready technologies and innovations; conducting an advanced research benchmark assessment, and establishing a new R&T Web site to keep our customers and stakeholders informed of our progress in implementing the *Corporate Master Plan* and new R&T initiatives (the site is available at <http://www.fhwa.dot.gov/rnt4u/>).

Commitment: Effectively Use Research Resources and Ensure Efficient RD&T Facility, Organization, and Program Operations.

RD&T is committed to ensuring that facility and program operations are conducted efficiently and make the best use of

resources. In FY 2004, two Transportation Pooled Fund (TPF) Program workshops were conducted at TFHRC. The workshops provided guidance on soliciting new pooled fund studies, initiating and conducting studies, reporting on studies, using the interactive TPF Web site (www.pooledfund.org), and other TPF Program features. The workshops were attended by FHWA staff, RD&T researchers, and other interested parties. The interactive website has greatly improved efficiency of the TPF program which leverages resources by pooling funds.

Facility improvement efforts are another important part of our commitment. Solar-powered lamps for the facility parking lighting systems were installed for the three parking lots and main entrance walkways to improve facility security. The solar-powered units were chosen for their ability to provide continuous lighting without concern for the need of emer-



TFHRC employees in Technical Reference Center.

gency-power backup and the fact that the cost for electricity to the center would not increase. The system meets the requirements of the Illuminating Engineering Society of America and is designed to minimize light trespass and sky glow.

Upgrades to the RD&T Technical Reference Center were also completed in FY 2004. Improvements included the addition of a new reading room and computer workstations. An enhanced cataloguing system for the Center's unique collection of high-ways research and technology materials was completed, as well.

The facility will also expand the collection to include a substantial amount of human factors literature and long-term pavement performance research. An Interlibrary Loan (ILL) service provided through the ILL automated system is now available to help make it easier for researchers to borrow materials from participating libraries nationwide.

Also in FY 2004, our Asphalt Labs (Binder Rheology and Bituminous Mixtures) received the AASHTO Materials Reference Laboratory (AMRL) certification. This widely regarded certification recognizes the quality of the Asphalt Labs and it recognizes the competency of lab personnel in carrying out construction materials testing.

Commitment: Define and Implement Methodologies/Tools to Evaluate Projects and Conduct Performance Measurement of Research at TFHRC

RD&T institutionalized its Lab Assessment Program by establishing routine procedures for assessments and completing three lab assessments in FY 2004, covering the Asphalt Laboratories, the Traffic Research Laboratory (TReL), and the Hydraulics Laboratory. Lab managers have developed action plans to respond to the recommendations of the panels, and are held accountable for them by management. RD&T leadership uses the external expert assessment process to document lab performance and provide feedback for improvements to lab managers, as well as to provide a credible, professional, and objective assessment that will improve stakeholders' confidence in the work done and the outcomes produced.

FHWA's research and technology (R&T) program received an indepth review by the Office of Management and Budget (OMB), using the Program Assessment Rating Tool (PART). OMB examined the program purpose and design, strategic planning processes, program management process, and program results/accountability. RD&T led the Agency in preparing for the OMB's assessment of the FHWA R&T program. An

RD&T led the Agency in preparing for the OMB's assessment of the FHWA R&T program. An R&T performance measurement framework and Agency strategic goal crosswalk/logic model were developed to clearly show the connection between research and Agency goals.

A key accomplishment in FY 2004 was the development of a Workforce Plan for RD&T. The workforce for RD&T in the future will need to reflect the diverse needs of our scientists and engineers, as well as those who provide program support for the research offices.

R&T performance measurement framework and Agency strategic goal crosswalk/logic model were developed to clearly show the connection between research and Agency goals. Overall, the R&T program received outstanding marks in strategic planning and program management.

Commitment: Advance Information Technologies and Systems to Address the Unique Needs of a World-Class Research Organization

The RD&T Information Technology Workgroup comprised of representatives from each RD&T office, conducted an assessment of both long-term requirements and short-term needs at TFHRC and developed a plan focusing on computer upgrades for all RD&T staff, replacement of old printers, and acquisition of laptops for presentation and travel needs. Additionally, a State Planning and Research (SP&R) Guide Web Portal was established as part of the RD&T Web site at: <http://www.tfhrc.gov/sprguide/index.htm>. The site provides information on legislation and regulations, oversight and stewardship, peer exchanges, the TPF program, TRB, NCHRP, and RAC. The web portal was created to provide a variety of information and links that are relevant to research programs under the SP&R Program.

Develop and Recognize Employees

Commitment: Mentor, Encourage, and Build Employee Skills and Add to FHWA Research Capacities and Competencies

Career development and enrichment are key focus areas for our organization, and RD&T is serious about training its employees. Employees are encouraged to take training, which includes but is not limited to, traditional classroom training, video and online training, mentoring, and sharing research ideas and results. All employees are encouraged to develop and regularly update Individual Development Plans (IDPs)

through the Learning and Development System (LADS). A key accomplishment in FY 2004 was the development of a Workforce Plan for RD&T. The workforce for RD&T in the future will need to reflect the diverse needs of our scientists and engineers, as well as those who provide program support for the research offices.

Along with planning for the future workforce, RD&T strives to build on the talents of its employees and develop future Federal executives and managers. In FY 2004, three RD&T personnel were selected for executive, management, and leadership programs such as the Executive Potential Program, the U.S. Department of Commerce Science and Technology Fellowship (ComSci) Program, the USDOT sponsored "So You Want to Be a Leader" course, and the 2003/2004 Academic Study Program. RD&T has also hosted Federal leadership development program candidates from the Executive Potential Program, the Executive Leadership Program, and the Professional Development Program. This provides RD&T staff with an excellent opportunity to mentor and develop talented women and men who will become future leaders in the Federal government.



Researchers discussing results of experiment

Building employee skills through training and professional development is critical to achieving organizational goals and improving customer service. RD&T hosted the FHWA Federal-Aid Highways 101 course at TFHRC this past June to provide RD&T

employees with a unique opportunity to learn more about the key requirements and laws of the Federal-Aid Highway Program. Topics included innovative financing, Civil Rights Program, EEO Contract Compliance, Environmental Justice, the project development process, and discussion on how

Federal-aid laws and regulations relate to the other laws (i.e., National Environmental Protection Act (NEPA), Uniform Act, the Davis Bacon Act, OMB Circular A-87, 49 Code of Federal Regulations (CFR) Part 18).

RD&T also invests in employee development by encouraging organizational and employee memberships in professional associations, such as AASHTO, American Public Works Association, American Chemical Society, American Society for Testing and Materials (ASTM), American Society of Civil Engineers (ASCE), Human Factors and Ergonomics Society, Institute of Transportation Engineers, Intelligent Transportation Society of America, and a host of other professional organizations.

RD&T hosts FHWA Postdoctoral researchers under a program sponsored by the National Research Council. The fellowship program provides postdoctoral scientists and engineers the opportunity to conduct research compatible with the interests of Federal labs. For recent doctoral graduates, the program provides an opportunity for concentrated research in association with selected members of the permanent professional laboratory staff. For established scientists and engineers, the program affords an opportunity to conduct research free from interruption and distraction. The presence of bright, highly motivated doctoral graduates and senior investigators provides participating labs with unique stimulus, new ideas, and innovative approaches to research.

Commitment: Improve the Award and Recognition Program to Value Achievements, Link Directly to Team Accomplishments, and Advance the RD&T Leadership Council’s Action Agenda

The use of cash awards, time-off awards, certificates, and other forms of recognition, both formal and informal, are an integral part of the way RD&T acknowledges and values the hard work and excellence of its employees. RD&T also organized an Employee Recognition Committee to propose new methods of

recognizing employees whose efforts have resulted in superior achievement, especially in relation to Agency goals. Award categories proposed by the committee include the areas of research and innovation, customer service, and process improvement.

In addition to internal awards, RD&T employees were the recipients of some notable external awards and recognition. The following list represents some of the recognition received this past year:

Al DiMillio was the recipient of four awards for his accomplishments in the area of geotechnical research. The awards were: the Association of Drilled Shaft Contractors (ADSC) Annual Award for Outstanding Service; the Deep Foundations Institute Annual Hal Hunt Lectureship Award; the International Workshop on Micropile Organizing Committee’s Leadership Recognition Award; and the U.S. Army Corps of Engineers and the Engineering R&D Center (ERDC) Award of Excellence.

Steve Chase received the Secretary’s Team Award for his work with the FHWA Infrastructure Research and Technology Working Group.



TFHRC Award winner Sheila Duwadi

Sheila Duwadi received the FHWA Administrator’s Award for Superior Achievement and the FHWA Award for Engineering Excellence.

Stephen Forster received an Honorary Membership on ASTM Committee D04. The honor was given in appreciation for Forster’s sustained outstanding service to Committee D04, Road and Paving Materials, and in appreciation for his dedication to its objectives. He was also the recipient of the Secretary’s Team Award for the FHWA Infrastructure Research and Technology Working Group.

HRDI completed a study that examined the benefits of Infrastructure R&D completed over the past 20 years in the areas of national design and data standards, new technologies, and new materials development.

RD&T acknowledges and values the hard work and excellence of its employees.

Sterling Jones was recently selected as the ASCE 2004 Hydraulic Structures Medal recipient. This annual award recognizes significant contributions to the advancement of the art and science of hydraulic engineering as applied to hydraulic structures.



TFHRC Award winner Sterling Jones.

Raymond Krammes was selected as the FHWA Engineer of the Year. Krammes completed extensive work in highway safety, especially in planning, research, development, contract monitoring, and most recently in implementation of the Interactive Highway Safety Design Model. His efforts have been a key component of FHWA's plan to improve highway safety, especially on two-lane roads. Krammes also received the FHWA Administrator's Award for Superior Achievement.



Ray Krammes, FHWA Engineer of the Year.

Jean Landolt of the Office of the Associate Administrator for RD&T received the Secretary's Award for Excellence for exceptional job performance and customer service.

Charles McDevitt was presented with a Meritorious Service Award by AASHTO in recognition for 25 years of meritorious public service.

John O'Fallon was recognized for an extraordinary 50 years of government service. O'Fallon began his career in FHWA in 1954 (then called the Bureau of Public Roads). He was the first Division Bridge Engineer in the Connecticut Division and served as Chief Structural Engineer. His assignments included starting the National Bridge Inspection and Special Bridge

Replacement Programs, drafting the original Bridge Inspector's Training Manual, creating the 6-week Bridge Engineers Workshop, editing the chapter on bridges in the book *America's Highways 1776-1976*, and managing the Northeast Corridor (NEC) Structures Program.

Paula Magoulas, Martha Soneira, and Dawn Vanlandingham received the "Strive for Excellence" Team Award as a result of their outstanding strategic communications support for the FHWA R&T program.

Communicate the FHWA R&T Story and Future Agenda

Highway research provides innovative solutions that can make our Nation's roads safer, less congested, smoother, more durable, more environmentally friendly, and better able to support our economy and national defense needs. RD&T's challenges and commitments in this area reflect the key role that communication and partnerships play in building success.

Commitment: Improve the State of the FHWA R&T Initiatives and Focus Areas

In FY 2004, several initiatives were undertaken to improve the R&T program and address Agency commitments. The Office of Infrastructure R&D conducted a series of workshops in February and March to assess the realignment of the Structures R&D program and produce a Structures R&D Strategic Roadmap. Other activities in FY 2004 were taken to address Agency commitments in the *Corporate Master Plan* relating to advanced research.

An independent external panel conducted an assessment of FHWA's advanced research activities and presented their findings to the FHWA R&T Leadership Team. Based on this baseline assessment, the R&T Leadership Team will lead the Agency in determining a process for management of long-

term, high-risk research with high payoff potential, and addressing significant highway research gaps and emerging issues with national implications.

Commitment: Collaborate with FHWA Headquarters and Field Offices to Gather and Disseminate Achievements in FHWA T&I Delivery

The Agency recently created a new exhibit entitled Moving Technology and Innovation into Practice, developed as a result of the *Corporate Master Plan*. The new exhibit consists of a retractable banner measuring 1.2 by 2.1 meters (4 by 7 feet), supplemental handouts, and wire publication racks. The handouts include one-page technical information sheets on the latest priority, market-ready T&Is that FHWA recommends for deployment.

One handout, for example, describes Border Wizard—a software model that accurately simulates all cross-border movements of cars, buses, trucks, and pedestrians using customs, immigration, and security procedures. Another handout discusses QuickZone—a user-friendly computer software tool for estimating and analyzing the length of queues and delays in work zones. A comprehensive list of the available T&Is can be viewed and downloaded from www.fhwa.dot.gov/rnt4u/pti.htm. RD&T is working with the FHWA R&T Leadership Team, Resource Center, and Divisions to track the deployment and implementation of these market-ready T&Is and document success stories.

Over the past 5 years, the RD&T produced over 300 publications to disseminate the results of laboratory research at TFHRC. A 58-page catalog summarizes RD&T technical research publications, which includes Application Notes, Product Briefs, Fact Sheets, CD-ROMs, Technical Reports, and TechBriefs, and provides information about where and how to access the materials or obtain hard copies (if available). Each listing in the catalog features the title of the publication, the publication number, a short description of the item, and in

most cases, a Web site where users can access the publication online. To access the catalog online, visit www.tfhrc.gov/techpubcat/index.htm.

Commitment: Identify National Research Program Priorities, Resources, and Funding Needs with Our Partners

RD&T works with groups such as the AASHTO RAC, the TRB RTCC, and the USDOT RTCC to build partnerships that help define research priorities and make the best use of available resources. The RAC is comprised of representatives from AASHTO's 52 member departments and serves as an advisory group to AASHTO'S SCOR. RD&T staff attended the 2004 National RAC meeting in Mystic, CT in July 2004. The agenda included examination of how research projects were furthering national goals (including environment and security), promotion of new market-ready technologies and innovations, opportunities for research partnerships, and future national priorities

RD&T serves as the focal point for FHWA participation in cooperative research activities with its State partners through the NCHRP. In addition, the TPF program allows FHWA, States, regional and local transportation agencies, academic institutions, foundations, and private firms to join together to conduct R&T projects of mutual interest. Funds from participants are consolidated, and the resultant project is managed such that the perspectives and desires of participating agencies are addressed. Another mechanism for cooperative research is participation in international cooperative efforts (see appendix E).

Commitment: Build a Common Advocacy to Enhance the National R&T Program and Legislative Agenda

Representatives from RD&T, FHWA Office of Policy, AASHTO, House T&I, House Science, and Senate Environment and Public Works staff members met with the AASHTO SCOR and RAC to conduct panel discussions on reauthorization of surface transportation research and technology programs in January of

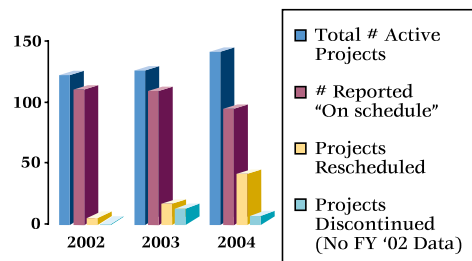
RD&T develops and executes a comprehensive research, development, and technology communications strategy and plan that disseminates achievements in FHWA T&I delivery.

2004 at the TRB Annual Meeting. RD&T staff also served on the USDOT task force to define the roles and responsibilities of the proposed Research and Innovative Technology Administration (RITA), with regard to research coordination. These roles are spelled out in the Norman Y. Mineta Research and Special Programs Reorganization Act, enacted as Public Law (PL) 108-426, signed on November 30, 2004.

2004 Research Project Status Summary

This has been a particularly challenging year due to funding and resource constraints, specifically regarding limitations and scheduling adjustments caused by delayed appropriations and short-term extensions of authorizing authority. A total of 14 projects cited funding as a cause for delay or halting of research.

RD&T Comparative Project Status: FY 2002-2004

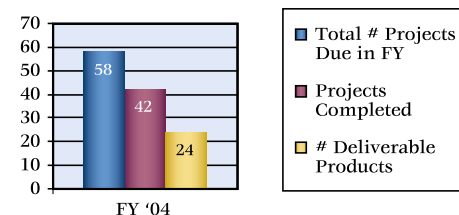


In FY 2004 there were a total of 115 projects reported in the FY 2004/2005 Performance Plan. Since the publication of the plan in November 2003, there have been a total of 35 new projects added and 7 projects discontinued, bringing the total number of projects to 143. The number of completed projects for FY 2004 was 42, with 24 products currently available for delivery.

Note that in the chart labeled FY 2004 Product Delivery, products are "ready-to-use" guidelines, procedures, protocols, best practices, software, equipment, etc. that are packaged and available to end users. Completed projects, depending on scope, may immediately generate usable products, but they

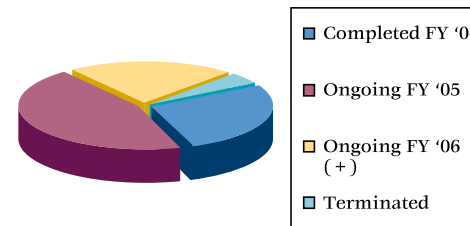
can also result in research findings and results that require further, review, packaging or formatting before becoming usable.

FY 2004 Product Delivery



There are 68 projects that are ongoing and scheduled for completion in FY 2005 and 33 scheduled for FY 2006 and beyond. (Further details on specific RD&T projects and services are available in the research project status and services tables located in appendices A and B.)

Current and Future Project Distribution (end of FY '04)



Lab Assessments

Three lab assessments were completed in FY 2004: an assessment of the Asphalt Labs, the Traffic Research Lab (TReL), and the Hydraulics Lab. Lab assessments are independent expert peer reviews intended to assess the relevance, quality and performance of research at TFHRC. These peer reviews help FHWA monitor whether the research program is appropriately structured and is on track toward providing an appropriate knowledge base for achieving Agency goals.

The lab assessments raise the visibility of the work of the labs with customers and stakeholders and are a welcome opportunity to obtain their feedback.

The lab assessment panel members provided valuable advice regarding knowledge of related work at universities, State DOTs, other government labs, or private industry. In addition, the experience of preparing for the assessment helped strengthen ties to other labs and organizations as a result of onsite interactions and follow-on exchanges between panel members and TFHRC staff.

RD&T Success Stories

Infrastructure R&D Success Stories

Angle Validation Kit

RD&T researcher, Tom Harman, worked in conjunction with Tom Brovold and Paul Fuchs to develop an Angle Validation Kit (AVK). The device underwent a patent review and was awarded a patent by the U.S. Patent Office. The AVK was developed in partnership between FHWA and the TestQuip Corporation. The patent lists the three parties involved in the development. FHWA is currently in the process of licensing the technology so that royalties from the license can be used to fund additional research.

Coefficient of Thermal Expansion Test for Concrete

One of the key characteristics of concrete pavements exposed to the environment is the response of the pavement to changes in temperature. However, this

response is not uniform, but varies according to the components and their proportions that make up the concrete being used. Noting that there was no standard test for this characteristic, the concrete pavement staff at RD&T began to work on developing such a test several years ago. The result is the Method for the Coefficient of Thermal Expansion (CTE) of Hydraulic Cement Concrete, currently approved as an AASHTO Provisional Standard (TP-60-00). When the recently completed new pavement design guide was being developed

under NCHRP Project 1-37A, they also recognized the importance of this characteristic for rigid pavement design and performance and included it as one of the standard tests to be run to characterize the concrete. As a result, the test will be widely used, and pavement performance will be more predictable and therefore enhanced.

Design Guide Introductory Workshops

During 2004, the long anticipated *Mechanistic-Empirical (M-E) Pavement Design Guide* was completed and released by NCHRP. In order to acquaint the highway community with the capabilities and benefits of this new guide as well as to help users prepare for its implementation, the FHWA Design Guide Implementation Team (DGIT) developed and held a series of free workshops in numerous locations across the country. One of these workshops was also broadcast live on the Internet and allowed interested participants who could not travel to one of the workshops to view the workshop and ask questions via e-mail in real time.

