With funding from the Florida Department of Transportation (FDOT) and the U.S. Department of Transportation, NCTR recently developed an Internet-based tool for dynamically delivering the National Transit Database (NTD) Sampling Manual.

In Spring 2010, the Federal Transit Administration (FTA) officially released the NTD Sampling Manual, which was developed by NCTR and sponsored by FDOT in response to an FTA request. The manual consists of guidance for individual transit agencies to get sampling plans, collect sample data, and estimate annual totals of unlinked passenger trips and passenger miles traveled that meet FTA requirements.

For three decades, FTA has provided guidance for transit agencies in Circulars 2710.1A and 2710.2A. However, these current circulars cover only two modes—bus and demand response; they do not reflect the operating conditions of individual agencies, and they do not take advantage of modern sampling techniques. The NTD Sampling Manual overcomes the shortcomings of the current circulars and is expected to reduce reporting burdens significantly for a wide range of transit agencies in Florida and across the nation. The experiences since the Spring 2010 release have been mostly positive and confirm this expectation.

The current manual was designed to be comprehensive to cover all modes, service types, units of measurement, methods of sampling and estimation, steps of data collection and estimation, etc. Being comprehensive, however, comes at a price—only a small portion of the guidance is directly relevant to any one specific application. Some guidance is common to all applications, but other guidance is unique to one or more applications. Because this manual is in the traditional static format, it is not practical to separate the guidance for all possible applications. As a result, agencies need to look for the relevant guidance for each application in this format. This is common to the traditional model of static content delivery, which pushes technical documents that cover many options and variations to an audience with varying needs.
Director’s Message

University Transportation Centers are usually best known for the research they conduct and the education they provide to students who intend to pursue careers in transportation. Thorough research can validate or disprove theories and lead to new knowledge, products, or processes that result in improvements to our transportation system and services.

While there is no denying the importance of research and the reports that are produced, there are some subject areas that are evolving and changing more rapidly than the typical research process can reasonably keep up with. For instance, advances in transit technology applications produce changes so rapidly that even a thorough research report might be outdated by the time it is published. For example, the progress being made in the use of alternative fuels is happening in many different venues around the U.S. where experience is being gained that is valuable to all interested in the subject. Many policy boards and managers of public transportation agencies need the best and most current information available as they approach making substantial investments in options that include natural gas, biofuels, hybrid buses, or electric buses. A definitive report on every option is years away, but policy makers need to make decisions now based on the best information available.

To address the need for providing information that is as current as possible, NCTR supports a number of clearinghouses that allow researchers and practitioners to share up-to-the-minute information on best practices in a variety of subjects and to otherwise communicate with each other on an ongoing basis on successes they have had or problems they are experiencing. NCTR now has four clearinghouses that deal with alternative fuels, GIS in transit, transportation demand management, and bus safety. The managers of these clearinghouses organize conferences and webinars, synthesize research, and host listserv discussion forums. In effect, the clearinghouses serve as a free and effective mutual-aid system among practicing transportation professionals. Our clearinghouse listservs continue to be a popular method for communicating among peers, providing a quick-response method of providing technical assistance to the various public transportation communities. Not a day goes by that information is not requested and/or provided through these listservs and made available to the more than 6,000 people who subscribe.

NCTR is very pleased to foster these opportunities for communication within the industry and hope that more will join. To do so, please visit our listserv website at http://lists.cutr.usf.edu/read/all_forums/ and click on “Subscribe” to join the listserv that serves you best.

Joel Volinski
Director, National Center for Transit Research
The primary objective of this project was to move the *NTD Sampling Manual* from its current static delivery format to a dynamic delivery format. This was accomplished by developing an Internet-based interactive tool where the full content of the manual is stored in terms of individual topics, but only the relevant topics are dynamically assembled and presented to a user once the user specifies the profile of a specific application.

Another important objective of this project was to make enhancements to the current version of the *NTD Sampling Manual*. The experiences since the Spring 2010 release of the current version and changes in FTA’s reporting requirements for NTD also prompted the desire to improve the manual in the following ways:

- Ensure that the sampling plans developed from the NTD Sampling Template are based on robust and precise sample data.
- Provide more options to transit agencies in developing sampling plans.
- Further reduce the reporting burden to transit agencies, particularly for small- and medium-size agencies.
- Simplify procedures that are relatively complex.