Guidance on Quality Assurance Specification Development

Statistically based, highway-construction quality assurance specifications have evolved and greatly improved since first introduced to the highway community in the late 1960s. With over 90 percent of State highway agencies using such specifications, yet depending on scattered, inconsistent, or out-of-date guidance, there was a need to develop a comprehensive guide containing instructions to allow State highway agencies to benefit more fully from national experience and take advantage of recent developments. The result was a manual, *Optimal Procedures for Quality Assurance Specifications*, which a highway



Engineer inspecting bridge cables

agency can use when developing new, or modifying existing, statistical acceptance plans and quality assurance specifications. The manual reflects the latest good practices in developing statistically sound specifications. It contains numerous, simple-to-follow examples while also identifying potential pitfalls and areas where caution should be exercised. It leads the agency through the entire process of specification development, including monitoring how well the specification is working and what adjustments should be made.

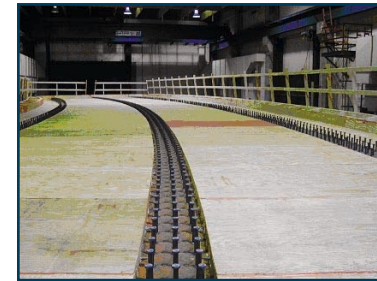
The success of the manual became obvious as its contents were immediately used in rewriting AASHTO R9, *Standard Recommended Practice for Acceptance Sampling Plans for Highway Construction*. The manual instructions also became the basis for a 4-day National Highway Institute training course as well as for shorter duration workshops sponsored by FHWA. In addition, the manual led to the development of software tools to assist highway agencies in better understanding and quantifying the risks associated with the statistical acceptance of highway construction.

High Performance Bridge Materials Testing

The FHWA Structures Laboratory has been instrumental in testing and accelerating implementation of high performance, innovative bridge materials. Recently, the 100th bridge fabricated from high performance steel (HPS) was constructed in Massachusetts. Baseline performance data, and critical weldability issues were addressed for this material through a cooperative effort led by the FHWA Structures Laboratory. Work to develop this material innovation involved FHWA, the U.S. Navy, the steel industry, State bridge engineers, and academia. Implementation of HPS offers bridge owners extended flexibility in designing steel bridges that can bring benefits in the form of initial and life cycle cost savings. High performance concrete (HPC) and more recently, ultra-high-performance concrete (UHPC), are also materials that have been exercised by the FHWA Structures Laboratory. HPC is currently prolifer-

ating within the bridge construction industry, as is self-consolidating concrete (SCC). Both HPC and SCC have been studied and tested in FHWA's labs with results fed directly to bridge owners looking to implement new technology for the structures. A new, rapid construction, full scale UHPC bridge was recently erected at TFHRC. This bridge was optimized to present the most efficient shape for use of this innovative material. Parallel projects are erecting the first UHPC bridges of their kind in Virginia and Iowa within the year. The data and knowledge generated by this research will be used to support State projects.

Horizontally Curved Steel Girder Research—Main Structures Laboratory



Structures laboratory curved girder experiment

The primary goal of the curved girder research is to develop a modern AASHTO Load Resistance Factor Design (LRFD) Specification for curved steel bridge design. Through FHWA outreach efforts in 1993, this was identified by AASHTO and the steel industry as the top priority need for steel bridge

research. Prior to this work, specifications were not LRFD compatible and resulted in overly conservative designs for curved bridges. Considering FHWA's strategic objective to require LRFD designs for all Federal-aid bridges starting in 2007, it was essential to develop a code that includes curved girder bridges.

During the research, it was recognized that the new design equations also had advantages for straight bridges. Therefore, the AASHTO Subcommittee on Bridges (SCOB), Technical Committee for Steel Bridges (T-14) opted to perform a complete rewrite of the entire steel bridge design provisions, completely integrating straight and curved bridge design. The

research performed in the FHWA Structures Laboratory fed results directly to the peer group developing the specification language. This peer group represented stakeholders from State highway, academic, and industry groups. These changes incorporated the new design equations that are LRFD compatible and unify the design approach for curved and straight steel girder bridges. The AASHTO SCOB unanimously adopted the new specification language at their meeting in June 2004.

Lithium Technology Program



Concrete damage caused by alkali-silica reaction (ASR)

There has been increased interest in recent years in using lithium compounds to treat existing structures and as a preventive measure in new concrete construction. To bring State and local agencies up to speed on the new application of this technology, FHWA is sponsoring a series of lithium workshops.

The workshop provides practitioners with the necessary information and guidance to test, specify, and use lithium compounds in new concrete construction, as well as in repair and service life extension applications for existing concrete. It has been presented in nine States to date, with more to follow in 2005. In addition, a protocol has been developed for selection of existing alkali-silica reaction (ASR) affected pavements and structures for treatment. The document helps State DOTs evaluate damaged pavements and structures to determine whether they are suitable candidates for lithium treatment to address ASR. The protocol was recently distributed to State DOTs for their use in selection and treatment of candidate field structures.

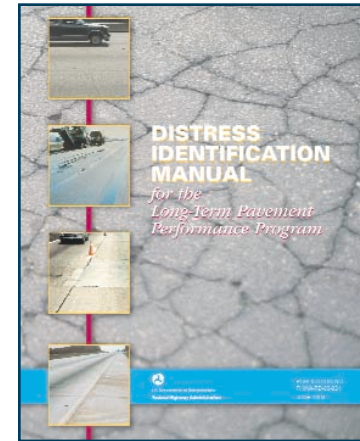
LTPP Distress Identification Manual

During FY 2004, the LTPP Program revised and reissued the *Distress Identification Manual for the Long-Term Pavement Performance*. This manual was originally developed for the

Strategic Highway Research Program (SHRP) Program to identify pavement distresses on asphalt and PCC pavements. LTPP has distributed over 1000 copies of the new distress manual (FHWA- RD- 03-031) at the annual TRB meeting and through e-mail requests. A Web version is available at <http://www.tfhrc.gov/pavement/ltppl/resource.htm>. Many State and local highway agencies use this manual in their pavement management programs. It is also used in several university civil engineering courses.

National Bridge Coatings Qualification Testing Program

AASHTO recently launched the first ever national qualification testing program for bridge coatings materials. This was done through the AASHTO National Transportation Product Evaluation Program (NTPEP). This program provides a level testing playing field for commercial paints and coatings to test their products. The data is collected in an online database with access given to all State bridge owners. For the first time, product choices and decisions directly affecting the durability of steel structures will be made nationwide using a common data set. FHWA staff and Coatings Laboratory directly supported the formation and implementation of this program. The FHWA Coatings Laboratory assisted in developing appropriate test protocols and evaluation criteria and personnel served as oversight for the various commercial testing laboratories that perform the bulk of the routine testing. The Coatings Laboratory also developed improved evaluation techniques and conducted round robin testing of materials to set benchmarks for the program. Use of the data generated by this program is expected to have a significant impact on the quality of coating materials supplied



LTPP Distress Identification Manual

for painting bridges nationwide. A similar, regional program in the Northeast served as a pilot for this national effort. The regional program also had direct involvement and support of FHWA through the Coatings Laboratory at TFHRC. This regional program's mark of success is the data's widespread use by all Northeast regional States, several toll authorities and various other States nationwide, as well as various private industry facility owners from utilities to heavy manufacturing.

Operations R&D Success Stories

Congestion Mitigation Through Expert Software



Traffic operations center.

RD&T partnered with the city of Los Angeles to install three expert system software packages to mitigate congestion on surface streets and free-ways around the Staples Center in downtown Los Angeles. The adaptive

traffic control software, a product of the Operations R&D program, will detect incidents and adjust signal timing in response to both recurring and nonrecurring congestion. This is a first in the United States, where incremental congestion forecasts and attendant remedies will be utilized to minimize congestion due to incidents and special events.

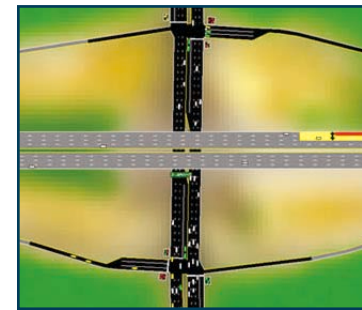
Collaborative Research on Road Weather Observations

RD&T partnered with the National Weather Service (NWS) to conduct five research projects through the Cooperative Program for Operational Meteorology, Education and Training (COMET). Teams from State DOTs, NWS Weather Forecast Offices, and universities evaluated the use of weather observations and modeling systems to improve highway safety and to support effective decision making by the various jurisdictions that manage the highway system. In particular, the research

evaluated how environmental sensor data, particularly data from road weather information systems (RWIS), could be used for both road condition forecasting and weather forecasting. Results from these projects will help all State DOTs improve how they manage RWIS networks and achieve maximum utility from RWIS investments. A summary of the lessons learned from the COMET program can be found at <http://www.tfhrc.gov/its/pubs/04101/index.htm>.

Assessing the Effects of Weather on Traffic Flow

Adverse weather conditions can have a dramatic impact on the quality of traffic flow. Traffic engineers need adequate traffic analysis tools to develop better designs for the impacts of adverse weather. One such tool is a microscopic traffic corridor simulation model (CORSIM) that allows analysts to model and evaluate complex roadway geometries, traffic control devices and Intelligent Transportation Systems (ITS). The report,



CORSIM simulation image.

Identifying and Assessing Key Weather-related Parameters and their Impacts on Traffic Operations Using Simulation, identifies how adverse weather affects traffic operations, assesses the sensitivity of weather-related traffic parameters within CORSIM, and develops guidelines for using CORSIM to account for the affects of adverse weather.

QuickZone Release 2.0

The QuickZone software is an easy-to-use, easy-to-learn tool to estimate delays in work zones. It is a key component of FHWA's Strategic Work Zone Analysis Tools (SWAT) program. The targeted audience for QuickZone is State and local traffic construction staff, operations and planning staff, and construction contractors. Release 2.0 of QuickZone contains many new



Highway work zone.

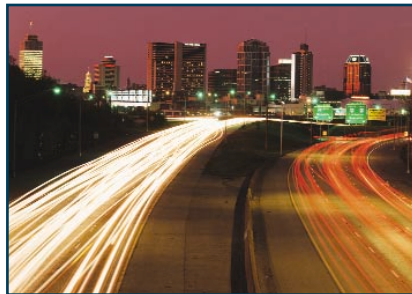
features requested by users, including features that make it more applicable to high or low volume rural work zones. These new features include two-way, one-lane operation for rural areas and an assessment of the costs to businesses of

work zones or road closures. Release 2.0 can analyze an increased number of work plans and work phases and can assess the impact of concurrent and adjacent work zones. Cases studies of the application of QuickZone in both urban and rural areas demonstrated the delay reduction benefits that the tool can provide. (See the RD&T Research Benefits Case Studies later in this report.)

DYNASMART-P

DYNASMART-P and its input editor, DSPed provide a new state-of-the-art dynamic network traffic operational planning tool. With a rich set of built-in features, DYNASMART-P can be used to evaluate complex strategic and operational network planning decisions and produce traffic assignment results for planning analysis. It over-

comes many of the known limitations of the static analysis tools used in current planning practices. Because it considers the time-varying nature of traffic flows, DYNASMART-P will produce more useful estimates of variables such as speeds, queue lengths,



Metropolitan skyline and traffic.

delays and congestion effects, and better assess the functional and environmental impacts of a variety of traditional and emerging transportation planning measures. DYNASMART-P and DSPed are available from the McTrans Center. For ordering information, visit <http://mctrans.ce.ufl.edu/>

Enhanced Digital Maps

The Enhanced Digital Maps (EDMap) project examined the feasibility of using very accurate digital maps as an enabling technology for advanced vehicle safety systems. Four major automobile manufacturers and a map supplier partnered in the EDMap project. Five high-benefit safety applications that can be enhanced or enabled by EDMap were identified: lane departure warning, forward collision warning, stop sign warning and control, curve speed warning and control, and traffic signal warning. Two test areas were mapped—Palo Alto, CA and southeast Michigan—and very successful engineering demonstrations were conducted of the five safety applications. The EDMap project has the potential to dramatically improve safety by providing the foundation knowledge of map database requirements, as well as needed vehicle-positioning capabilities that support future collision avoidance systems.



Experimental signal system.

Intelligent Intersection Traffic Control Laboratory

The Intelligent Intersection Traffic Control Laboratory at TFHRC is the first of its kind in the United States and was designed to highlight intersection collision-avoidance systems that currently are being developed by the Infrastructure Consortium, a pooled fund with the States of California, Minnesota, and Virginia. This activity is sponsored by the



Intelligent Intersection at TFHRC.

Cooperative Intersection Collision Avoidance Systems Initiative, a component of the ITS program. In addition to the traffic signals, controllers, special signing, and other equipment needed to support the operation of the intersection, a unique roadside-to-vehicle communication system will allow drivers of specially equipped vehicles to receive a warning when an intersection crash is imminent. In addition to supporting the intersection collision-avoidance research, the new “intelligent intersection” will continue to serve as an outdoor lab for future FHWA intersection and traffic control research activities.

Nationwide Differential Global Positioning System

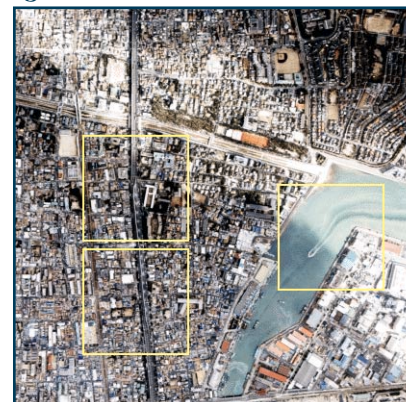
Nationwide Differential Global Positioning System (NDGPS) can pinpoint a person or vehicle’s position to within 3 meters (9.8 feet). NDGPS helps emergency responders find the exact location of a crash, makes it easier for highway agencies to monitor and respond to hazardous pavement conditions, supports in-vehicle navigation systems, and a host of other transportation applications. NDGPS sites will also form part of a nationwide operational GPS meteorological



GPS Satellite.

observing system that will enable the NWS to provide more accurate weather forecasting.

High-Accuracy Nationwide Differential Global Positioning System



Satellite image.

As part of its ongoing research efforts, RD&T modified two existing NDGPS facilities to broadcast corrections that achieve 10-centimeter (4-inch) horizontal accuracy. Initial testing of the High-Accuracy NDGPS (HA-NDGPS) indicates that the new broadcast is accurate to within 10 centimeters (4 inches) and better in many areas. Further research is underway to modify two additional NDGPS facility to achieve faster and even more accurate navigation solutions.

Weather Data Collected from the Eye of Hurricane Ivan

RD&T has supported the installation of the GPS Surface Observation System (GSOS) at NDGPS sites to collect data for improved weather forecasting for surface transportation and other needs. Hurricane Ivan made landfall approximately 31 km (19 miles) east of the NDGPS site at Mobile Point, AL. Ivan was a strong Category 3 hurricane at the time, with winds exceeding 58 meters per second (130 miles per hour). The GSOS equipment at the Mobile Point NDGPS site



Image of hurricane.

successfully collected data through the passage of the eye wall and into the eye of the hurricane. This was the first known ground-based observation of upper-air moisture from within the eye of a hurricane and the highest recorded level of precipitable water vapor in the atmosphere using GPS meteorological techniques. The GSOS data collected during hurricane Ivan will help the NWS improve forecasting of future hurricanes and other severe meteorological events.

Safety R&D Success Stories

Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations

This study compared the safety effectiveness of marked crosswalks against that of unmarked crosswalks at uncontrolled crossing locations and developed recommendations on how to provide safety crossing for pedestrians at these locations. These recommendations, summarized in report *Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations: Executive Summary and Recommended Guidelines* (FHWA-RD-01-075), have been used by various local communities to developing crosswalk improvement plans. An example is provided by the City of Seattle in the January 2004 **ITE** (Institute of Transportation Engineers) **Journal** article, *The City of Seattle, WA, USA, Crosswalk Inventory and Improvement Plan*.



Pedestrian at intersection.

Sign Retroreflectivity

The efforts of the FHWA's Office of Safety and Office of Safety R&D has led to the publication of a Notice of Proposed Rulemaking (NPRM) in the Federal Register on July 30, 2004

(Vol. 69, No. 146). This NPRM is the product of many years of efforts to determine minimum levels for traffic sign retroreflectivity and develop methods to bring in-place signs into compliance. FHWA research over the past 15 years has advanced, validated, and refined the concept of minimum maintained sign retroreflectivity. Initial minimum retroreflectivity levels were first proposed in a 1993



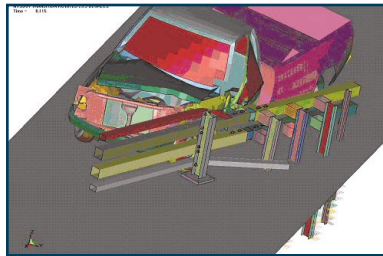
Highway warning sign.

research report, and these levels were revised in 1998 through further research. Research over the last 4 years expanded the proposed minimum levels to overhead and street name signs and fully updated the minimum levels to reflect current conditions. More specifically, the minimum levels were recomputed to consider the effects of various changes, including:

- ▶ Changes in the vehicle fleet to reflect that a large proportion of the fleet is now SUV or light truck type vehicles with higher headlight positions and driver eye heights.
- ▶ Improvements in headlight technology and changes to the European designs that reduce the amount of light projected upward.
- ▶ An increasingly older driver population with diminished night visual acuity.
- ▶ Modifications in the *Manual on Uniform Traffic Control Devices* (MUTCD) legibility criteria.
- ▶ Changes in the characteristics and types of sign materials available.

The resulting minimum level values are presented in the NPRM. It is important to note that the proposed table of levels represents a significant simplification of the minimum levels tables that were promulgated in the mid-1990s to address concerns expressed by AASHTO. Efforts continue at FHWA to develop and administer training on traffic sign retroreflectivity and to develop detailed methods and procedures for assessment and management of retroreflectivity for the millions of in-place signs on the Nation's highways.

Roadside Safety Simulation



Simulation model of barrier crash.

The FHWA, and the National Highway Traffic Safety Administration (NHTSA) worked on a successful collaborative research effort with the George Washington University (GW) School of Engineering and Applied Science. The research

focused on highway infrastructure safety and resulted in several lifesaving innovations to roadside hardware devices, such as guardrails, signposts, and lighting towers. Research included the establishment of W-beam height performance limits for a pickup truck using finite element analysis, and a solution was developed for a State DOT that had a problem with occurrences of under rides for cable guardrails located in depressed medians.

Full-scale crash testing of multiple crash scenarios is cost-prohibitive and does not achieve comprehensive solutions. Instead, researchers simulated crash scenarios on high-performance computers, saving time and maximized research dollars. Results can then be validated by actual crash tests in a more systematic manner, while helping to further refine modeling data.

The partnership also worked to find solutions for the use of barriers to secure Federal facilities. The desire to maintain aesthetic/architectural design features while providing free access to public spaces during certain events requires unique antiramp barrier designs. FHWA and GW produced designs for specialized removable bollards and a cable guardrail system that satisfied protection criterion and aesthetic/architectural desires. Work was conducted with the Department of State (DOS), National Capital Planning Commission (NCPC), and the Secret Service to provide security improvements for Federal buildings. The partnership produced successful designs for bollard, metal fence, full wall, 3-foot high wall, and other barriers for highly secure facilities. These designs were tested at TFHRC. The designs have become the basis for the General Services Administration (GSA), Department of Homeland Security (DHS), and other Federal agencies for barriers within urban landscapes (e.g., park benches or lampposts that would serve as vehicular barriers for Federal buildings).

Highway Safety Information System

The multistate Highway Safety Information System (HSIS) contains accident data for more than 5 million crashes, information about traffic volumes, and roadway inventory data covering approximately 265,650 km (165,067 miles) of State highway systems. FHWA staff, consultants, and other researchers use HSIS to study current highway safety issues, to direct research efforts, and to evaluate the effectiveness of safety countermeasures. FHWA works closely with States and other partners through HSIS to gather data and improve our ability to analyze roadway safety challenges. HSIS helps FHWA direct investments to specific projects and programs that will deliver the most value in terms of saving lives and minimizing injuries. Two recent HSIS summary reports—*Evaluation of Lane Reduction "Road Diet" Measures and Their Effects on Crashes and Injuries* and *An Examination of Fault, Unsafe Driving Acts, and Total Harm in Car-Truck Collisions* are available at <http://www.hsisinfo.org/> under Products.

Characteristics of Emerging Road and Trail Users



Urban roadway with bike lane

Over the past decade, there has been an emergence of various types of nonmotorized transportation. Examples of these “emerging” modes include scooters, the Segway® human transporter, and various configurations of bicycles. These emerging users are

using pedestrian and bicycle facilities that were not designed to accommodate them. A recently completed study examined the operational characteristics and safety of various emerging road and trail users. Recommendations regarding design characteristics will be provided in a published report.

Digital Highway Measurement Vehicle

In FY 2004 RD&T’s Advanced Research Team developed a new Digital Highway Measurement (DHM) vehicle. The vehicle and associated software enables researchers to obtain high resolution measurements at levels that allow systematic definition of a roadway’s geometry. These accurate measurements allow assessment of health conditions of the road and roadside. This vehicle can collect three dimensional geometry data of the highway at vehicle speeds up to 97 km/h (60 mi/h) using a high resolution inertial navigation unit (INU) and high accuracy differential GPS in real time. The vehicle also collects high resolution stereo images, pavement macro-texture data, and lower resolution pavement edge data using a sweeping laser. The use of other sensors, such as ground penetrating radar, are planned to extend its capability to measure the con-



Digital Highway Measurement Vehicle

dition of highway infrastructure. FHWA researchers have used the DHM vehicle in recent field tests with the Pennsylvania DOT on a project to determine the effects of roadway delineation on drivers’ abilities.

Interactive Highway Safety Design Model

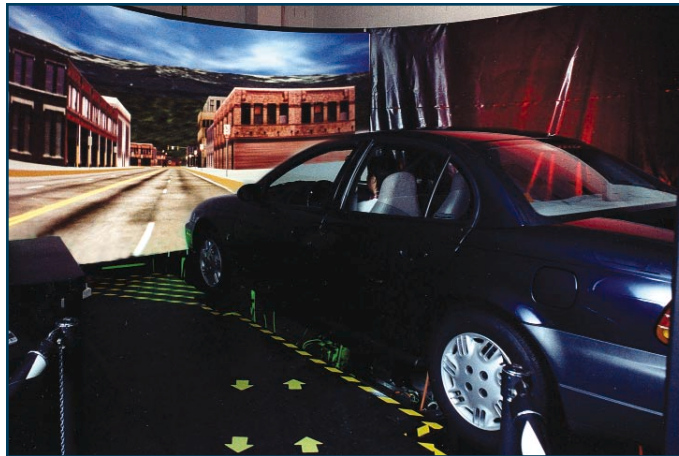
During 2004, FHWA posted updates to the Interactive Highway Safety Design Model (IHSDM), which may be downloaded free-of-charge through www.tfhrc.gov/safety/ihsdm/ihsdm.htm, and provided training in the use of the software to five additional State DOTs. Since its release in 2003, FHWA has provided IHSDM training to nine State DOTs and two Federal Lands Highway Division offices. State DOTs or their engineering consultants to evaluate several projects have used it. Western Federal Lands completed and distributed a draft environmental impact statement to the public for a project in which they used IHSDM to help develop the preliminary designs for the three build alternatives. In addition to improving safety by 50 percent over existing conditions, IHSDM enabled the design of context sensitive solutions, which minimized impacts on the land and the residential development along the road.

Influences of Delineation on Driver Performance on Curves

FHWA with the strong support of Pennsylvania DOT took the first steps in a research project to understand the effects of roadway delineation on the abilities of drivers to safely and efficiently negotiate the highway. The premise of the study is that improved delineation leads to a more appropriate response by the driver. To test this premise, subject drivers drove a section of two-lane rural road in a specially modified vehicle that monitored their speed and lane position. A unique aspect of this study was the incremental nature of changes to the delineation treatments and the use of the same set of subjects over six different sets of highway conditions. The tests were conducted over a 6-mile section of two-lane roadway near Delta, PA. For the tests, 14 curves of varying sharpness (degree

of curvature) were identified. The driving subjects were exposed to six different levels of delineation on these curves (as well as adjacent tangent sections of the road) over a 3-week period. The DHM vehicle was used to determine the design features of this roadway segment. The data gathered will also be used to create a computer representation of this road segment for use in the Highway Driving Simulator (HDS) Lab. Another group of participants will be asked to drive the HDS and experience the same roadway treatments. Speed and lane position are among the measures of driving performance that will be recorded. Once the HDS model is validated, driving subjects can be run through the system repeatedly to test variations of these devices and other new ideas for traffic control.

operations of signalized intersections and tools to remedy deficiencies. The *Signalized Intersections: Informational Guide* will help practitioners make insightful intersection assessments and understand the tradeoffs of potential improvement measures. The guide is available at <http://www.tfhrc.gov/safety/pubs/04091/index.htm>.



Highway Driving Simulator

Signalized Intersections: Informational Guide

Twenty-one percent of crashes and 24 percent of all fatalities and injury collisions occurred at signalized intersections. Because traffic signals play an important role in improving safety at intersections, FHWA developed a comprehensive guide that provides methods for evaluating the safety and

IV. RD&T Performance Management

FHWA's R&T program supports the mission of the Agency to enhance mobility through innovation, leadership and public policy. It contributes to achievement of the USDOT and Agency strategic goals and is stakeholder driven.

Stakeholders are engaged throughout the entire R&T process from agenda setting, through the conduct of research, technology and innovation deployment, implementation, and customer feedback.

In measuring performance, the Office of RD&T uses the Agency Corporate Management Strategies (CMS), based on the Baldrige Criteria, as a framework for improving internal business processes and meeting the needs of our customers. The Baldrige Criteria consist of seven functional categories vital to organizational performance: leadership, strategic planning, customer and market focus, information and analysis, human resource focus, process management, and business results. The U.S. Commerce Department's National Institute of Standards and Technology (NIST) manages the Baldrige National Quality Program in close cooperation with the private sector. Congress established the Baldrige Award program in 1987.

In addition to the CMS framework, RD&T utilizes the following criteria established by the OMB for Federal investment in R&D:

- ▶ **Relevance.** RD&T program managers must be able to articulate why an investment is important, relevant, and appropriate. Our research activities, products, and services outlined in this plan are designed to support the Agency's goals and address customer needs.
- ▶ **Quality.** RD&T program managers must justify how funds will be allocated to ensure quality research. Programs allocating funds through means other than a

competitive, merit-based process must justify these exceptions and document how quality will be maintained. Quality is also assessed periodically through independent lab assessments.

- ▶ **Performance.** RD&T program managers must be able to monitor and document how well this investment is performing. Program managers track R&T projects to determine whether the projects are on time and within budget, and assess whether to increase or redirect funding. Customer feedback mechanisms and retrospective benefit studies also provide important information on performance.

Performance Management Framework

Our approach to performance management builds on our planning process. The RD&T Performance Management Framework chart below identifies existing performance measures and assessment mechanisms that are utilized by unit managers and integrates them across management functions using the Agency's Baldrige-based CMS. This approach helps us manage, analyze, and integrate information obtained from a variety of sources and mechanisms. It also helps keep in mind the various dimensions for analyzing program results, such as financial performance, customer feedback, and business results.

The R&D investment criteria are designed to help improve R&D program management, inform funding decisions, and increase public understanding of the potential benefits of investment in Federal research.

RD&T Performance Management Framework			
CMS	Definition	Related RD&T Performance Measures	Methodology
Leadership	Leadership focuses on how senior leaders guide the organization. It describes how leaders set direction and high-performance expectations, project a strong customer focus, and communicate clear and visible values to employees.	<ul style="list-style-type: none"> ▶ Leadership Effectiveness Inventory (LEI) results. ▶ Action items completed. ▶ Performance plan items fulfilled. ▶ Self-assessment score. 	<ul style="list-style-type: none"> ▶ 360-degree feedback. ▶ Action agenda. ▶ Performance plans. ▶ Quality self-assessments.
Strategic Planning	Strategic planning examines how the organization sets strategic goals and develops key action plans.	<ul style="list-style-type: none"> ▶ Action items completed. ▶ Self-assessment score. ▶ Progress made on goals established. 	<ul style="list-style-type: none"> ▶ Performance plans and action agenda. ▶ Quality self assessment. ▶ Lab assessments.
Customer/ Partner Focus	Customer and partner focus examines how the organization determines customer and market requirements and expectations.	<ul style="list-style-type: none"> ▶ Percent of satisfaction with RD&T products and services. ▶ Number of technology facilitation plans in place. ▶ Self-assessment score. ▶ Lab assessment results. ▶ RD&T customer survey results. 	<ul style="list-style-type: none"> ▶ Customer satisfaction. ▶ Technology Facilitation Action Plan (TFAP). ▶ Quality self-assessments. ▶ Lab assessments. ▶ Customer surveys.
Information and Analysis	Information and analysis examines the management, effective use, and analysis of data and information to support key organization processes, to include the organization's objectives.	<ul style="list-style-type: none"> ▶ Performance measurement framework. ▶ Response level and content of feedback mechanism. ▶ Self-assessment score. ▶ Lab assessment results. 	<ul style="list-style-type: none"> ▶ Performance measurement framework. ▶ Quality self-assessments. ▶ Lab assessments.

RD&T Performance Management Framework (continued)

CMS	Definition	Related RD&T Performance Measures	Methodology
Human Resource Development	Human resource development and management examines how the organization enables its workforce to develop to its full potential and how the workforce is aligned with the organization's objectives.	<ul style="list-style-type: none"> ▶ Self-assessment score. ▶ Percent employee satisfaction survey rating. ▶ Percent payroll spent on training and development. ▶ Number of Individual Development Plans (IDPs) in place and in Learning and Development Systems (LADS). ▶ Number of "priority 1" training needs met. ▶ Number of vacancies filled. ▶ Number of days that positions are vacant. 	<ul style="list-style-type: none"> ▶ Quality self-assessments. ▶ Employee satisfaction survey. ▶ LADS.
Process Management	Process management examines aspects of how key production, delivery, and support processes are designed, managed, and improved.	<ul style="list-style-type: none"> ▶ Number of process improvements documented. ▶ Lab assessments. ▶ Number of contracts on time and on budget. 	<ul style="list-style-type: none"> ▶ Quality self-assessments. ▶ Lab assessments. ▶ Project tracking system.
Business Results	Business results show the organization's performance and improvement in its key business areas: customer satisfaction, financial and marketplace performance, human resources, supplier and partner performance, and operational performance. The category examines how the organization performs relative to competitors.	<ul style="list-style-type: none"> ▶ Percent of project completion. ▶ Number of success stories. ▶ Research benefits. ▶ Implementation of <i>Corporate Master Plan</i>. 	<ul style="list-style-type: none"> ▶ Track project and services delivery. ▶ RD&T success stories. ▶ RD&T performance report.

Performance Management Workgroup

The primary purpose of the Performance Management Workgroup is to help the RD&T leadership develop, coordinate, and implement organizational performance improvement efforts. The workgroup also helps RD&T leadership improve the management of research programs and assists in the adoption of effective practices. Performance management efforts currently underway include:

- ▶ Developing performance goals, measures, strategies, and initiatives to improve organizational performance management in RD&T offices and laboratories.
- ▶ Monitoring results of measures and analyzing performance management information.
- ▶ Coordinating the annual self-assessment process and supporting the RD&T Leadership Council in implementing solutions to issues raised during the process.
- ▶ Contributing to special projects related to RD&T performance management.
- ▶ Providing support for agencywide performance improvement initiatives.
- ▶ Reviewing in retrospect whether investments were well directed, efficient, productive, and essential for validating program design and instilling confidence that future investments will be appropriate. Retrospective RD&T benefit studies are conducted periodically to document the benefits of research products.

RD&T Research Benefits Case Studies

RD&T periodically contracts out retrospective benefits studies to collect data on the benefits of RD&T research, glean insight into characteristics of successful R&T projects, and identify

potentially useful methodologies for documenting and/or estimating benefits that could be used to evaluate other RD&T projects. RD&T contracted out evaluations of HSIS, QuickZone, and Infrastructure R&D with the understanding that there is no single approach to the issue of research performance measurement and benefits assessment. A synthesis report on these three studies was completed in FY 2004. All three studies indicated that RD&T products are widely used and well regarded by our customers. Products were especially well received when customers were involved in design and testing. Benefits of research conducted in the areas of high performance steel, ground penetrating radar, and geotechnical R&D, just to name a few, have helped transform the state-of-practice and saved millions of dollars in infrastructure construction and maintenance costs. Cost savings at a national level have been estimated to be more than ten times the annual research funding.

Customer Feedback

To determine whether our research products are meeting the needs of our customers, RD&T seeks and obtains customer feedback through such mechanisms as formal surveys, Web links, and focus group meetings. A Customer Survey Workgroup is helping the Leadership Council identify existing mechanisms for receiving customer feedback and to develop and implement an RD&T customer survey.

The questions in the FHWA's State and local partner survey that relate to deploying technology and innovation provide us with important information/customer feedback. In particular, the R&T Leadership Team has adapted a question, which asks how satisfied customers are with the deployment of technologies/innovations that are designed to help improve their program. The question serves as an overall indicator of how well we are meeting customer needs.

Respondents in the FHWA State Customer and Metropolitan Planning Organization (MPO) Partner Survey Wave III and IV

indicated that communications on T&I were good overall. Respondents mentioned that FHWA contacts in the T&I arena were knowledgeable, provide information from other States, and share lessons learned. Areas for improvement included the need for more timely and advanced notice of new T&I and the need for guidelines on how to implement them.

RD&T Lab Assessment Process

Beginning in FY 2004, FHWA established a full-scale lab assessment process. The process has been refined over the course of the year and is working well. RD&T laboratory assessments are unbiased, independent expert reviews of the technical and scientific merit of research conducted at TFHRC. The assessment process is designed to:

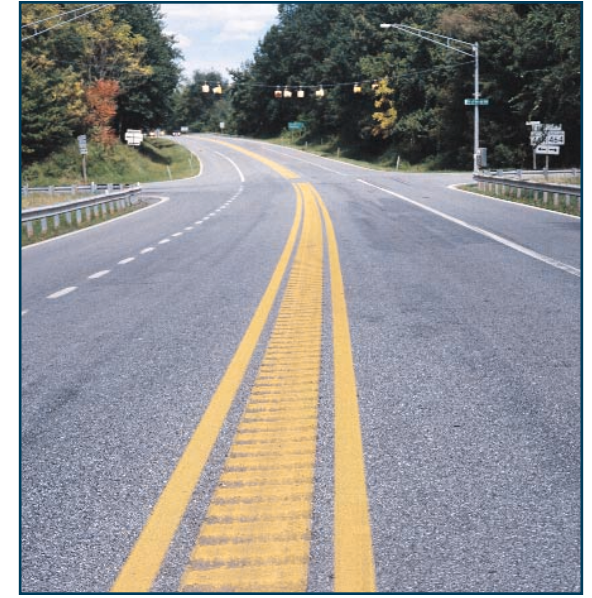
- ▶ Enhance laboratory performance and quality by providing feedback to laboratory managers.
- ▶ Provide an opportunity to exchange views among technical experts.
- ▶ Create a feedback method that will increase the opportunities for customer and stakeholder input to research activities.
- ▶ Provide a credible, professional, and objective assessment that further improves stakeholder confidence in the value of the work performed and outcomes produced.

A lab assessment handbook was developed to guide lab assessment panel members in examining the relevance, quality, and performance of laboratory research. Assessments focus primarily on the conduct of research, but also examine whether the research activities have high potential value and whether they have achieved stated objectives. The review process is continuous, with each laboratory having the benefit of an assessment every 3 to 4 years. Three labs were assessed in FY 2004: Asphalt, TReL, and Hydraulics.

The advice we have received from the panels has been invaluable. Knowledge of related work at universities, State DOTs, other government labs, or private industry is often shared. In addition, the experience of preparing for the assessment has been a useful exercise for FHWA staff, and we have strengthened ties to other labs and organizations as a result of on-site interactions and follow-on exchanges between panel members and TFHRC staff.

Lab assessments have also served as a valuable opportunity to obtain feedback from customers and stakeholders (who are interviewed by the panel)—and have raised the visibility of the work of the labs with these customers and stakeholders.

APPENDICES



Appendix A

R&D Research Project Status



The following charts detail RD&T research and identify the goals that this research supports. The charts also indicate which projects were completed in FY 2004 and which ones are ongoing for 2005 and beyond. The comment column provides reasons behind changes or deviations from the unit plan and schedule. Additionally, we've included new projects that were not identified at the time the *FY 2004/2005 Performance Plan* was published.

Office of Infrastructure R&D										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Pavements Design and Analysis										
Cost and Performance Benefits of Concrete Pavement Design Features *	Peter Kopac HRDI-11 202-493-3151	Mobility and Productivity				X	Yes	Complete	Yes	Software for quickly assessing relative costs and benefits of incorporating various design features being evaluated
Strategic Analysis of Pavement Evaluations for Rehabilitation (SAPER) Software Tool	James Sherwood HRDI-12 202-493-3150	Mobility and Productivity				X	Yes	Nov. 04	No	Software product currently being evaluated by FHWA prior to distribution.
Guidance for Constructing Smooth, Long-Lasting Concrete Pavements *	Peter Kopac HRDI-11 202-493-3151	Mobility and Productivity			X		Yes	Nov. 04	No	In process of analyzing data and writing report.
Long-Term Pavement Performance (LTPP) Binder (LTPPBind) v 3.0	Aramis López HRDI-13 202-493-3145	Mobility and Productivity			X		Yes	Feb. 05	No	Beta version available, final version pending availability of reauthorization funds.

* Addition to FY 2004/2005 Performance Plan

Office of Infrastructure R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Pavements Design and Analysis (continued)										
LTPP Traffic Projection Software	Aramis López HRDI-13 202-493-3145	Mobility and Productivity	X				No	Sep. 05	No	Presently on hold, as recommended by the Traffic Expert Task Group (ETG), until final results of NCHRP 1-39 are available.
Evaluation of NCHRP 1-37A Mechanistic-Empirical Design Models	Katherine Petros HRDI-12 202-493-3154	Mobility and Productivity	X				No	Dec. 05	No	Model evaluation has begun; lack of resources has slowed the process.
Guidance for the Use of Fiber-Reinforced Polymer (FRP) in Concrete Pavements	Peter Kopac HRDI-11 202-493-3151	Mobility and Productivity			X		No	Oct. 06	No	Delays incurred in order to schedule field trials of FRP in pavements.
Impact of Dynamic Modulus on Model Prediction *	Tom Harman HRDI-11 202-493-3072	Mobility and Productivity		X			No	Dec. 04	No	Equipment challenges have delayed the timely completion of this project.
Seasonal Monitoring Program *	Aramis López HRDI-13 202-493-3145	Mobility and Productivity				X	No		Yes	Release delayed due to 508 conversions. Set of 3 CDs (version 1.2) are now available.

* Addition to FY 2004/2005 Performance Plan

Office of Infrastructure R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Pavement Materials and Construction										
Prediction of Paving Concrete Shrinkage	Peter Kopac HRDI-11 202-493-3151	Mobility and Productivity		X			No	Oct. 03	No	Project delayed by work priorities and loss of staff. An interim technical contact is listed until the vacant position is backfilled.
Mixture-Specific Procedure for Estimating Alkali-Silica Reactivity (ASR) Potential	Peter Kopac HRDI-11 202-493-3151	Mobility and Productivity		X			No	Dec. 03	No	Software product currently being evaluated by FHWA prior to distribution.
Low-Temperature Binder Characterization	Peter Kopac HRDI-11 202-493-3151	Mobility and Productivity			X		No	May 04	No	In process of analyzing data and writing report.
Guidance on Compatibility of Mixture Components	Peter Kopac HRDI-11 202-493-3151	Mobility and Productivity			X		Yes	Mar. 05	No	Beta version available, final version pending availability of reauthorization funds.
FHWA Dynamic Angle Validation Kit (DAVK)	Tom Harman HRDI-11 202-493-3072	Mobility and Productivity		X			Yes	July 05	Yes	Original project to develop the DAVK is complete; this extension will incorporate mix-less technology.
Computer-based Guidelines for Concrete Pavements	Fred Faridazar HRDI-11 202-493-3076	Mobility and Productivity			X		No	Jan. 06	No	Contract was modified to include pocket PC-based system of guidelines on curing concrete. The development of the HIPERPAV™ II software is complete. The final report is current being reviewed for editing for publication. Contract delayed staffing challenges.