This project successfully revised the *NTD Sampling Manual* to incorporate a number of enhancements to the existing version.

To ensure quality data for developing sampling plans, for example, the new manual requires a minimum sample size of 50 for all new sampling plans and for all sample data to be used in developing new sampling plans. As another example, to give transit agencies more options to seek the best sampling plans, the new manual provides guidance and a tool for transit agencies to develop sampling plans that are customized to their conditions and have a structure similar to those in Circular 2710.1A. Furthermore, the new manual simplifies guidance for transit agencies to determine whether they should revise their previously-developed sampling plans.

Researchers also investigated several potential enhancements and ultimately decided not to incorporate them into the new manual. These potential enhancements had been suggested by FTA to reduce the likely negative impact on transit agencies as a result of the recent split in NTD of the traditional single mode of bus services into three modes—regular bus, commuter bus, and bus rapid transit. One suggestion was to allow combined sampling across these three bus modes. Another was to waive the newly-added minimum sample size of 50 for certain services.

Researchers also successfully developed a Web tool for the new *NTD Sampling Manual* to be delivered to its users in a range of options. Users can download the entire manual and the Sampling Template. In addition, users can
browse the manual by its major sections, subsections, or even individual pairs of questions/answers. Users also can specify what they need in terms of four profiling questions (e.g., What is your mode of service?) and their various options (e.g., vanpool), and the Web tool, in turn, can deliver the relevant content of the manual.

The enhancements to the *NTD Sampling Manual* help improve the reliability of NTD sampling plans and the resulting ridership data reported and give transit agencies more options to search for the best sampling plans for their special circumstances. The Web tool greatly condenses and simplifies the comprehensive full manual for many transit agencies and their special circumstances, particularly small- and mid-size agencies.


### NTD Sampling Manual Profiling Questions and Profiling Options for User Interface

<table>
<thead>
<tr>
<th>Profiling Questions</th>
<th>Profiling Options</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What are you trying to do?</td>
<td>General Directions</td>
<td>Overall directions to the full manual.</td>
</tr>
<tr>
<td></td>
<td>Sampling Plans</td>
<td>Major steps for getting estimates of annual totals of UPT and PMT.</td>
</tr>
<tr>
<td></td>
<td>Data Collection</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Estimation</td>
<td></td>
</tr>
<tr>
<td>2. What is the mode of service?</td>
<td>Bus Modes</td>
<td>Regular bus, commuter bus, BRT, etc.</td>
</tr>
<tr>
<td></td>
<td>Commuter Rail</td>
<td>CR</td>
</tr>
<tr>
<td></td>
<td>Other Rail Modes</td>
<td>Heavy rail, light rail, streetcar rail, etc.</td>
</tr>
<tr>
<td></td>
<td>Other Scheduled Modes</td>
<td>Ferryboat</td>
</tr>
<tr>
<td></td>
<td>Demand Response Modes</td>
<td>Regular (DR) or by taxi (DT).</td>
</tr>
<tr>
<td></td>
<td>Commuter Vanpool</td>
<td>Vanpool service for commuters.</td>
</tr>
<tr>
<td></td>
<td>Other Non-Scheduled Modes</td>
<td>Jitney services, etc.</td>
</tr>
<tr>
<td>3. Do you report 100% UPT?</td>
<td>Yes</td>
<td>Can sample far less if you report 100% UPT and only estimate PMT.</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>4. Do you have own sample data?</td>
<td>Yes</td>
<td>Use template or alternative sampling plans.</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>Should use ready-to-use sampling plans.</td>
</tr>
</tbody>
</table>

Notes:
1. Template sampling plans are what you get from using your own NTD sample data from a previous report year with the Sampling Template.
2. Alternative sampling plans are what you have qualified statisticians develop and certify with your own NTD sample data from a previous report year.
3. Ready-to-use sampling plans are what the *NTD Sampling Manual* provides for you to use temporarily if you do not have your own NTD sample data from a previous report year for various reasons.
As a leader in the public transportation research arena, NCTR is pleased to announce its continued support of the National Transit GIS Clearinghouse and the 8th National Transit GIS Conference at the Keck Center of the National Academies in Washington, DC, on October 16–17, 2013. NCTR is continuing its support of this one-of-a-kind conference that focuses on the unique and diverse needs and applications of GIS in the public transit industry.

We are excited about our new partnership with the Transportation Research Board (TRB) and our continued partnership with the Urban and Regional Information Systems Association (URISA) for this conference. These partnerships exemplify the applied and theoretical focus of NCTR. URISA, the professional GIS certification body and leading GIS association, represents the commitment to the applied aspect of the conference program.

Our partnership with TRB represents the equally important research that helps advance the state of the art of GIS development in the field of public transportation. Together with the extensive public transit experience among the NCTR research faculty and attendees, those who register can be assured of experiencing a conference that is both groundbreaking and foundational.

The conference will continue to provide attendees with a broad range of topics on agency experiences, demographic and performance analysis, and cutting-edge GIS techniques. Sessions designed to address the diverse and unique GIS needs regardless of agency size and technical proficiency are characteristic of the conference.

Conference organizers expect that hosting the conference at the Keck Center of the National Academies will increase the pool and diversity of presentations and attendees and will result in one of the best transit GIS conferences yet.

Conference attendees must register by September 8, 2013, to get the early registration fee. Registration at the conference hotels (Hotel Monaco or Hotel George) must be made before August 30, 2013. More information can be found on the Transit GIS clearinghouse website at http://transitgis.org/2013/01/10/2013-conference/.
Transit vehicles, like all vehicles, exhibit areas that are blind to the driver due to the limitation of mirror visibility. These “blind zones” are larger for long vehicles such as buses or trucks, and drivers often cannot see areas to the sides of the vehicle. This results in dangerous situations where side collisions with other vehicles can occur, especially while changing lanes or turning. The side-view camera system has been shown to eliminate these zones by providing a clear view of the blind zones to the driver, thus reducing the opportunity for collisions.

The side-view camera system has been successfully used on recreational vehicles (RVs) for several years. This NCTR project focused on applying similar aftermarket systems to transit buses and developing the specifications required to deploy such systems in the future. However, the side-view camera systems currently available on the market usually include two side cameras and one or two monitors with a wide angle view that presents a distorted image and too much information, potentially leading to distraction.

The first phase of the project tested the feasibility of replacing the vehicle side mirrors with a side-view camera system to evaluate if drivers can correctly estimate distances and properly identify objects. The participating drivers performed the controlled driving test twice: once with the camera system, and once with mirrors only.

Results of the comparison of mirrors and camera systems showed that the side blind zones were greatly reduced or eliminated when using the side-view video system with wide angle cameras. The result from volumetric measurements of blind zone reduction from this study showed that a camera-based system with a 60° lens (no distorted image) reduced about 64% of the blind zones of a flat mirror system and reduced about 43% of the blind zones of a common combined flat and convex mirror system. Using a wide-angle lens (100°), the blind zones on both sides of transit buses can be completely eliminated.

The 28 drivers reacted positively on distance/depth perception and lane change maneuvers with the system.
They were able to adapt to the side-view video system and quickly learn how to use the system to drive. They could see vehicles in the side blind zones and at least two lanes next to the bus, providing them the opportunity to avoid situations where a lane-change maneuver would potentially result in a sideswipe crash.

A driver survey confirmed that the majority of bus drivers participating in the controlled driving test liked the side-view video system and valued its benefits, with some reservations about its reliability due to their unfamiliarity with the new system or some distortion of wide angle views. The testing verified that the side-view video system could perform better than the mirrors in rain and in dark conditions due to infrared sensors. Overall, it showed positive results for side-view video systems and the potential for further implementation.

During the second phase of the research, an integrated camera-mirror system (hybrid system) was developed, tested, and evaluated. The system had a 65° horizontal view, which was adequate to cover the side blind zones. The initial system was tested in a controlled driving test with 29 bus drivers who used the system to drive the bus and identify objects placed around the bus. Comparison was performed with the mirrors-only vs. the hybrid system. Statistical analysis showed that with the hybrid system, drivers had 96–98% correct identification of the location of the object vs. 70–78% with mirrors only. They were faster in identifying the objects using the hybrid system, even though two additional search locations (monitors) were present with the hybrid system.