Office of Infrastructure R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Pavement Materials and Construction (continued)										
Seasonal Monitoring Program *	Aramis López HRDI-13 202-493-3145	Mobility and Productivity				X	No	Oct. 03	Yes	Release delayed due to 508 conversions. Set of 3 CDs (version 1.2) are now available.
Pavement Data and Performance										
Smoothness Specifications	Dennis Sixbey HRDI-11 202-493-3078	Mobility and Productivity			X		No	Nov. 03	No	
Warp and Curl Analysis Software	Dennis Sixbey HRDI-11 202-493-3078	Mobility and Productivity			X		No	Nov. 03	No	
LTPP Distress Identification Manual	Aramis López HRDI-13 202-493-3145	Mobility and Productivity				X	Yes	Feb. 04	Yes	Report printed in December 2003 (FHWA-RD-03-031). Over 2,000 copies distributed.
Fatigue Model	Katherine Petros HRDI-12 202-493-3154	Mobility and Productivity			X		No	Sep. 04	No	Development of a visco-elastoplastic fatigue model for modified asphalt concrete (AC) binders using the results from accelerated loading facility (ALF) testing.
Weigh-in-Motion (WIM) Pavement Smoothness Specifications	Aramis López HRDI-13 202-493-3145	Mobility and Productivity			X		No	Jan. 05	No	One extra validation will be performed at an Ohio site. Product expected January 2005.

* Addition to FY 2004/2005 Performance Plan

Office of Infrastructure R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Pavement Data and Performance (continued)										
Anytime Weather Software	Aramis López HRDI-13 202-493-3145	Mobility and Productivity	X				Yes	Feb. 05	No	Alpha version completed; final version pending availability of reauthorization funds.
DataPave Online	Aramis López HRDI-13 202-493-3145	Mobility and Productivity				X	Yes	Feb. 05	Yes	Product available at www.datapave.com . Request for Proposal (RFP) for maintenance and long-term revisions on hold pending availability of reauthorization funds.
Bridge of the Future										
Compilation and Evaluation of Results from High-Performance Concrete (HPC) Bridge Projects	Joseph Hartmann HRDI-06 202-493-3059	Mobility and Productivity				X	Yes	Dec. 03	No	Survey of condition complete. Report being produced.
Curved Girder Bridge Strength Prediction Equation	William Wright HRDI-06 202-493-3053	Mobility and Productivity				X	Yes	Dec. 03	Yes	AASHTO SCOB T-14 balloted and accepted changes to AASHTO bridge design code in June 2004.
New Fiber Reinforced Polymer (FRP) Specifications	Eric Munley HRDI-06 202-493-3046	Mobility and Productivity			X		Yes	Dec. 03	Yes	AASHTO materials specification is complete. FRP deck testing specification is near completion. Working on consensus. FRP repair specification in early stages of development.

Office of Infrastructure R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Bridge of the Future (continued)										
Standard Tests Using a GeoGauge	Mike Adams HRDI-06 202-493-3025	Mobility and Productivity				X	Yes	Oct. 04	Yes	GeoGauge testing device has been validated and is commercially available to State highway administrations.
Corrugated Web Plates for Steel Girders	William Wright HRDI-06 202-493-3053	Mobility and Productivity				X	Yes	Dec. 04	No	Physical testing completed. Report production underway.
Improved Fracture Toughness Specifications for High-Performance Steel (HPS)	William Wright HRDI-06 202-493-3053	Mobility and Productivity		X			Yes	June 05	No	Physical testing work completed. Development of design criteria will be accomplished in cooperation with AASHTO SCOB T-14.
Design Guidance for Composite Timber Bridges	Sheila Duwadi HRDI-07 202-493-3106	Mobility and Productivity			X		Yes	Dec. 05	No	This study will produce design and material specifications for FRP reinforced timber bridges for adoption by AASHTO.
Safety, Reliability, and Security										
Improved Seismic Design Provisions for AASHTO Bridge Specifications	Phillip Yen HRDI-07 202-493-3056	Mobility and Productivity				X	No	Dec. 03	No	Study on improving current bridge seismic design provisions. A new seismic design provision was proposed to AASHTO and is now in the process of being adopted.

Office of Infrastructure R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Safety, Reliability, and Security (continued)										
Seismic Retrofit Manual	John O'Fallon Phillip Yen HRDI-07 202-493-3051	Mobility and Productivity				X	Yes	Feb. 04	No	Study of seismic vulnerability of bridges and other highway structural components. Report completed and is under technical and editorial review. It will be published in December 2004.
Wind-Induced Vibration of Stay Cables	Harold Bosch HRDI-07 202-493-3031	Mobility and Productivity				X	No	Apr. 04	No	Study of wind/rain effects on bridge stay cables for development of design guide. Technical review of report complete; awaiting editorial review. It will be published in 2005.
Abutment Scour Field Data (ABSCOUR) *	Sterling Jones HRDI-07 202-493-3043	Mobility and Productivity			X		No	Oct. 04	No	Database has been upgraded for testing prediction methods. The ABSCOUR program used by the Maryland State Highway Administration (SHA) is being evaluated and revised based on this data. The study is approximately 3 months behind schedule due to complications resolving ABSCOUR discrepancies.

* Addition to FY 2004/2005 Performance Plan

Office of Infrastructure R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Safety, Reliability, and Security (continued)										
Effects of Inlet Geometry on Culvert Performance *	Sterling Jones HRDI-07 202-493-3043	Mobility			X		No	Oct. 04	No	This study is approximately 6 months behind schedule due to difficulties in getting a contract underway to fabricate models. Results will be presented to South Dakota DOT sponsors in August 2004 and at the National Hydraulics Conference in Sept. 2004.
Examples for Design of Seismic Isolation Bearings	Hamid Ghasemi HRDI-07 202-493-3042	Mobility, Safety, and Productivity			X		Yes	Nov. 04	No	Additional funding is required to complete the work.
A Risk-Based Methodology for Assessing the Seismic Performance of Lifeline Systems Report	Phillip Yen HRDI-07 202-493-3056	Mobility, Safety, and Productivity			X		Yes	Dec. 04	No	Developing computer software that will help State DOTs to assess the seismic risk for bridges. Research is almost complete and is now under testing for validation.

* Addition to FY 2004/2005 Performance Plan

Office of Infrastructure R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Safety, Reliability, and Security (continued)										
Design Procedure for Bottomless Culverts	Sterling Jones HRDI-07 202-493-3043	Mobility, Safety, Productivity, & Environment			X		No	Dec. 04	No	This study was interrupted to conduct additional scour tests for the Woodrow Wilson Bridge. Results will be presented at the National Hydraulics Conference.
Seismic Retrofitting Manuals: Part III: Special Bridges	Phillip Yen HRDI-07 202-493-3056	Mobility, Safety, and Productivity			X		Yes	Dec. 04	No	Study on seismic vulnerability of long truss and other special bridges for design and retrofitting. The manual is 75 percent completed and will be reviewed by the Highway Seismic Research Council.
Tacoma Narrows Technology Demonstration and Research Project	Hamid Ghasemi HRDI-07 202-493-3042	Mobility, Safety, and Productivity	X				Yes	Dec. 05	No	A number of studies under this project are on schedule. One study concerning health monitoring is running behind schedule.
Stewardship and Management										
Measurement of the Benefits of Infrastructure R&D	Sheila Rimal Duwadi HRDI-07 202-493-3106	Productivity				X	Yes	Oct. 03	Yes	This project produced a methodology to measure the benefits of research. The final report and a CD containing the methodology were delivered to FHWA. As it is an in-house report, it has not been published.

Office of Infrastructure R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Stewardship and Management (continued)										
Guidelines for the Ultrasonic Inspection of Hanger Pins	Hamid Ghasemi HRDI-07 202-493-3042	Mobility and Productivity				X	Yes	Dec. 03	Yes	Report completed and published.
Guidelines for the Use of High-Energy Radiography for Structures	Hamid Ghasemi HRDI-07 202-493-3042	Mobility and Productivity				X	Yes	Jan. 04	No	This study investigated the use of nuclear methods for evaluation of bridges and bridge materials. Report will be published.
Covered Bridge Manual *	John O'Fallon HRDI-07 202-493-3051	Mobility and Productivity				X	Yes	Feb. 04	Yes	Manual is a guide to rehabilitate, restore, preserve and reconstruct historic covered bridges.
Fatigue Retrofit Manual	William Wright HRDI-06 202-493-3053	Mobility and Productivity				X	Yes	Apr. 04	Yes	Manual complete.
Corrosion Performance of Epoxy-Coated Rebar in Concrete (10-Year Laboratory Study)	Paul Virmani HRDI-10 202-493-3052	Mobility and Productivity				X	Yes	June 04	No	Report being printed.
Ultrasonic Methods for Health Monitoring of Prestressing Tendons	Hamid Ghasemi HRDI-07 202-493-3042	Mobility and Productivity				X	Yes	Sep. 04	No	This study investigated the use of ultrasonic methods for examining bonded strands for corrosion or breakage.

* Addition to FY 2004/2005 Performance Plan

Office of Infrastructure R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Stewardship and Management (continued)										
Bridge and Tunnel Surveillance: A State-of-the-Art Review	Sheila Rimal Duwadi HRDI-07 202-493-3106	Mobility, Productivity, and Security			X		Yes	Jan. 05	No	This project will develop a protocol for assessing security and surveillance systems.
Guidelines for Corrosion Control Design of Bridges	Bob Kogler HRDI-06 202-493-3080	Mobility and Productivity	X				Yes	Apr. 05	No	This effort will coordinate closely with AASHTO SCOB T-9 to develop best practice guidance using FHWA (and other) research results as a baseline. Effort just started in FY 2004.
Life Cycle Cost Analysis (LCCA) for Bridges	John Hooks HRDI-03 202-493-3023	Mobility and Productivity		X			Yes	Aug. 05	No	This study will develop simplified software and provide guidance on collecting costs for using LCCA in bridge management systems.
Best Practices Manual for Quality Bridge Coatings	Bob Kogler HRDI-06 202-493-3080	Mobility and Productivity			X		Yes	Sep. 05	No	This effort will produce a training course and national level inspector certification program. Program to be available in January 2005.
Thermal Imaging System for Crack Detection *	Glenn Washer HRDI-10 202-493-3082	Mobility		X			No	Sep. 05	No	Method to detect cracks and prevent failure of steel structures. Test setup complete; experiencing difficulties with vendor-supplied equipment.

* Addition to FY 2004/2005 Performance Plan

Office of Infrastructure R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Stewardship and Management (continued)										
Corrosion resistant Alloys for Use as Reinforcement in Concrete *	Paul Virmani HRDI-10 202-493-3052	Mobility and Productivity		X			Yes	Aug. 06	No	This study will identify cost-effective clad or alloyed reinforcement for concrete bridge members to provide 75 years service life.
HERMES II Ground Penetrating Radar	Glenn Washer HRDI-10 202-493-3082	Mobility		X			Yes	Oct. 06	No	Tools to rapidly survey concrete decks for deficiencies. Prototype system undergoing expanded testing under a new work plan in cooperation with State partners.

* Addition to FY 2004/2005 Performance Plan

Office of Operations R&D										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Intelligent Vehicle Initiative (IVI) and Research Related to Human Centered Systems										
Human Factors Assessment of Infrastructure-Based Intersection Collision Avoidance (ICA) Devices-Phase I	Greg Davis HRDS-07 202-493-3367	Safety				X	Yes	Mar. 04	Yes	The goal is to evaluate alternative infrastructure-based warnings to drivers to prevent collisions (in conjunction with the Human Centered Systems Lab). First phase competed on time in March 04.
Human Factors Assessment of Infrastructure-Based Intersection Collision Avoidance (ICA) Device-Phase II	Greg Davis HRDS-07 202-493-3367	Safety	X				Yes	Dec. 06	No	This study will be conducted on a closed test course to gather deceleration profiles and reaction time data for drivers responding to warnings that are given both nearer and farther from the intersection.
Enhanced Digital Mapping	Toni Wilbur HRDO-01 202-493-3303	Safety				X	No	Apr. 04	No	Detroit demonstration delayed from November 03 to March 04. Final report is complete and undergoing FHWA and NHTSA review. Report will be available November 04.
Work Zone ITS for Crash Avoidance, Phase I	Peter Huang HRDO-04 202-493-3484	Safety				X	Yes	Dec. 04	No	Developed the operational concept for work zone crash avoidance, which is being tested on a driving simulator. Developed hardware requirements. Several types of sensor applications are being tested in the field.

Office of Operations R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Intelligent Vehicle Initiative (IVI) and Research Related to Human Centered Systems (continued)										
Infrastructure Consortium (IC) Prototype Intersection Collision Avoidance Projects.	Gene McHale HRDO-03 202-493-3275	Safety			X		Yes	Jan. 05	No	Completion date extended so that the IC can support the new Cooperative Intersection Collision Avoidance Systems ITS Tier 1 initiative. New target completion date is April 05.
Traffic Control and Operations										
Traffic Detector Handbook	David Gibson HRDO-04 202-493-3271	Safety, Mobility and Productivity			X		No	Nov. 03	No	Update to handbook completed; currently working on making the report 508 compliant. New estimated completion date is March 2005.
Freeway Management Handbook	James Colyar HRDO-03 202-493-3282	Mobility and Productivity				X	Yes	Dec. 03	Yes	Update to handbook is complete and a free download is available at: http://www.ops.fhwa.dot.gov/Travel/traffic/freeway_management.htm
Traffic Control Systems Handbook	Raj Ghaman HRDO-03 202-493-3270	Mobility and Productivity					No	Dec. 03	No	No funding. Project cancelled.
Adaptive Control System (ACS) "Lite" Version Software	Raj Ghaman HRDO-03 202-493-3270	Mobility and Productivity				X	No	Jan. 04	No	Software and laboratory testing completed and communication to actual signal hardware has been developed. The effort was completed in September 04.

Office of Operations R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Traffic Control and Operations(continued)										
ACS "Lite" Field Test	Raj Ghaman HRDO-03 202-493-3270	Mobility and Productivity		X			No	Sep. 04	No	Gahanna, OH selected as field test site. Field testing planned for Fall 04. Estimated completion date is December 04.
Coordinated Freeway and Arterials Plans and Procedures Handbook *	James Colyar HRDO-03 202-493-3282	Mobility and Productivity			X		Yes	Dec. 04	No	Final report under development.
Traffic Detector Video*	David Gibson HRDO-04 202-493-3271	Safety, Mobility and Productivity	X				Yes	Feb. 05	No	The video script has been approved and the contractor will begin filming shortly.
Ramp Metering 2000 Software Expanded Simulation Testing	Deborah Curtis HRDO-03 202-493-3267	Mobility and Productivity			X		Yes	May 05	No	Software development completed in May 2003. Planned field test replaced with more cost-effective expanded simulation testing. Working with Office of Operations to determine next steps for product.
Ramp Management Handbook *	James Colyar HRDO-03 202-493-3282	Mobility and Productivity		X			Yes	June 05	No	This is a follow-up document to Freeway Management Handbook. Completed annotated outline and decision diagrams, working on draft report.

Office of Operations R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Traffic Control and Operations(continued)										
Winter Weather Maintenance Decision Support Systems Pooled Fund Study	Rudy Persaud HRDO-04 202-493-3391	Safety, Mobility and Productivity, Environment		X			Yes	June 05	No	The five States Pooled Fund Study project is to develop a Maintenance Decision Support System to help maintenance forces better plan and respond to winter weather and road conditions.
Winter Weather Maintenance Decision Support Systems (MDSS)	Randall VanGorder HRDO-03 202-493-3266 Rudy Persaud HRDO-04 202-493-3391	Safety, Mobility and Productivity, Environment				X	Yes	Dec. 03	Yes	The project was extended to conduct a second field demonstration in Iowa in the winter of 2003-04. The demonstration is completed. MDSS Release 3.0 is expected in October 04. CD-ROMs can be ordered through the NCAR MDSS Web site: www.rap.ucar.edu/projects/rdwx/documents/index.html .
MDSS Deployment Assistance *	Randall VanGorder HRDO-03 202-493-3266 Rudy Persaud HRDO-04 202-493-3391	Safety, Mobility and Productivity, Environment	X				Yes	Sep. 05	Yes	This project will provide deployment assistance to assure successful technology transfer to the private sector and to complete all programming, documentation and evaluations from the second year of the MDSS demonstration.

* Addition to FY 2004/2005 Performance Plan

Office of Operations R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Traffic Control and Operations(continued)										
DynaMIT—Field Test in Los Angeles, CA	Henry Lieu HRDO-03 202-493-3273	Mobility and Productivity		X			No	Dec. 05	No	This project is to integrate CLAIRE, DynaMIT and Advanced Incident Detection Algorithm (AIDA) in Los Angeles for real time traffic management on arterials. The data collection process has proven more time consuming than originally anticipated so the target completion date has been reevaluated. The new estimated completion date is February 06.
Unmanned Aerial Vehicle (UAV) for Aerial Surveillance	David Gibson HRDO-04 202-493-3271	Safety, Mobility and Productivity			X		Yes	Dec. 05	No	Uses model airplane for traffic surveillance and potential transportation system inspections. Currently working with VDOT and GeoData to establish a test section along Interstate 66 to test/demo the data collection abilities of the UAV.
Real Time Linux Operating System for Advanced Traffic Controller *	David Gibson HRDO-04 202-493-3271	Mobility and Productivity	X				Yes	Sep. 06	No	Phase I is complete. Phase II is in negotiation.

* Addition to FY 2004/2005 Performance Plan

Office of Operations R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Traffic Control and Operations(continued)										
DYNASMART-X—Field Test in Houston, TX	Henry Lieu HRDO-03 202-493-3273	Mobility and Productivity		X			No	June 06	No	This project is to integrate CLAIRE, DYNASMART-X and RHODES in Houston TranStar for real-time traffic management to alleviate traffic congestion, particularly caused by freeway reconstruction and flooding. The project was delayed by 1 year due to contracting issues that have now been resolved. The project will start in late 2004 and is projected for completion in March 07.
Surface Transportation Security and Reliability Information System Model Deployment (Florida)	Toni Wilbur HRDO-01 202-493-3269	Safety, Mobility and Productivity, Security	X				Yes	June 07	No	This project will demonstrate and evaluate how the operation of the surface transportation system can be enhanced through the widespread availability of real-time information. The design phase is complete.
Alternate Avalanche Control Ammunition Pooled Fund Study	Rudy Persuad HRDO-04 202-493-3391	Safety, Mobility and Productivity								Pooled Fund Study cancelled.
Traffic Analysis Tools/ Simulation and Modeling										
Emergency Vehicle Network Delay Study	Gene McHale HRDO-03 202-493-3275	Mobility and Productivity			X					Project delayed due to other priorities related to TSIS/CORSIM software. Expected completion date is December 04.

Office of Operations R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Traffic Analysis Tools/ Simulation and Modeling(continued)										
Traffic Analysis Tools Selection Guide Primer	Gene McHale HRDO-03 202-493-3275	Mobility and Productivity				X	No	Dec. 03	No	Document complete. Project delayed while 508 compliant version was developed. Primer is posted at http://ops.fhwa.dot.gov/Travel/Traffic_Analysis_Tools/traffic_analysis_tools.htm .
Traffic Simulation Application Guidelines	Gene McHale HRDO-03 202-493-3275	Mobility and Productivity				X	No	Dec. 03	Yes	Document complete. Project delayed while 508 compliant version was developed. Primer is posted at http://ops.fhwa.dot.gov/Travel/Traffic_Analysis_Tools/traffic_analysis_tools.htm .
DYNASMART-P	Henry Lieu HRDO-03 202-493-3273	Mobility and Productivity				X	No	Jan. 04	Yes	DYNASMART-P software and its input editor DSPeD, are complete and were released to the public via the McTrans Center in September 2004.
CORSIM Application Guidelines	James Colyar HRDO-03 202-493-3282	Mobility and Productivity	X				No	Sep. 04	No	Delayed start of project. Completed annotated outline. Working on draft report. New target completion date September 05.

Office of Operations R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Traffic Analysis Tools/ Simulation and Modeling(continued)										
Traffic Analysis Tools Case Studies and Best Practices	James Colyar HRDO-03 202-493-3282	Mobility and Productivity	X				No	Sep. 04	No	Delayed start of project. Completed annotated outline. Working on draft report. New target completion date September 05.
Traffic Analysis Tools Course	James Colyar HRDO-03 202-493-3282	Mobility and Productivity					No	Sep. 04	No	Delayed indefinitely due to changed funding priorities.
Traffic Simulation Application Course	James Colyar HRDO-03 202-493-3282	Mobility and Productivity					No	Sep. 04	No	Delayed indefinitely due to changed funding priorities.
Federal Facility Evacuation Study *	James Colyar HRDO-03 202-493-3282	Safety and Mobility		X			Yes	Dec 04	No	Completed development of combined internal and external compound simulation network. Working on developing and modeling optimal evacuation scenarios.
Strategic Work Zone Analysis Tools (SWAT)	Deborah Curtis HRDO-03 202-493-3267	Mobility and Productivity		X			No	Dec 04	No	Working on impact analysis tool. Project delayed by Work Zone Rule Making Initiative. Project management transferred to Work Zone Implementation Project Team (WZIPT). New target completion date October 05.

* Addition to FY 2004/2005 Performance Plan

Office of Operations R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Traffic Analysis Tools/ Simulation and Modeling(continued)										
QuickZone Work Zone Delay Estimation Tool	Deborah Curtis HRDO-03 202-493-3267	Mobility and Productivity			X		No	Dec. 03	No	Working on cost estimate tool. QuickZone 2.0 release delayed due to section 508 issues. Software will be available in October 04 from the McTrans Center.
QuickZone Partnership Program	Deborah Curtis HRDO-03 202-493-3267	Mobility and Productivity				X	Yes	May 05	No	No further funding and no additional States being added. However, we are maintaining a working relationship with the current seven partner States.
Advanced CORSIM Course	James Colyar HRDO-03 202-493-3282	Mobility and Productivity					No	Sep. 05	No	Delayed indefinitely due to changed funding priorities.
Exclusive Truck Lane Simulation Safety Study *	James Colyar HRDO-03 202-493-3282	Safety, Mobility, and Productivity	X				Yes	Sep. 05	No	Completed literature review and methodology for surrogate safety measures using CORSIM. Working on simulation networks and scenarios.
DynaMIT-P—Field Test in Hampton Roads, VA	Henry Lieu HRDO-03 202-493-3273	Mobility and Productivity		X			Yes	Jan. 06	No	The Phase 1 offline evaluation work completed in July 2004. The Phase 2 online evaluation work started in September 2004.

* Addition to FY 2004/2005 Performance Plan

Office of Operations R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Traffic Analysis Tools/ Simulation and Modeling(continued)										
Next Generation Simulation Modeling	James Colyar HRDO-03 202-493-3282	Mobility and Productivity	X				Yes	Sep. 07	Yes	Completed algorithm assessment, algorithm prioritization, and high-level plans. Finished data collection for prototype study, and completed prototype algorithm. Report is available at http://ops.fhwa.dot.gov/Travel/Traffic_Analysis_Tools/ngsim_program.htm . Depending on funding for option years of contract, will begin new algorithm development.
Enabling Technologies										
Global Positioning System (GPS) Surface Observation System Installation for Integrated Precipitable Water Vapor (IPWV)	James Arnold HRDO-04 202-493-3269 Rudy Persaud HRDO-04 202-493-3391	Safety, Mobility and Productivity, Environment, Security		X			Yes	Dec. 05	No	Installation of GPS Surface Observation System (GSOS) meteorological sensors at NDGPS sites provides useful weather observations along with the information needed to calculate atmospheric water vapor from the GPS signals.
NDGPS Reference Station Modernization	James Arnold HRDO-04 202-493-3269	Safety, Mobility and Productivity, Environment, Security		X			Yes	Dec. 05	No	Research to define existing GPS capability.

Office of Operations R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Enabling Technologies (continued)										
High-Accuracy NDGPS	James Arnold HRDO-04 202-493-3269	Safety, Mobility and Productivity, Environment, Security		X			Yes	Dec. 07	No	Research program to evaluate the potential for achieving very high accuracy navigation solutions using existing infrastructure.
Clear Roads Pooled Fund Study *	Rudy Persaud HRDO-04 202-493-3391	Safety, Mobility and Productivity, Environment	X				Yes	Dec. 07	No	Clear Roads is a new pooled fund research project aimed at rigorous testing of winter maintenance materials, equipment, and methods for use by highway maintenance crews.
Precipitable Water Vapor for Weather Forecasting *	James Arnold HRDO-04 202-493-3269	Safety, Mobility and Productivity, Environment, Security		X			Yes	Dec. 07	No	Research program to develop and evaluate a precipitable water vapor algorithm to improve weather forecasting.
Dedicated Short Range Communications/Wireless Access for Vehicular Environment *	James Arnold HRDO-04 202-493-3269	Safety, Mobility and Productivity, Environment, Security			X		Yes	Dec. 08	No	Development of telecommunications technology to include spectrum allocation from the Federal Communications Commission (FCC), licensing rules, standards, prototypes, and initial deployment.
Telecommunications Interference Model for Predicting Ionospheric Changes *	James Arnold HRDO-04 202-493-3269	Safety, Mobility and Productivity, Environment, Security		X			Yes	Dec. 08	No	Research program to develop and evaluate an ionospheric model to predict interference levels to telecommunication systems.

* Addition to FY 2004/2005 Performance Plan

Office of Safety R&D											
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments	
			25	50	75	100					
Run-Off-Road Prevention: Design											
Research Recommended Update to Minimum Levels for Traffic Sign Retroreflectivity	Ken Opiela HRDS-05 202-493-3371	Safety				X	No	Dec. 04	No	The report is in the final stages of publication and will be available soon.	
Requirements for High Conspicuity Traffic Signs	Carl Andersen HRDS-05 202-493-3366	Safety	X				No	Mar. 04	No	Study plan completed. Human factors studies delayed until FY 2005 due to lack of funding.	
Research Recommended Minimum Retroreflectivity Requirements for Overhead Guide and Street Name Signs *	Ken Opiela HRDS-05 202-493-3371	Safety				X	Yes	Dec. 04	No	The report is in the final stages of publication and will be available soon.	
Interactive Highway Safety Design Module—2004 Release	Ray Krammes HRDS-05 202-493-3312	Safety				X	Yes	Sep. 04	Yes	The software is available at: www.ihsdm.org .	
Enhanced Night Visibility Project Results	Carl Andersen HRDS-05 202-493-3366	Safety				X	Yes	Mar.05	No	Research is completed. Reports are in progress. There will be a total of 18 separate volumes.	
Relative Effectiveness of Pavement Markings and Raised Retroreflective Pavement Markers (RRPM)	Ken Opiela HRDS-05 202-493-3371	Safety				X	Yes	Dec. 04	Yes	Study findings were documented in a TRB paper that was presented in January 2004.	
Guidelines for Maintaining Night Visibility of Traffic Signs	Ken Opiela HRDS-05 202-493-3371	Safety			X		No	Jan. 05	No	Research in progress. Draft versions of parts of the final report have been reviewed.	

* Addition to FY 2004/2005 Performance Plan

Office of Safety R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Run-Off-Road Prevention: Design (continued)										
Driver Recognition of Traffic Control Color Coding	Carl Andersen HRDS-05 202-493-3366	Safety	X				No	June 05	No	No work to date due to lack of funding. Was intended to follow work on High-Conspicuity Signs.
Driver Performance Effects of Innovative Applications of Pavement Markings and RRPMS	Ken Opiela HRDS-05 202-493-3371	Safety	X				Yes	Dec. 05	No	Field data has been gathered to allow work to begin on a Highway Driving Simulator model. Subject testing will begin in March 2005.
Visibility Requirements for Novel Pavement Marking Treatments	Ken Opiela HRDS-05 202-493-3371	Safety	X				No	Sep. 06	No	This effort would follow completion of the effort above.
Guidelines for Maintaining Night Visibility of Pavement Markings	Ken Opiela HRDS-05 202-493-3371	Safety	X				Yes	Dec. 05	No	Contractor to carry out this research starting September 2004.
Requirements for Light-Emitting Diode (LED) Traffic Signals	Carl Andersen HRDS-05 202-493-3366	Safety	X				Yes	June 06	No	Studies not yet initiated.
Degradation of Traffic Sign Retroreflectivity and Color	Joe Moyer HRDS-07 202-493-3370	Safety		X			No	Dec. 06	No	Project halted due to budget constraints.
Develop Design Guidelines for Crosswalk Lighting *	Carl Andersen HRDS-05 202-493-3366	Safety	X				Yes	Dec. 05	No	Completed Phases I and II and now preparing for Phase III, Dynamic Testing. A draft report is under review.

* Addition to FY 2004/2005 Performance Plan

Office of Safety R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Run-Off-Road Prevention: Design (continued)										
Wet Night Visibility of Pavement Markings *	Carl Andersen HRDS-05 202-493-3366	Safety	X				No	Mar .07	No	Draft report of static testing is under review.
Run-Off-Road Mitigation: Severity Reduction										
Guardrail Blockout Surrogate Test	Leonard Meczowski HRDS-04 202-493-3317	Safety	X				No	Jan .04	No	Project on hold.
Mailbox Surrogate Test	Leonard Meczowski HRDS-04 202-493-3317	Safety	X				No	Jan .04	No	Project on hold.
Aesthetic Traffic Barriers	Leonard Meczowski HRDS-04 202-493-3317	Safety				X	Yes	Mar .04	Yes	
Guardrail-to-Bridge-Rail Transitions	Leonard Meczowski HRDS-04 202-493-3317	Safety				X	Yes	Apr .04	No	Product not yet complete.
Pedestrian and Bicycle Safety										
Characteristics of Emerging Road and Trail Users and Their Safety	Ann Do HRDS-06 202-493-3319	Safety			X		No	Jan .04	No	Product will be available in December 2004.
Pedestrian Bicycle Crash Analysis Tool (PBCAT) v 2.0	Ann Do HRDS-06 202-493-3319	Safety			X		No	Jan .04	No	Project delayed due to coordination of project with Office of Safety efforts (Ped Safe and Bike Safe). PBCAT v 1.0 is currently available.

* Addition to FY 2004/2005 Performance Plan

Office of Safety R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Pedestrian and Bicycle Safety (continued)										
Evaluation of Safety Design and Operation of Shared Use Paths	Ann Do HRDS-06 202-493-3319	Safety			X		No	Mar .04	No	Product will be available in December 2004.
Hazard Index for Assessing Pedestrian and Bicyclist Safety at Intersections	Ann Do HRDS-06 202-493-3319	Safety		X			No	Apr .04	No	Project is ongoing.
Speed Management										
Results of Field Tests on Impacts of Setting and Enforcing Rational Speed Limits	AJ Nedzesky HRDS-05 202-493-3369	Safety		X			Yes	Dec. 05		Demonstration project is underway.
Intersections										
Guidelines for High-Volume Signalized Intersections	Joe Bared HRDS-05 202-493-3314	Safety				X	Yes	Apr. 04	Yes	A TechBrief, FHWA-HRT-04-092, was published April 04; full report will be available in October 04.
Design and Operational Performance of Double Crossover Intersection and Diverging Diamond Interchange *	Joe Bared HRDS-05 202-493-3314	Safety, Mobility				X	Yes	July 04	No	Results will be reported in a paper submitted to TRB during July 04 for presentation at the January 05 Annual Meeting.
Crash Comparison of Single Point and Tight Diamond Interchanges *	Joe Bared HRDS-05 202-493-3314	Safety				X	Yes	Aug. 04	Yes	The results have been accepted for publication in the Journal of Transportation Engineering.
Roundabout Accessibility Study	Greg Davis HRDS-07 202-493-3367	Safety		X			Yes	Aug. 04	No	Data collection has been delayed due to construction and weather. Revised target is December 04.

* Addition to FY 2004/2005 Performance Plan

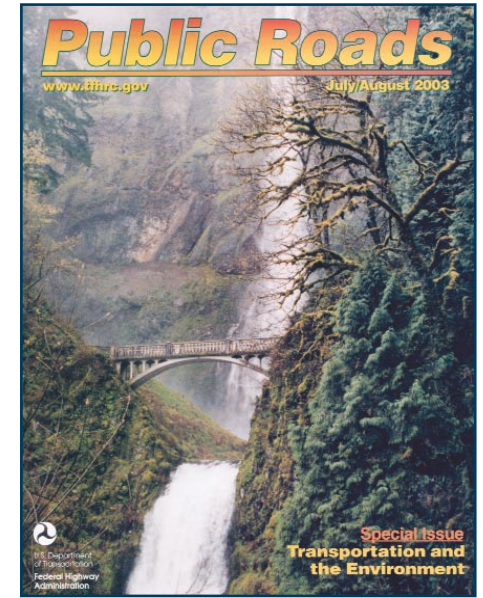
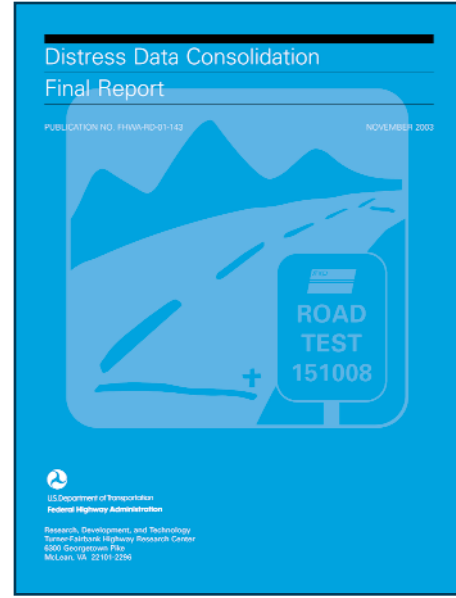
Office of Safety R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Intersections (continued)										
Novel Intersections—Continuous Flow and Median U-Turn	Greg Davis HRDS-07 202-493-3367	Safety	X				No	Sep. 05	No	Not yet started due to limitations of FY 2004 funding; FY 2005 start is subject to availability of funds. Revised target is September 06.
Safety of Continuous Flow Intersections	Joe Bared HRDS-05 202-493-3314	Safety				X	Yes	Sep. 05	No	Results will be reported in a paper submitted to TRB during July 04 for presentation at the January 05 Annual Meeting.
Evaluation of Separator Islands at Nonsignalized Intersections	Joe Bared HRDS-05 202-493-3314	Safety	X				No	Sep. 06	No	The start of the contract under which this work will be performed was delayed due to FY 2004 funding limitations and delays. Revised target is September 07.
Safety Management Systems										
Evaluation of Lane Reduction “Road Diet” Measures and Their Effects on Crashes and Injuries *	Carol Tan HRDS-06 202-493-3315	Safety				X	Yes	Mar. 04	Yes	HSIS Summary Report FHWA-HRT-04-082.
Examination of Fault, Unsafe Driving Acts, and Total Harm in Car-Truck Collisions *	Carol Tan HRDS-06 202-493-3315	Safety				X	Yes	July 04	Yes	HSIS Summary Report FHWA-HRT-04-085.
Roadway Safety Hardware Management Systems *	Kerry Perrillo HRDS-05 202-493-3318	Safety, Operations			X		Yes	Dec. 04	No	Draft report produced in July final; report due in December.
Rollover Causation Study	Mort Oskard HRDS-04 202-493-3339	Safety		X			No	Dec. 04	No	Project was partially completed before being terminated.

* Addition to FY 2004/2005 Performance Plan

Office of Safety R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Safety Management Systems (continued)										
Pavement Edge Drop-Off Study	Kerry Perrillo HRDS-05 202-493-3318	Safety	X				No	Dec. 05	No	Project scope has changed and is now a Pooled Fund Study with California, George, Indiana, New York , and North Carolina participating. The new project end date is now December 07.
Safety Analyst	Mike Griffith HRDS-02 202-493-3316	Safety		X			Yes	Apr. 06	Yes	White papers and functional specifications for the software are currently available
Safety Evaluation of Red Light Running Cameras *	Mike Griffith HRDS-02 202-493-3316	Safety			X		Yes	Dec. 04	No	This study will report the findings of evaluating Red Light Running cameras from several jurisdictions.
Advanced Research—Digital Road Maps	Pete Mills HRDS-06 202-493-3338	Safety			X		Yes	Oct. 06	No	Ongoing, long-term research.
Human Centered Systems										
Personal Transportation Technology: Segway® Human Transporter	Gabriel Rousseau HRDS-07 202-493-3383	Safety				X	No	Jan. 04	No	Delays experienced in equipment delivery and getting approval from the human subjects review board to conduct the study.
Infrastructure Cooperative Systems ICAS	Greg Davis HRDS-07 202-493-3367	Safety, Mobility and Productivity				X	Yes	Mar. 04	Yes	Research results presented at 2004 Human Factors and Ergonomics Society Annual Meeting.

* Addition to FY 2004/2005 Performance Plan

Office of Safety R&D (continued)										
Project	Technical Contact	Projected Goal Impact	Project Completion Status (Percent)				On Schedule	Target Completion Date	Product Available	Comments
			25	50	75	100				
Human Centered Systems (continued)										
In-Roadway Warning Lights Study	Gabriel Rousseau HRDS-07 202-493-3383	Safety			X		No	Sep. 04	Yes	System installation delays at the field sites and budget limitations have slowed this project. Interim findings were presented at the ITE Annual Meeting in August 2004.
Sign Assessment for Infrastructure Systems	Joe Moyer HRDS-07 202-493-3370	Safety, Mobility and Productivity	X				No	Dec. 04	No	This project is on hold due to budget cutbacks.
Pedestrian Decision-Making	Gabriel Rousseau HRDS-07 202-493-3383	Safety	X				No	Sep. 05	No	Project was suspended due to FY 2004 budget cutbacks.
Traffic Control Device Consortium Pooled Fund Study Projects	Joe Moyer HRDS-07 202-493-3370	Safety, Mobility and Productivity		X			Yes	Dec. 06	No	This pooled fund project encompasses a series of ongoing research project. Reports for each project will be released as completed.
Work Zone Safety										
Improving Visibility of Work Zone Features to Aid Drivers	Ken Opiela HRDS-05 202-493-3371	Safety	X				No	Mar. 06	No	There is no funding to initiate this effort at this time, but alternative funding sources are being pursued.
Guidelines for Work Zone Safety Impacts	Ken Opiela HRDS-05 202-493-3371	Safety	X				NO	Dec. 06	No	There is no funding to initiate this effort at this time, but alternative funding sources are being pursued.



Appendix B

RD&T Services



The following charts outline the services provided by RD&T over the past year in the area of technical and program support for FHWA R&T nationwide.

Infrastructure R&D Technical Services		
Service	Technical Contact	Comments
Bridge Forensic and Specialized Engineering Services		
Analysis of Grout and Corroded Steel Samples from Various Bridges for Various State DOTs including the District of Columbia and West Virginia.	Bob Kogler HRDI-06 202-493-3080	Chemical analysis of chloride concentration within grouts and steel corrosion products to assist in determining the corrosion condition of existing bridge components.
Cooperative Testing Design and Instrumentation for Pile Supported Embankment Testing in Iowa	Mike Adams HRDI-06 202-493-3025	Supplied testing design consultation, instrumentation, and field set-up for testing of innovative pile-supported embankment project in Iowa. Work in support of Resource Center-led field testing project.
Construction, Instrumentation and Testing of Innovative Tie-Back Wall as a Service for Central Federal Lands (CFL)	Mike Adams HRDI-06 202-493-3025	Expert consulting, construction, and instrumentation services provided to CFL on their project to test a new design for tie-back walls. This physical testing is being performed onsite at TFHRC due to unique capabilities and expertise.
Hydraulics Special Study for Woodrow Wilson Bridge	Sterling Jones HRDI-07 202-493-3043	Tested a cost saving proposal for leaving existing footings in place for the Woodrow Wilson Bridge.
Hydraulics Special Study for Storm Sewer Junction Loss Procedure	Sterling Jones HRDI-07 202-493-3043	Set up a special experiment to test a new storm sewer junction loss procedure for the urban drainage training course.
In Shop Inspection of Prestressed, Precast Girders Using Self-Consolidated Concrete for Maine DOT	Joseph Hartmann HRDI-06 202-493-3059	Consulting and inspection of girders cast using innovative material and process.
Inspection and Consultation Regarding Cracking of Steel Girder Bridges in Various States, including Delaware and Pennsylvania	William Wright HRDI-06 202-493-3053	Bridges showing cracking during inspections that are suspected to have Hoan-like details are generally referred to Dr. Wright for his input and evaluation.

Infrastructure R&D Technical Services (continued)		
Service	Technical Contact	Comments
Bridge Forensic and Specialized Engineering Services (continued)		
Instrumentation and Testing of the Cape Girardeau Cable-Stayed Bridge	Harold Bosch HRDI-07 202-493-3031	At the request of the Missouri DOT, the Aerodynamics Lab has been involved in establishing vibration properties of stay cables on the new Cape Girardeau cable-stay bridge through instrumentation and measurement of modal frequencies and damping characteristics of stay cables.
Instrumentation and Monitoring of the Chesapeake and Delaware Canal Cable-Stayed Bridge	Harold Bosch HRDI-07 202-493-3031	At the request of Delaware DOT, Delaware Division, and Eastern Resource the Aerodynamics Lab has been involved in the instrumentation and measurement of dynamic stay cable properties and monitoring of cable vibrations on the Chesapeake and Delaware Canal Cable-Stayed Bridge in order to identify any potential wind-induced cable vibrations and damping characteristics of the cables.
Instrumentation Testing Support for Minnesota DOT	Carl Ealy HRDI-06 202-493-3039	Onsite testing and data acquisition using Statnamic™ testing protocol.
Load Testing of Self Consolidating Concrete Full Scale Beams for VDOT	William Wright HRDI-06 202-493-3053	Testing provided as a service to VDOT due to availability of FHWA's unique capability to test to failure in full scale. Testing to verify development length with this innovative material (self-consolidating concrete) done in cooperation with VDOT, Virginia Transportation Research Center (VTRC), and Virginia Polytechnic Institute.
Modeling and Analysis for NYSDOT Relating to Construction Accident	William Wright HRDI-06 202-493-3053	Expert finite element modeling to support FHWA New York Division and NYSDOT in case of construction collapse.
Modeling and Analysis Work for VDOT in Support of Disputed Bridge Design/Fabrication in Hampton Roads	William Wright HRDI-06 202-493-3053	Expert design analysis and finite element modeling to support FHWA Virginia Division and VDOT in long-term dispute regarding critical bridge in Tidewater area.
Oversight Efforts in Support of AASHTO-NTPEP Bridge Coatings Test Program	Bob Kogler HRDI-06 202-493-3080	Service on oversight panel for AASHTO nationwide material qualification testing program for bridge coatings. Development of test criteria; Quality assurance (QA) review of data; oversight of commercial testing labs; and liaison with SHAs and commercial manufacturers.

Infrastructure R&D Technical Services (continued)		
Service	Technical Contact	Comments
Bridge Forensic and Specialized Engineering Services (continued)		
Physical Testing and Modeling in Support of Colorado Division and National Transportation Safety Board (NTSB)	William Wright HRDI-06 202-493-3053	Expert finite element modeling and physical forensic testing in support of NTSB and FHWA Colorado Division regarding construction collapse.
Round Robin Testing for New Occupational Safety and Health Administration (OSHA) Slip Testing for Steel Erection	Bob Kogler HRDI-06 202-493-3080	Testing to support SHAs in compliance effort for new OSHA rule of steel erection.
Seminar on Covered Bridge Manual	John O'Fallon HRDI-07 202-493-3051	A seminar was held at TFHRC for engineers and preservationists for proper rehabilitation, restoration, preservation and reconstruction of historic covered bridges.
Virtual Team for Health Monitoring	Hamid Ghasemi HRDI-07 202-493-3042	Seeing an opportunity to take the lead in building and maintaining a functional area of expertise in Structural Health Monitoring and to coordinate research at a national level, FHWA established a Virtual Team for Health-Monitoring of Bridges. This team hopes to create a new generation of bridges and structures that incorporate innovative intelligent sensing technologies and automated data collection and processing capabilities for bridge monitoring and maintenance decisionmaking, so as to effectively manage our Nation's highway bridges.
Pavement Forensic and Specialized Engineering Services		
Access to the World's Largest and Most Comprehensive Pavement Performance Database; Technical Assistance and Consultation in Pavement Data Use	Aramis López HRDI-13 202-493-3145	During the first and second quarters of 2004, the LTPP customer office received 333 requests for LTPP data and/or information. There have been 161 data requests, 144 questions, and 28 requests for materials and other LTPP information.
Forensic Evaluations of Performance Problems in Concrete Pavements; Technical Assistance in Various Materials and Testing Areas	Peter Kopac HRDI-11 202-493-3151	Activities include conducting petrographic examinations of pavement and bridge concrete for several States, and providing technical assistance to States and FHWA Division offices.

Infrastructure R&D Technical Services (continued)		
Service	Technical Contact	Comments
Pavement Forensic and Specialized Engineering Services (continued)		
Lab Testing of New, Innovative, and Recycled Materials Used in Pavement Construction	Tom Harman HRDI-11 202-493-3072	Evaluated crumb rubber material and recycled polyester fiber polymers in the lab and in full-scale testing.
Models Expert Task Group (ETG)	Katherine Petros HRDI-12 202-493-3154	Establishment of the ETG is on hold due to a lack of funding. In spite of this, coordination between FHWA, NCHRP, and the AASHTO Joint Task Force on Pavements is being accomplished through the efforts of all involved.
Technical Assistance in the Application, Testing, Evaluation, and Problem Solving for Construction Quality Control, Quality Assurance, Performance-Related Specifications, and Warranties	Peter Kopac HRDI-11 202-493-3151	Provided advice to States interested in adopting new specifications or in validating the effectiveness of current specifications.
Technical Assistance and Information on the Application, Testing, Specifications, Cost, and Performance of Recycled Pavement Materials	Tom Harman HRDI-11 202-493-3072	Asphalt team continues to provide technical assistance on a national basis to our State partners, industry, and FHWA Federal Lands.
Technical Expertise, Assistance, and Lab Testing Support for Field Trials of New Pavement Materials and Procedures	Tom Harman HRDI-11 202-493-3072	Evaluated polymer-modified materials in the laboratory and in full-scale testing at the FHWA pavement testing facility and in partnership with the National Center for Asphalt Technology.

Operations R&D Technical Services		
Service	Technical Contact	Comments
Transportation Management Center (TMC) National Pooled Fund Study Results	Raj Ghaman HRDO-03 202-493-3270 Tom Granda HRDS-07 202-493-3365	Developed several references for TMC operations. For more information see Pooled Fund Web site http://tmcpsfs.ops.fhwa.dot.gov/index.cfm .
Traffic Control Device Consortium Pooled Fund Study	Joe Moyer HRDS-07 202-493-3370	A consortium of State, regional, and local entities, FHWA, and other partners will evaluate innovative traffic control devices and disseminate the results for incorporation into the Manual of Uniform Traffic Control Devices (MUTCD) (in conjunction with the Human Centered Systems Lab).
Dedicated Short-Range Communications (DSRC) Program Support for Standards and ITS Applications	James Arnold HRDO-04 202-493-3269	Providing technical analysis and general guidance for the development of a dedicated short-range communications standard at 5.9 gigahertz.
Frequency Spectrum Coordination for FHWA	James Arnold HRDO-04 202-493-3269	Support various organizations in FHWA to find appropriate spectrum for specific applications and work with the field and the United States Coast Guard (USCG) to ensure the availability of spectrum for various applications.
Intelligent Intersection Traffic Control Laboratory	Peter Huang HRDO-04 202-493-3484	The Intelligent Intersection Traffic Control Laboratory supported research on intersection collision-avoidance (ICA) systems being developed by the Infrastructure Consortium (IC). The lab also supported research on advanced signal control systems, new ICA technologies, data collection, and software and hardware testing. Dedicated short-range communications (DSRC) emulator project was completed. Both in-vehicle and roadside units are operational. Fiber-optic network cable has been installed and the end applications (video, data, etc.) are in design phase.

Operations R&D Technical Services (continued)		
Service	Technical Contact	Comments
Intelligent Vehicle Initiative (IVI) Infrastructure Consortium Coordination and Leadership	Gene McHale HRDO-03 202-493-3275	The IC brought together State DOTs and their supporting universities with an interest in conducting research in the area of infrastructure based intersection collision avoidance systems. The IC is a key partner in the Cooperative Intersection Collision Avoidance Systems ITS Tier 1 Initiative, and its membership and functions will adapt to fit this new role.
QuickZone Train the Trainer Sessions	Deborah Curtis HRDO-03 202-493-3267	Completed two training sessions that will enable Resource Center personnel to provide QuickZone training to the Division offices and States.
Traffic Research Laboratory (TReL) Model-Simulation and Problem-Solving Studies	Randall VanGorder HRDO-03 202-493-3266	The TReL is a mixture of hardware and software, providing a test bed for traffic engineering and control applications. The TReL is used to test both new technologies developed for and by FHWA and advances in the state-of-the-art made by the traffic engineering community at large. Completed Lab assessment in May 04. Currently upgrading core Lab equipment and developing Strategic Plan for the Lab.
Traffic Software Integrated System (TSIS) Support	Raj Ghaman HRDO-03 202-493-3270	Maintained the TSIS suite of traffic software, which includes the CORSIM traffic simulator, TRAFED graphical input processor, and TRAFVU output viewer and animator.
Ultrawide-Band Radar Technology Coordination	Peter Huang HRDO-04 202-493-3484	Provided technical support for other FHWA offices on spectrum planning and allocation through National Telecommunications and Information Administration (NTIA) and support Office of the Secretary of Transportation (OST) in their efforts to better understand the implications of ultrawide-band radar technology on existing users of the radio spectrum.
United States-Japan ITS Joint Research Program	Bob Ferlis HRDO-02 202-493-3268	Identified promising opportunities for collaboration and assembled technical materials to share with Japan.

Safety R&D Technical Services		
Service	Technical Contact	Comments
Highway Safety Information Systems (HSIS) Data	Carol Tan HRDS-06 202-493-3365	Provided HSIS data and research support for requesting parties.
Photometric and Colorimetric Measurements of Signing and Marking Materials (including Coefficient of Retroreflectivity and Fluorescence)	Carl Andersen HRDS-05 202-493-3366	Measured retroreflective post delineators for North Dakota. Measured 50 plus samples of retroreflective sheeting materials for NCHRP 4-29. Initiated evaluation on various colorimetric measurements of retroreflective sheeting. Working with industry and academia to determine appropriate lab measurement that correlates with human visual response for daytime color.
Photometric and Radiometric Measurements of Light Sources (including Traffic Signals, Vehicle Headlamps, and Roadway Lighting)	Carl Andersen HRDS-05 202-493-3366	Completed evaluation of photometric performance of incandescent traffic signal lights, as a benchmark for light emitting diode (LED) systems. Spectroradiometric evaluations of typical LED traffic signal lights concluded, for use in development of LED Circular Supplement to Institute of Transportation Engineers (ITE) Vehicle Traffic Control Signal Heads (VTCSH). Evaluation of “far-field” measurement point for 200 millimeter LED traffic signal lights completed.
Human Factors International Scan	Tom Granda HRDS-07 202-493-3365	An international scan was completed on “Human Factors in Highway Design and Operations.”

Corporate Support Services		
Service	Technical Contact	Comments
Program Development and Evaluation		
Customer Surveys	Donna McEnrue HRPD-01 202-493-3166	Support the development of an RD&T customer feedback process, including working with Headquarters Office of Corporate Management (HCM) on FHWA State and Metropolitan Planning Organization (MPO) Customer Satisfaction Survey.
International	Norm Paulhus HRPD-01 202-493-3166	Support FHWA and DOT activities with the Organization of Economic Cooperation and Development (OECD), the European Conference of Ministers of Transport (ECMT), Japan, etc.
Legislative Monitoring and Analysis	Tom Krylowski Norm Paulhus HRPD-01 202-493-3166	Monitored and reported on Congressional developments. Participated in Legislative Advisory Working Group. Responded to Congressional Q&As and requests for technical assistance, etc. Contributed to statements of Administration policy.
Information Analysis/Program Analysis	Donna McEnrue Joe Parks Norm Paulhus Lisa Williams HRPD-01 202-493-3166	Developed program recommendations based on analysis of lab assessment results. Provided performance measure and goal alignment crosswalk for OMB PART evaluation. Provided R&T budget-related analysis for FHWA. Analyzed Pooled Fund projects and developed annual report for TPF program.
Outreach for Reauthorization	Tom Krylowski Norm Paulhus HRPD-01 202-493-3166	Supported DOT and FHWA reauthorization outreach activities on behalf of R&T. Contributed to RD&T communications plan by identifying stakeholder groups and views on reauthorization. Developed reauthorization message points. Contributed to statements of Administration policy. Identified opportunities to communicate message points to decision-makers and stakeholders, etc.

Corporate Support Services (continued)		
Service	Technical Contact	Comments
Program Development and Evaluation (continued)		
Partnership and Customer Outreach Activities to Define and Implement a National Highway Research Agenda	Norm Paulhus Lisa Williams Bill Zaccagnino HRPD-01 202-493-3166	Liaison with University Transportation Centers (UTCs). Coordinated Small Business Innovation Research (SBIR). Liaison to State DOT research programs, SCOR, RAC. Developed guidance to field and States on SP&R funds by developing field handbook and SPR Web site. Coordinated FHWA participation in NCHRP and provided Future Strategic Highway Research Program (FSHRP) liaison. Participant in FHWA Task Force on Public/Private Partnerships.
Performance and Budget Integration	Tom Krylowski Norm Paulhus HRPD-01 202-493-3166	Contributed to interagency and Agency dialogue on budget and performance integration; reflect appropriate performance measures in R&T budget. Coordinated, gathered evidence, and developed responses to FHWA R&T Program Assessment Rating Tool review.
Performance Measures	Ariam Asmerom Donna McEnrue Joe Parks HRPD-01 202-493-3166	Managed Lab Assessment process and conducted assessments of three labs. Contributed to development of performance measure framework for R&T. Developed R&D goals and activities crosswalk. Coordinated, gathered evidence, and developed responses to FHWA R&T Program Assessment Rating Tool Review. Synthesized results of RD&T benefits studies.
Performance Planning	Ariam Asmerom Joe Parks HRPD-01 202-493-3166	Contributed to FHWA performance planning process. Developed RD&T FY 2004/2005 Plan. Supported development of R&T Performance Measure Framework and Roadmaps.

Corporate Support Services (continued)		
Service	Technical Contact	Comments
Program Development and Evaluation (continued)		
Performance Report	Ariam Asmerom Joe Parks HRPD-01 202-493-3166	Contributed to FHWA performance report. Developed RD&T Performance Report for FY 2003. Facilitated discussions on Agency R&T performance reporting process. Coordinated development of Agency R&T Performance Report.
R&T Budget development	Tom Krylowski Norm Paulhus HRPD-01 202-493-3166	Developed R&T budget proposal and compiled budget justification. Developed budget delivery plan.
Strategic Planning	Ariam Asmerom Joe Parks Norm Paulhus HRPD-01 202-493-3166	Contributed to DOT and FHWA strategic plans. Coordinated input to DOT R&T strategic plan. FHWA Liaison to DOT RTCC. Facilitated discussions of FHWA R&T Leadership Team in its efforts to implement Agency <i>Corporate Master Plan</i> . Coordinated Agency Advanced Research Program development and roadmap.
Research and Technology Services		
Audio/visual/computer marketing productions; photography, VHS tape and digital filming; computer presentation services; and CD reproductions.	Marketing Team 202-493-3467 Strategic Communications Team 202-493-3468	Provided multimedia services for RD&T program offices: still photography, VHS or digital filming services, computer presentation preparation, and CD production or duplication (i.e., photographs, promotional VHS tapes, short movies, Microsoft® PowerPoint® presentations).

Corporate Support Services (continued)		
Service	Technical Contact	Comments
Research and Technology Services (continued)		
FHWA exhibit, events, and program support services.	Marketing Team 202-493-3467	Coordinated storage and shipping of 236 FHWA program exhibits and displays for 87 events and conferences. Provided full-service support of national exhibitions for FHWA program offices and the Office of the Secretary of Transportation.
FHWA meeting and conference support services.	Marketing Team 202-493-3467	Provided full-service logistics planning and support for 19 FHWA program office meetings. Services included hotel meeting space rental, meeting invitations and announcements, invitational travel, and speaker(s) support.
FHWA R&T Product Distribution Center/Technical Reference Center	Marketing Team 202-493-3467	Managed R&T product distribution center, distributing hard copy publications and CD-ROMS to FHWA customers, nationally and abroad. Shipped 386,000 documents in response to over 5,000 requests.
Full-service RD&T Web site Content and HTML Programming Support	Strategic Communications Team HRTS-02 202-493-3468	Completed thousands of HTML coded text pages for 508 compliant document preparation and PDF preparation of thousands of pages of RD&T reports, directories, newsletters, brochures, etc.
Other publications, FHWA News, Technology Talks (TT) Newsletter	Strategic Communications Team 202-493-3468 Marketing Team 202-493-3467	Developed input to quarterly newsletters. Compiled 12 TT newsletters and distributed electronically.

Corporate Support Services (continued)		
Service	Technical Contact	Comments
Research and Technology Services (continued)		
Periodical Publications: –PUBLIC ROADS –Transporter (monthly) –Focus (monthly)	Strategic Communications Team 202-493-3468	Worked with editorial board to develop issue themes and articles to support FHWA R&T programs. Developed article content and assisted writers in selecting appropriate story angles and audience. Provided entire suite of publication services, including all writing/editing phases, style guidelines and design layout, other camera-ready preparation services, printing, Web site posting, and distribution.
RD&T Research Reports and Marketing and Informational Publications	Strategic Communications Team 202-493-3468	Provided 141 publication services, including all writing/editing phases, style guidelines and design layout, other camera-ready preparation services, printing, Web site posting, and distribution.
Strategic Marketing and Communications Plans	Strategic Communications Team 202-493-3468	Worked with project managers to facilitate technology transfer deployment activities targeted to specific users. Included action plan of outreach tools and activities such as events, publications, Web presence, and public service announcements.
TFHRC Visitors Program	Strategic Communications Team 202-493-3468	Scheduled and coordinated tours of RD&T labs for over 600 guests per year. Arranged for meeting room(s), audio/visual needs, refreshments (e.g., lunches, coffee breaks), informational kits, and technical meetings.
T&I Deployment	Marketing Team 202-493-3467	Provided full logistical and publication support for implementation and marketing of the <i>Corporate Master Plan for Research and Deployment of Technology & Innovation</i> , and related T&I activities.

Corporate Support Services (continued)		
Service	Technical Contact	Comments
Research, Technology, and Innovation Deployment Services		
Implement the FHWA <i>Corporate Master Plan for Research and Deployment of Technology and Innovation</i>	Deb Elston HRT-01 202-493-3181	Adopted a performance measurement framework for R&T that is tied to the overall FHWA performance measurement framework. Developed 60 plus multiyear program plans that provides guidance and direction for future R&T activities. Identified and promoted Agency priority market-ready technologies and innovations. Established a new R&T Web site which will keep customers and stakeholders informed of progress in implementing the <i>Corporate Master Plan</i> and of new R&T initiatives.
Resource Management Services		
FHWA Advance Acquisition Planning System Development	Sue Stanton HRRM-01 202-493-3480	The Advance Acquisition Planning pilot was successfully completed. Plans for the implementation of Web based PRIZM Reports for use by all RD&T Staff are underway.
Research Facility Strategic Development	Sue Stanton HRRM-01 202-493-3480	Planning underway for study that will assist FHWA in developing and maintaining a long-term facility inventory and plan. The plan will ensure that TFHRC remains a world-class research facility. The Statement of Work is complete and will be forwarded for award pending funding availability.
R&T Budget Execution	Richard Collins HRRM-01 202-493-3179	The vital challenge of reconciling FY 2003 funds in DELPHI was accomplished. New procedures for monthly reconciliation of DELPHI accounts were implemented.

Organizational Support Services		
Service	Technical Contact	Comments
Resource Management Services – Organizational		
Accountable Property Management	Denise Seward HRRM-01 202-493-3471	The Property Plus System has been upgraded to the Inte-Great Property Management™ System. The new system is used for the asset management and reporting tool that provides a cost-effective solution to the complex task of managing office equipment and personal property. The new system includes a portable barcode scanner, which allows for gathering and uploading scanned data, automatically updating the database program, and identifying missing, misplaced, or improperly recorded assets. The accountable property inventory maintained was valued at \$14.7 million as of the end of FY 2004.
Acquisition Planning	Sue Stanton HRRM-01 202-493-3480	Accomplished 100 percent of annual Contracting Officer's Technical Representative (COTRs) Recertifications. Continued to develop improvements in the COTR refresher training options.
Administrative Support	Angela Lee HRRM-01 202-493-3175	The Standard Operating Procedures (SOP) manual is undergoing updating and expansion. Improved documentation and control of Procurement Requests were implemented.
Contract Administration and Purchase Card Management	Sue Stanton HRRM-01 202-493-3480	Piloted the development of 2-hour COTR Refresher Training Sessions to better meet the needs of our COTRs. In lieu of our COTRs retaking the standard 4-hour COTR Refresher Training Course each year, three or four pertinent and timely training sessions relating to COTR responsibilities was developed and held onsite at the TFHRC.

Organizational Support Services (continued)		
Service	Technical Contact	Comments
Resource Management Services – Organizational (continued)		
Emergency Planning and Support	Doreen McCarthy HRRM-01 202-493-3173	TFHRC Continuity of Operation Plan (COOP) was finalized and distributed to all COOP members. RD&T has participated as observers in the FHWA/DOT Emergency Preparedness Drills. A new emergency information line was installed for the TFHRC facility. The number can be called at any time to determine the operational status of the facility. If a situation occurs which changes the routine operation of the facility, the message will be changed to advise employees of the changed facility operational status.
Employee and Organizational Development	Freddie Forster HRRM-01 202-493-3298	Three RD&T personnel were approved for executive, management, and leadership courses; one to the Executive Potential Program; one to the Science and Technology Fellowship (ComSci) Program; one SES to the Forum Series. RD&T personnel selected for the DOT sponsored “So You Want to Be a Leader” course and the 2003/2004 Academic Study Program.
Facility Management	Sue Stanton HRRM-01 202-493-3480	A new solar lighting system has been installed for the facility in the parking lots and along the main sidewalk entrance.
Financial Management	Richard Collins HRRM-01 202-493-3179 George Curtis HRRM-01 202-493-3180	Demonstrated the ability to respond and cope with challenges in FY 2004 associated with delays, reconciliation, and utilization. Established a process for, and provided early communication of guidelines for early cut-off dates for FY 2004 financial transactions. Served in a lead role for RD&T’s implementation of a new management cost accounting system. Developed new formula to allocate funding under Activity 10 that provides fair and equated allotments. Ensured the Activity 10 Budget was maintained within the budget limitations established by the continuing resolutions by developing and implementing new processing and control procedures.

Organizational Support Services (continued)		
Service	Technical Contact	Comments
Resource Management Services – Organizational (continued)		
Human Resource Management	<p>Doreen McCarthy HRRM-01 202-493-3173</p> <p>Carol Roberts HRRM-01 202-493-3185</p>	<p>Competitive sourcing—Ensured all RD&T staff members were kept apprised of competitive sourcing actions via All-Hands meetings and e-mail messages.</p> <p>Workforce planning—Completed first RD&T Workforce Review and Succession Plan.</p> <p>ROADS utilization—Assisted supervisors in utilizing the Recruitment Online Activity Data System (ROADS) for recruitment and staffing activities. Met new mandatory training requirements for credit card holders and IT security.</p> <p>Implemented government On-line training program in RD&T.</p> <p>Position review—Completed comprehensive review of all RD&T position descriptions.</p> <p>Student Volunteer Program has been expanded to include a formal agreement with the George Washington University. Also set up volunteer opportunities with students from the University of Maryland and the Catholic University of America.</p>
Information Technology Planning and Support	<p>Diana Martin HRRM-01 202-493-3168</p>	<p>IT Funds Spending Plan—The IT Review Team met to consider both long-term requirements and short-term needs and developed a plan that focused on getting the desktop computers for all RD&T staff members up-to-date. The plan also addresses the longer-term need to update printers and laptops needed for presentations.</p> <p>Awarded the follow-on IT support contract. The new contract is task-based to provide greater flexibility while controlling costs.</p>

Organizational Support Services (continued)		
Service	Technical Contact	Comments
Resource Management Services – Organizational (continued)		
Physical Security	Sue Stanton HRRM-01 202-493-3480	<p>TFHRC security measures have been upgraded to respond to Homeland Security Regulations. Security cameras were installed and are monitored at all times by the Security Guards.</p> <p>All Federal and contract employees have Electronic ID/Card Key, which activates the entry gate and building access entrances. Security guards are also stationed at each TFHRC entrances.</p> <p>All Federal and contractor personnel vehicles must prominently display a TFHRC parking pass.</p> <p>A public address system was installed throughout the facility and can be used to provide emergency announcements.</p> <p>An assessment of the vulnerability of TFHRC to weapons of mass destruction attacks was completed by the U.S. Army and follow-on training and formal plan development are underway.</p>



Appendix C

RD&T Customer Outreach Activities



In keeping with FHWA's commitment to involve customers throughout the R&T process, RD&T conducted a number of special outreach activities in FY 2004.

Coastal Storm Runoff

RD&T Hydraulics Lab personnel took part in an advisory panel meeting for the Coastal Transportation Engineering Research Center at the University of South Alabama in Mobile, AL on April 23rd. The research center was set up to evaluate models and highway design concepts for coastal storm surges and water quality mitigation measures for storm runoff in the vicinity of coastal waterways.

FHWA Bridge Leadership Council

To ensure the best possible coordination and as an important element of the Office of Infrastructure R&D's overall process to regularly communicate with internal customers, the Technical Director for Bridges is a member of the FHWA Bridge Leadership Council. The Bridge Leadership Council is a cross-cutting group of FHWA bridge engineers, representing the entire FHWA bridge community including the Division office; the Resource Center; Federal Lands Highway Division; the Office of Research, Development and Technology; and the Office of Infrastructure.

FHWA Partnership with South Dakota to Improve Culvert Design

Researchers at FHWA are conducting a series of tests on models of box culverts in the Hydraulics Laboratory at TFHRC. Designers and researchers from the South Dakota DOT and representatives from the concrete industry observed and evaluated the tests. Results of the research will be used to make design manual updates and to improve analysis programs.

FHWA and the National Concrete Bridge Council (NCBC) Annual Meeting

FHWA and the National Concrete Bridge Council (NCBC) held their annual meeting at the TFHRC in FY 2004. The meeting is a forum for sharing information and identifying opportunities to support and advance concrete bridge technology and to help improve communication and collaboration between FHWA and the concrete bridge industry. At the meeting, the two parties discussed the status of activities such as the Innovative Bridge Research and Construction (IBRC) Program, ultra-high performance concrete research and projects, implementation of specifications for load and resistance factor design, accelerated bridge construction technologies, and legislation and funding for various bridge projects across the country.

The Next Generation Simulation

The Next Generation Simulation (NGSIM) project will develop a core of driver behavior algorithms that are freely open to the public to foster the improvement of the baseline accuracy and validity of microscopic traffic simulation models. To ensure that NGSIM products meet the needs of the simulation community, three stakeholder groups were formed: simulation modelers, simulation users, and simulation developers. Each group contains approximately 10 to 15 leading experts in the field of traffic simulation. Annual workshops and bi-monthly teleconferences are held to allow the stakeholder groups to provide meaningful insight and guidance to the NGSIM project.

FHWA Researchers Visit Virginia's Smart Road

RD&T and VDOT researchers met with researchers from the Virginia Tech Transportation Institute (VTTI) at their Smart Road facility to share knowledge on building safer, more efficient roads, and to gain a better understanding of the factors that contribute to driver performance, including road design, vehicle features, daytime/nighttime conditions, and human factors such as age, driving experience, and vision. Briefings by

the VTTI staff provided FHWA representatives with information about some of the cutting edge research currently underway to improve traffic control, highway lighting, traffic control device design, and driver training, and assess the impacts of emerging vehicle technologies. In addition, FHWA representatives had the opportunity to learn about and see Smart Road features. The briefings focused on the progress of several projects that are active or nearing completion, including:

- ▶ Enhanced night visibility study.
- ▶ Naturalistic driving study.
- ▶ Crosswalk visibility analysis.
- ▶ Visibility of wet pavement markings and raised retroreflective pavement markers.

Roundabout Workshops

Staff from RD&T in conjunction with the Resource Center facilitated five Roundabout Workshops in December 2003. The workshops provided information on design, operation, and safety benefits of roundabouts. In addition, the sessions provided practical examples and hands-on applications of geometric designs for single- and double-lane roundabouts, and covered methods for assessing the capacity of single and multi-lane roundabouts. About 160 designers, traffic engineers, researchers, and planners from FHWA, VDOT, the city of Richmond, Henrico County, VA, and several consultants attended these workshops.

Safety Partnership Report Helps Shape Agenda

Publication of the report titled “Development of Critical Knowledge Gaps and Research Efforts” was another step in the process to create a national working research and technology agenda for all parties involved with the infrastructure and operations aspects of highway safety. The report presents a set of five independent white papers on topics selected by the

National Safety R&D Partnership, including a comparison of expected results from the research across the white papers and a review by a group of experts. Each potential project was rated for likelihood of success, estimates of cost and duration, and most importantly, a distinction between applied or advanced. The report will be reviewed by a TRB oversight group for consideration into a final recommended highway safety R&T agenda.

Self-Consolidating Concrete (SCC) Beam Test

HRDI tested several concrete beams for VDOT in the Structures Laboratory. The beams were fabricated from SCC, a type of concrete that allows casting without the need for vibration. TFHRC was selected by VDOT because of its unique capabilities and expertise for full-scale testing. Performing the service for VDOT provided TFHRC researchers the opportunity to assist VDOT while adding to their own knowledge regarding this innovative material.

Technical Expertise for Security

RD&T researchers provided technical expertise on roadway design, highway engineering, and driving simulations to DHS for the purpose of developing a state-of-the-art Driver Training Range at the Federal Law Enforcement Training Center (FLETC) in Cheltenham, MD. The range will be used to train law enforcement officers in driving skills under stressful scenarios. FHWA has offered FLETC its skills in roadway design and highway engineering to improve the driving range, as well as expertise in driving simulation to enhance law enforcement simulator training. In addition, RD&T researchers successfully designed antiram barriers (bollards, fences, walls, etc.) using computer simulation technology and actual crash testing to enhance facility protection and structural design.

The Office of Infrastructure R&D Technical Seminar Series

The Office of Infrastructure R&D conducted a seminar on “Investigations into the Nanostructure of Alkali-Silica Reaction Products.” The seminar was part of its Technical Seminar Series and covered the alkali-silica reaction (ASR) in concrete, novel experimental techniques, and advanced methods used to characterize ASR gels.



Appendix D

Market-Ready Technologies



FHWA List of Market-Ready T&Is

The following T&Is have been identified by FHWA as warranting special attention. This list is not intended to include all T&Is available. Numerous T&Is are being developed, but are not yet ready to be marketed in the field. In addition, many T&Is are considered good concepts, practices, and/or success stories that should continue to be shared. This initial list is intended to be a dynamic list. A process will be developed for reviewing and updating these T&Is.

511—An easy-to-remember three-digit telephone number available to State and local transportation agencies nationwide so they can readily provide information, highway, and transit conditions to travelers by telephone. Travelers can make more informed decisions regarding travel routes and modes, resulting in a more balanced transportation network.
Contact: Bob Rupert, 202-366-2194.

Asset Management Guide—A guide, along with the companion National Highway Institute (NHI) course, that illustrates asset management principles and identifies techniques and methods for adopting the decisionmaking framework in transportation agencies.
Contact: Stephen Gaj, 202-366-1559.

Augered Piles—Technology characterized by drilling a hollow-stem auger into the ground, forming the diameter of the pile. Sand-cement grout or concrete is pumped into the hole as the auger is being removed from the hole, eliminating the need for temporary casing. After the auger is removed, reinforcement is installed in the pile. For certain applications, these foundation systems can be constructed more quickly and less expensively than can deep foundation alternatives.
Contact: Silas Nichols, 410-962-2460.

Border Wizard—A PC-based model that accurately simulates all cross-border movements of autos, buses, trucks, and pedestrians, using customs, immigration, and security procedures. It

can be used to evaluate and balance policy needs for security and trade efficiency, and address community impacts of improvements and functions at and near borders.
Contact: Mike Onder, 202-366-2639.

Dispute Resolution Guidance for Environmental Streamlining—Procedures that present strategies for interagency collaborative problem solving during the transportation development and environmental review process.
Contact: Ruth Rentch, 202-366-2034.

Expanded Polystyrene Geofoam—Lightweight material that can be used as fill behind walls and other support structures. In specific applications, these materials may be required to reduce stress on underlying soils or lateral pressures to retaining walls, abutments, or foundations.
Contact: Peter Osborn, 410-962-0702.

FHWA Traffic Noise Model (TNM), Version 2.1—A model that improves the ability to predict noise impacts in the vicinity of highways and thus improves the quality of decisions. Field efforts would be to assist with the implementation of the FHWA TNM and guide future improvements to the model.
Contact: Bob Armstrong, 202-366-2073.

Highway Economic Requirements System, State Version—A software model designed to evaluate the implications of alternative programs and policies on the conditions, performance, and user cost levels associated with highway systems. The model provides cost estimates for achieving economically optimal program structures and predicting system condition and user cost levels resulting from a given level of investment.
Contact: David Winter, 202-366-4631.

Improved Decisionmaking Using Geographic Information Systems (GIS-T)—A software program that allows for manipulation, analysis, and display of geographically referenced data. Applications include safety analysis, environmental partner-

ing, asset management, highway inventory attributes, and over-sized truck permitting. The GIS-T Web site (<http://www.gis-t.org/yr2004/gist2004.htm>) contains numerous examples of how and where this technology has been implemented.

Contact: Mark Sarmiento, 202-366-4828.

Interagency Funding Guidance for Environmental Streamlining

—Guidance provides transportation and resource agencies with options for using Federal funds to support Federal resource agency coordination for streamlining environmental reviews.

Contact: Ruth Rentch, 202-366-2034.

Intelligent Transportation Systems (ITS) SpecWizard

—A software tool that can help transportation agencies write specifications for the National Transportation Communication for ITS Protocol (NTCIP) standards-based ITS equipment.

Contact: Jason Hedley, 202-366-4073.

Load and Resistance Factor Design and Rating of Structures

—An AASHTO Load Resistance Factor Design (LRFD) and Load Resistance Factor Rating (LRFR) bridge specification provides for more uniform levels of safety, which should lead to superior serviceability and long-term maintainability.

Contact: Firas Ibrahim, 202-366-4598.

Pavement Smoothness Methodologies—New pavement smoothness specification covers smoothness test methods, smoothness equipment specifications, and equipment-certification programs.

Contact: Mark Swanlund, 202-366-1323.

QuickZone—A user-friendly computer software tool for estimating and analyzing length of queues and delays in work zones.

Contacts: Scott Battles, 202-366-4372; Deborah Curtis, 202-493-3267.

Red Light Cameras—Automation of the traditional enforcement of violations for running red lights by using camera systems at light-controlled intersections that detect an offending motorist, capture an image of the license plate, and issue a citation by mail.

Contact: Hari Kalla, 202-366-5915.

Roundabouts—A circular intersection that requires entering vehicles to yield to existing traffic in the circulatory roadway. Studies show that modern roundabouts can reduce intersection fatalities by up to 90 percent, reduce injury crashes by 76 percent, and reduce crashes involving pedestrian by 30-40 percent.

Contact: Hari Kalla, 202-366-5915.

Rumble Strips—Shoulder rumble strips, continuous grooved indentations in roadway shoulders that provide both an audible warning and a physical vibration to alert drivers that they are leaving the roadway. Studies have shown that these strips yield a significant reduction in run-off-road crashes.

Contact: Dick Powers, 202-366-1320.

Safe Speeds in Work Zones—Two technologies that can improve safety in work zones—portable speed limit signs that automatically display the safe speed based on traffic conditions and the nature of the roadwork and feedback displays that show the speed of approaching vehicles.

Contact: Davey Warren, 202-366-4668.

Transportation, Economics, and Land Use System

(TELUS)—An information-management and decision-support system that helps State DOTs and metropolitan planning organizations (MPO) prepare their annual transportation-improvement programs and Statewide transportation-improvement programs.

Contact: Fred Ducca, 202-366-5843.

AASHTO Technology Implementation Group Approved Technologies

AASHTO created the Technology Implementation Group (TIG) to identify high-payoff, ready-to-use technologies and to champion the implementation or deployment of these few select technologies, products, or processes that are likely to yield significant economic or qualitative benefits to the users throughout the country. FHWA works closely with and fully supports the AASHTO TIG initiatives and the implementation of the approved TIG technologies. The FHWA Priority, Market-Ready Technologies and Innovations include the following nine approved AASHTO TIG technologies.

Accelerated Construction—This undertaking promotes creative techniques to reduce construction time and enhance quality and safety. It includes techniques and elements along with innovative contracting practices that reduce congestion and enhance quality and safety.
Contact: Dan Sanayi, FHWA, Dan.Sanayi@fhwa.dot.gov.

Air Void Analyzer—The Air Void Analyzer can be used to provide real-time evaluation for measuring air content, specific surface, and the spacing factor of fresh portland cement concrete.
Contact: John Wiakowski, Kansas DOT, JohnW@ksdot.org.

Fiber Reinforced Polymer—This material can be used to repair cracks in overhead sign supports by wrapping the support with the fiber reinforced material.
Contact: Paul Wells, New York State DOT, pwells@gw.dot.state.ny.us.

GPS Surveying—The GPS uses satellites that transmit signals continuously. It has many highway applications, including surveying pavement conditions and inventorying highway assets.
Contact: Charlie Brown, North Carolina DOT, CharlieBrown@dot.state.nc.us.

Ground-Penetrating Radar—Vehicle-mounted, ground-penetrating radar can be used to collect information about underlying highway pavement layers without incurring the time and labor costs and traffic delays associated with traditional methods of drilling for core samples.
Contact: Mike Murphy, Texas DOT, mmurphy@dot.state.tx.us.

Highway Rail Warning System—A low cost active warning system that can replace passive crossing warning signs at low volume, highway-railroad at-grade intersections. The system consists of locomotive-installed hardware that communicates with the crossing device to activate the signals; it can upload and download data on nearby crossings and report on system operations or health. The device is mounted on standard crossing poles and is solar/battery powered with wireless communications between the device and the locomotive.
Contact: Dave Huft, South Dakota DOT, dave.huft@state.sd.us.

ITS Technologies in Work Zones—The use of ITS technologies in work zones, such as ramp-metering systems, intrusion alarms, and queue-detection information (sensors/cameras), is aimed at increasing safety for workers and road users and ensuring a more efficient traffic flow. These technologies provide ways to better monitor and manage traffic flow through and around work zones, and thus minimize the impact of delays and increase safety.
Contact: Doug Rose, Maryland State Highway Administration, Drose@sha.md.us.

Prefabricated Bridge Elements and Systems—These prefabricated elements and systems may be manufactured on or offsite, under controlled conditions, and brought to the job location ready to install. These systems minimize traffic impacts of bridge construction projects, improve construction-zone safety, make construction less disruptive for the environment, improve the quality of our nation's bridges, and lower life cycle costs. Using these systems also reduces traffic and environmental impacts by minimizing the need for lane clo-

tures, detours, and use of narrow lanes.

Contact: Mary Lou Ralls, Texas DOT, mralls@dot.state.tx.us.

Thermal Imaging Safety Screening System—The system allows an operator at a weigh station to view the relative temperatures of brake drums through the wheel rims of commercial vehicles. The infrared image of a correctly operating brake system shows all brake drums to be hot and approximately the same temperature when the vehicle is braking. When a brake is defective, the brake drum appears to be the same temperature as the wheel rim and darker than a properly operating brake. The system was developed using commercial, off-the-shelf components and advanced infrared image acquisition, processing, and storage.

Contact: Gary Hoffman, Pennsylvania DOT,
ghoffma@dot.state.pa.us.



Appendix E

FHWA RESEARCH AND TECHNOLOGY PARTNERSHIPS



FHWA's research approach emphasizes cooperation, information sharing, and formal development of research agendas, both within USDOT and across the entire government. We promote partnerships with State and local governments, academia, and the private sector to quickly and cost-effectively transform new technologies and concepts into better transportation systems, processes, and services.

The following is just a partial listing of different R&T partnerships. Many partnerships may transcend categories and may often have three or more participants that can represent several categories. The several different partnership types offer many opportunities for participation and involvement in FHWA R&T projects. Partnerships generally can be separated into nine categories (a comprehensive listing of abbreviations can be found in appendix F) :

1. Partnerships with other USDOT agencies: ITS Joint Program Office (JPO), NHTSA, Federal Transit Administration (FTA), Research and Special Programs Administration (RSPA), Federal Motor Carrier Safety Administration, Federal Aviation Administration, Federal Railroad Administration, Maritime Administration, USCG, and Bureau of Transportation Statistics.

2. Partnerships with other Federal agencies (outside USDOT): National Aeronautics and Space Administration, Department of Defense, Department of Commerce, Department of Energy, Department of State, U.S. Environmental Protection Agency, Department of Health and Human Services, Department of Housing and Urban Development, Department of the Interior, U.S. Army Corps of Engineers, U.S. Army Cold Region Research and Engineering Lab, U.S. Navy, National Weather Service, Forecast Systems Lab, U.S. Coast Guard, and Department of Agriculture.

3. Partnerships with States or organizations representing States: AASHTO, LTPP, National Governors' Association.

4. Partnerships with quasi-governmental organizations: TRB, NCHRP, and National Science Foundation (NSF).

5. Partnerships with local governments, MPOs and other organizations representing local and county governments: National Association of County Engineers, Cities of Los Angeles, CA, Houston, TX (to evaluate CLAIRE), and Florida DOT.

6. Partnerships with universities: UTCs, Minority Institutes of Higher Education (MIHE), STIPDG, Dwight David Eisenhower Transportation Fellowship Program (DDETFP), National Summer Transportation Institutes for Secondary Students (NSTI), Recycled Materials Resource Center, and George Washington University.

7. Partnerships with industry: Castle Rock Services, Lockheed Martin, Iteris, Mitretek, GEOPAK® Corporation, Innovative Pavement Research Foundation (IPRF), SBIR program participants, Ford, General Motors, Toyota, DaimlerChrysler, and NAVTEQ™ Corporation.

8. Partnerships with nongovernmental organizations: American Society of Civil Engineers' Civil Engineering Research Foundation, ITE, ITS America.

The Transportation Pooled Fund (TPF) Program

When significant or widespread interest is shown in solving transportation-related problems, research, planning, and technology innovation activities and studies may be funded jointly by several Federal, State, regional, and local transportation agencies, academic institutions, foundations, or private industry under the transportation pooled fund program. FHWA plays a key role in this process. While FHWA participates and contributes directly to some pooled fund studies, it also encourages States to pool their funds for regional or national problems to avoid research duplication and to effectively use monies for managing research.

To qualify as a pooled fund study, more than one State transportation agency, Federal agency, other agency (such as a municipality or MPO, college, university, or private company) must find the subject important enough to commit funds or other resources to conduct the research, planning, and technology innovation activities. A pooled fund study is intended to address a new area or complement or advance previous subject matter investigations. All studies receive funding from the States involved. Federal and State transportation agencies may initiate pooled fund studies and act as the “lead agency” for the study. Local and regional transportation agencies, private industry, foundations, and colleges and universities may partner with any or all of the sponsoring agencies to conduct pooled fund projects. In FY 2004, the TPF program included 100 FHWA-led projects and 140 State-led projects valued at over \$155 million.

The TPF Web site (<http://www.pooledfund.org>) permits online solicitations and funding commitments for new pooled fund studies and allows lead agencies to post work plans, progress reports, final report/deliverables, implementation activities, and other relevant information.

Small Business Innovation Research Program

The SBIR program is an R&D program mandated by Congress in 1982 and reauthorized in 1992. Its purpose is to develop technological innovations by using high level expertise in the small business community throughout the United States. The program aims to stimulate technological innovations; meet the Federal Government’s needs for R&D by providing opportunities to small businesses; increase private sector commercialization of innovations derived from Federal R&D; and provide opportunities for minority and disadvantaged participation in technological innovations. One example of an SBIR research partnership is the Visual Freight Database, which is a public/private partnership that provides improved modeling tools for national, State, and MPO freight planning and infor-

mation that shows county-to-county freight movements by modes and commodity types. The database is available for use throughout FHWA.

International Involvement

FHWA promotes the U.S. highway transportation community’s objectives through participation in international organizations and their operating committees, including the Permanent International Association of Road Congresses (PIARC), the Organization of Economic Cooperation and Development (OECD) and the European Conference of Ministers of Transport (ECMT) Joint Transport Research Center (JTRC), the International Road Federation (IRF), and the Asia-Pacific Economic Cooperation (APEC) Forum. FHWA also fosters cooperation on international R&T activities with such U.S. partners as AASHTO and NCHRP. The International Technology Scanning Program accesses and evaluates foreign technologies and innovations that might significantly benefit U.S. highway transportation systems. This program enables advanced technology to be adapted and implemented much more efficiently without spending scarce research funds to recreate advances that already have been developed by other countries. Twelve scans are conducted over a 2-year period. Additionally, FHWA has a number of bilateral agreements with other countries.

In October 2003, Dennis Judycki, FHWA Associate Administrator for Research, Development & Technology, represented the U.S. at the OECD/ECMT JTRC meeting in Paris. The JTRC reaffirmed its existing Working Groups and Roundtables for 2004 and 2005, as an extension of the preliminary Program of Work for 2005–2006 approved by the Ministers at their last meeting. In addition, a meeting was held with the OECD Ambassador’s office in preparation for the ECMT Committee of Deputies meeting scheduled for October 14–15, 2004.

OECD Road Transport Research (RTR) projects completed in FY 2004 included several projects for which the U.S. had the lead, including a report on new technologies for road safety, a symposium on human factors of technology for elderly users, and a symposium on road pricing cosponsored by the OECD, FHWA, TRB and Florida DOT in November 2003. RD&T researchers are also actively involved in an OECD RTR research project on the Economic Evaluation of Long-Life Pavements. The OECD RTR program undertakes policy-oriented research and evaluation of best practices, through joint ventures and international cooperation, and international data exchange. An FHWA representative serves as an official member of the OECD RTR Steering Committee that meets in April and October of each year.

The Joint Transport Research Centre (JTRC)

The JTRC is supported by the OECD and the ECMT. Established in January 2004, the JTRC has the following mandate:

The Centre shall promote economic development and contribute to structural improvements of OECD and ECMT economies, through cooperative transport research programmes addressing all modes of inland transport and their intermodal linkages in a wider economic, social, environmental, and institutional context.

The Centre is intended to provide a wider international forum devoted to research and related discussions on surface transportation with an intermodal perspective. The JTRC research program for 2004 included four major work projects in which the U.S. is participating:

- ▶ Speed management.
- ▶ Economic evaluation of long-life pavement.
- ▶ Young driver risks and effective counter measures.
- ▶ Congestion in large metropolitan areas.

In particular, TFHRC researchers are playing an active role in the Economic Evaluation of Long-Lived Pavements. Phase 1 of this pavement project focused on long-life wearing courses and their economic viability. Two nonconventional materials are being investigated in participating laboratories located around the world. These materials are epoxy-asphalt and the use of a continuously paved high performance cementitious material.

Throughout the effort, RD&T researchers shared the latest technologies, reports, and ideas on wearing course performance with stakeholders and international partners. Phase 2 of the study will focus on comprehensive joint testing of candidate course materials. Participation has been confirmed with 21 different countries.

Seismic Workshop in Turkey

In September 2004, FHWA and Turkey's General Directorate of Highways (KGM) hosted a second workshop on state-of-the-art techniques for mitigating the damaging effects of earthquakes. The workshop, funded by the National Science Foundation, was a continuation of an established relationship between FHWA and Turkey started by the first workshop, "Lessons Learned from the Recent Earthquakes," jointly held in Turkey shortly after two devastating earthquakes took place there in 1999.

United States-Japan ITS Joint Research

The United States-Japan ITS Joint Research Program was initiated in November 2000 at a meeting held in conjunction with the ITS World Congress in Turin, Italy. Organizations participating in the ITS Joint Research Program included the USDOT, the Japanese Ministry of Land, Infrastructure and Transport (MOLIT), and the Japanese Automated Highway System (AHS) Research Association. The following are some highlights from the program:

- ▶ In FY 2004, the Joint Research Program focused on intersection collision avoidance systems. Intersection collisions represent almost 30 percent of U.S. crashes, or 1.7 million per

year. Reducing these crashes is one of FHWA's highest priorities.

- ▶ A business meeting and information exchange among the participants in the ITS Joint Research Program was held in conjunction with the ITS World Congress in November 2003. Representatives from FHWA, the ITS Joint Program Office, and the Japanese Ministry of Land, Infrastructure and Transport discussed the topic of “Electronic Mapping to Support Intersection Collision Avoidance Services.” It was agreed to continue to focus on advancements in digital maps in 2004 and to hold the next meeting in conjunction with the ITS World Congress to be held in Nagoya, Japan in October, 2004.
- ▶ The FHWA sponsored a research fellow from Japan. The process involved the nomination of a Fellow by the MOLIT of Japan, the acceptance of the nomination by the FHWA Associate Administrator for RD&T, and a contract between the Fellow and FHWA. The fellowship is awarded annually.

Cooperation with the Japanese Universal Traffic Management Society (UTMS)

UTMS is comprised of university professors, Sumitomo Corporation, Koito Industries, and the National Police Agency (NPA). The UTMS has been addressing issues related to alleviating the surface street congestion problem. NPA is the operating agency for traffic signal systems in Japan. The following are some highlights from the program:

- ▶ A member of the FHWA Office of Operations R&D participated in the 6th International UTMS and NPA conference in Tokyo in March.
- ▶ In December, 2003, the Office of Operations R&D hosted Yasushi Okamoto from the Japanese National Police Agency for a 2-month assignment supporting the ITS Advanced Transportation Management Systems (ATMS) program. Mr. Okamoto had spent the previous 2 months with NHTSA.

- ▶ UTMS and ITS America have signed an agreement to continue cooperation and information exchange between the United States and Japan and anticipate that representatives of the Japanese NPA will continue to be assigned on a rotational basis to support the ITS program in the future.

International Scans

International technology scans are an important means for identifying, assessing, and importing foreign highway technologies and practices that can be cost-effectively adapted to U.S. Federal, State, and local highway programs.

Similar to the “benchmarking” process that is widely used by firms in the private sector, scans are conducted as a means of comparing products and best practices with the intent of identifying better, safer, and more environmentally sound technologies. Scans help to limit duplication and promote information sharing, thus allowing technologies to be put into practice more quickly and efficiently. Scanning reviews add depth and cohesion to research and practice in the United States. The process and findings generally complement and enhance the existing knowledge base in the U.S. highway community, often putting innovations on the fast track to deployment.

In 2004, scans were completed in the following areas:

- ▶ Traffic safety information systems.
- ▶ Construction management.
- ▶ Performance measures.
- ▶ Prefabricated bridge elements.
- ▶ Quiet pavements.

Scan teams represent FHWA, State highway departments, local governments, and where appropriate, transportation trade and research groups, the private sector, and academia. Personal domestic and international networking, team dynamics, and the creation of U.S. champions for promising foreign innova-

tions are keystones of the methods used. The program's goal is to successfully implement the world's best practices in the U.S.

In October of 2003, RD&T staff participated in the FHWA and AASHTO sponsored scanning study of traffic safety information systems in Germany, Australia, and the Netherlands. The results of the study were used to help improve data collection and management processes, and to support the development of integrated approaches in the U.S. In June 2004, personnel from RD&T, FHWA Headquarters, AASHTO, and academia, conducted a human factors safety research scan of transportation centers of excellence in Finland, Norway, Sweden, Denmark, Netherlands, and France. The primary objective of the tour was to learn how the various research groups plan, develop, and conduct human factors research and put the findings into practice. The following list from the countries visited consists of areas that could be developed further and implemented in U.S. roadway transportation programs:

- ▶ “Self-explaining” roads.
- ▶ Driving simulators and infrastructure design guidelines.
- ▶ Interdisciplinary roadway research teams.
- ▶ Speed management.
- ▶ Human centered focus.
- ▶ Cognitive models.
- ▶ Top-down human factors direction.

The United States “in kind” Contribution to the European Union's Fully Optimized Road Maintenance Project

Several years ago the European Union reviewed the FHWA research program to identify projects that complemented their own plans. As a result of this review, two areas for cooperation were identified: One was the development of road profilers, and the second involved a research project titled “Repair

Versus Rehabilitation of Concrete Pavements.” In support of the Fully Optimized Road Maintenance (FORMAT) project, a study was conducted on the application of a bonded concrete overlay to a continuously reinforced concrete pavement in Texas. The principal investigator also analyzed accelerated load tests, of asphalt concrete pavement maintenance techniques, in several European nations.

The guidelines produced by the review led to the development of a software tool for the analysis of rehabilitation strategies called Strategic Analysis of Pavement Evaluations for Rehabilitation (SAPER). SAPER utilizes condition surveys, laboratory and field tests, traffic forecasts, and climate to arrive at the optimum pavement treatment option.

Concrete Pavement Technology Program (CPTP)

Launched in 1999, the CPTP is a 5-year, \$25 million effort charged by TEA-21 with carrying out “research on improved methods of using concrete pavement in the construction, reconstruction, and repair of Federal-aid highways.” FHWA and the Innovative Pavement Research Foundation (IPRF), a concrete paving industry consortium, jointly administered the program. The program's partners also include State highway agencies and TRB. Specifically, the partnership will ensure that the highest priority concrete pavement technology needs are addressed; the expertise and resources of States, industry, and FHWA are used effectively and efficiently; and new concrete pavement technology will proceed rapidly from research to implementation.

In addition to the oversight provided by FHWA and the IPRF, the program receives guidance from the TRB Committee for Research on Improved Concrete Pavements. The committee reviews and provides advice on the program's long-range work plan and project tasks, including objectives, appropriateness, and the likelihood of success. The committee has representatives from industry, academia, and State highway agencies, FHWA, IPRF, and AASHTO.

Appendix F

Abbreviations

The following abbreviations are used in this document; this list is provided for quick reference.

AASHTO	American Association of State Highway and Transportation Officials
ACS	Adaptive Control Software
ADSC	Association of Drilled Shaft Contractors
AHS	Japanese Automated Highway System
APEC	Asia-Pacific Economic Cooperation Forum
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
CLAIRE	Expert decision software for real-time traffic management developed in France
CMP	<i>Corporate Master Plan</i>
COMET	Cooperative Program for Operational Meteorology, Education and Training
COTR	Contracting Officer's Technical Representative
CPTP	Concrete Pavement Technology Program
CRG	Communications Reference Guide
DDETFP	Dwight David Eisenhower Transportation Fellowship Program
DGIT	Design Guide Implementation Team
DHM	Digital Highway Measurement
DHS	Department of Homeland Security
DOD	Department of Defense
DOS	Department of State
DOT	Department of Transportation
DynaMIT	Prototype for the Real-Time Traffic Estimation and Prediction System (TrEPS)

DynaMIT-P	Prototype for the Traffic Estimation and Prediction System for Operations Planning
DynaSMART-P	Prototype for the Traffic Estimation and Prediction System for Operations Planning (TrEPS-P)
DynaSMART-X	Prototype for the Real-Time Traffic Estimation and Prediction System
ECMT	European Conference of Ministers of Transport
ETG	Expert Task Group
EU	European Union
FEHRL	European Federation of Highway Research Labs
FHWA	Federal Highway Administration
FLETC	Federal Law Enforcement Training Center
FOIL	Federal Outdoor Impact Lab
FRP	Fiber-Reinforced Polymer
FTA	Federal Transit Administration
FY	Fiscal Year
GIS-T	Geographic Information Systems Decisionmaking Software
GPS	Global Positioning System
GSA	General Services Administration
GSOS	GPS Surface Observation System
HA-NDGPS	High-Accuracy Nationwide Differential Global Positioning System
HDS	Highway Driving Simulator
HERMES	A Bridge Inspection Trailer Unit
HIPERPAV	High-Performance Paving Software
HPC	High-Performance Concrete
HPS	High-Performance Steel

HRDI	FHWA Office of Infrastructure R&D	MIHE	Minority Institutes of Higher Education
HRDO	FHWA Office of Operations R&D	MOLIT	Japanese Ministry of Land, Infrastructure and Transport
HRDS	FHWA Office of Safety R&D	MPO	Metropolitan Planning Organization
HRPD	FHWA Office of Program Development and Evaluation	MUTCD	Manual on Uniform Traffic Control Devices
HRRM	FHWA Office of Resource Management	NCHRP	National Cooperative Highway Research Program
HRTS	FHWA Office of Research and Technology Services	NCBC	National Concrete Bridge Council
HSIS	Highway Safety Information Systems	NCPC	National Capital Planning Commission
IDEA	Innovations Deserving Exploratory Analysis	NDGPS	Nationwide Differential Global Positioning System
IDP	Individual Development Plans	NGSIM	Next Generation Simulation
IPRF	Innovative Pavement Research Foundation	NHI	National Highway Institute
IHSDM	Interactive Highway Safety Design Model	NHTSA	National Highway Traffic Safety Administration
INRETS	French Ministry of Transportation	NPA	Japanese National Police Agency
IT	Information Technology	NSF	National Science Foundation
ITE	Institute for Transportation Engineers	NSTI	National Summer Transportation Institutes
ITS	Intelligent Transportation Systems	NTCIP	National Transportation Communication for ITS Protocol
IVI	Intelligent Vehicle Initiative	OECD/RTR	Organization of Economic Cooperation and Development Road and Transport Research Program
JPO	Joint Program Office	OMB	Office of Management and Budget
JTRC	Joint Transport Research Centre	OST	Office of the Secretary of Transportation
Labs	Laboratories	PBCAT	Pedestrian and Bicycle Crash Analysis Tool
LADS	Learning and Development System	PCC	Portland Cement Concrete
LED	Light-Emitting Diode	PCCP	Portland Cement Concrete Pavement
LIFE	Long-lasting highways using Innovative technologies and practices to accomplish Fast construction of Efficient and safe pavements and bridges	PDP	Professional Development Program
LRFD	Load Resistance Factor Design	PIARC	World Road Association
LTPP	Long-Term Pavement Performance		

PIH	Pan American Institute of Highways	TFAP	Technology Facilitation Action Plan
QuickZone	Work zone delay estimation software	TFHRC	Turner-Fairbank Highway Research Center
R&D	Research and Development	TIG	AASHTO Technology Implementation Group
R&T	Research and Technology	TMC	Transportation Management Center
RAC	AASHTO Research Advisory Committee	TNM	Traffic Noise Model
RD&T	Research, Development, and Technology	TRB	Transportation Research Board
RITA	Research and Innovative Technology Administration	TRB RTCC	Transportation Research Board Research and Technology Coordinating Committee
RPC	Reactive Powder Concrete	TReL	Traffic Research Lab
RSPA	Research and Special Programs Administration	TPF	Transportation Pooled Fund
RTR	Road Transport Research	TSIS	Traffic Software Integrated System
RWIS	Road Weather Information System	TT	Technology Talks newsletter
SAFETEA	Safe, Accountable, Flexible, and Efficient Transportation Equity Act of 2003	U&GP	Universities and Grants Program
SBIR	Small Business Innovation Research	UHPC	Ultra-High-Performance Concrete
SCC	Self-consolidating concrete	USCG	United States Coast Guard
SCOR	AASHTO Standing Committee on Research	USDOT	United States Department of Transportation
SHRP	Strategic Highway Research Program	USDOT RTCC	United States Department of Transportation Research and Technology Coordinating Committee
SOW	Statement of Work	USLIMITS	Preliminary Expert System for Speed Zoning
STIPDG	Summer Transportation Internship Program for Diverse Groups	UTC	University Transportation Center
Superpave®	Superior Pavement System	UTMS	Universal Traffic Management Society
SWAT	Strategic Work Zone Analysis Tools	WIM	Weigh-In-Motion
T2	Technology Transfer		
T&I	Technology and Innovation		
TEA-21	Transportation Equity Act for the 21st Century		
TELUS	Transportation, Economics, and Land Use System		

This publication communicates the benefits
and developments of our research and services.

www.tfhrc.gov

FHWA-HRT-05-040
HRPD-01/03-05(1M)E