A transit agency in Florida was recruited to participate in the field deployment and evaluation for the hybrid system. The participating bus drivers overall were positive about the experience even though there were initial problems with fogging that were quickly overcome. After a one- to two-month deployment, the majority of drivers agreed that the hybrid system reduced or eliminated the blind zones and could be effective in the reduction of side crashes. One of the reported problems of the system was that during night-time driving, the headlights of passing vehicles tended to be distracting due to light bleed-through the camera, but participating drivers seemed to recover relatively fast from this effect.

Results of the comparison of mirrors and camera systems showed that the side blind zones were greatly reduced or eliminated when using the side-view video system with wide angle cameras.

Both the driving test and field deployment helped identify major factors to aid in the development of specifications for side-view camera systems. Using the results from the testing and a literature review, recommendations for specifications on the integrated camera-mirror system were compiled to help practitioners, industry professionals, and operating managers when choosing such hybrid systems for their fleets.

For more information on this project, contact Dr. Pei-Sung Lin at lin@cutr.usf.edu or Dr. Achilleas Kourtellis at kourtellis@cutr.usf.edu.
**FY 2013 Ongoing NCTR Projects**

- Project UCARE: Uniform Cost Accounting and Reporting Elements for TDM (Phil Winters, CUTR, 77922)
- Quantifying the Benefits of the TRIP Program (Jan Davis, CUTR, 77936)
- Field Evaluation of Yield-to-Bus Roadside Treatments and Bus Pullout Bays Design Characteristics (Pei-Sung Lin, CUTR, 77938)
- A Tool for Assessing Economic Impacts of Public Transit Spending (Xuehao Chu, CUTR, 77941)
- Flexible Public Transportation Services in Florida (Jay Goodwill, CUTR, 77942)
- Tracking Costs of Alternatively-Fueled Buses (Steve Reich, CUTR, 77943)
- Effectively Managing Consumer Fuel-Price-Driven Transit Demand (Justin Begley, CUTR, 77944)
- TBEST Calibration for Guideway and BRT Modes (Steve Polzin, CUTR, 77945)
- Ridership Impacts of South Florida’s EASY Smart Card (Ann Joslin, CUTR, 77946)
- Improving Cost-Effectiveness of Financial Incentives in Managing TDM (Chanyoung Lee, CUTR, 77947)
- Integrating Transit with Road Pricing Projects (Steve Reich, CUTR, 77948)

**NCTR Projects Completed in FY2013 (7/1/12–12/31/12)**

- Assessing the Impact of Proposed Transit Investments and Public Policy Choices on Land Use Patterns (A Simulation Approach with UrbanSim) (Chanyoung Lee, CUTR, 77931)
- Dynamic Delivery of the National Transit Database Sampling Manual (Xuehao Chu, CUTR, 77933)
- Analysis of the Implementation Status of Impact to Transit Research (Michael Audino, CUTR, 77934)
- Forecasting Paratransit Services Demand—Review and Recommendations (Jay Goodwill, CUTR, 77939)
- Evaluation of Camera-Based Systems to Reduce Transit Bus Side Collisions (Pei-Sung Lin, CUTR, 77940)

Information on NCTR research projects and contact information for principal investigators can be accessed at [http://www.nctr.usf.edu/research-2000-2013/](http://www.nctr.usf.edu/research-2000-2013/).

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**NCTR-Hosted Public Transportation Listservs**

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*See links below for subscribing to CUTR/NCTR announcement listservs*

- **BFM—General (transit maintenance)** – discussion forum; 390 subscribers
- **Bus Rapid Transit (BRT)** – discussion forum; 610 subscribers
- **Journal of Public Transportation (JPT)** – announcements sent by NCTR including calls for papers and availability of the online copies of NCTR’s academic journal on public transportation; 559 subscribers—subscribe at [http://mailman.rc.usf.edu/mailman/listinfo/jpt](http://mailman.rc.usf.edu/mailman/listinfo/jpt)
- **National Center for Transit Research (NCTR)** – announcements of publications, conferences, etc.; 1,472 subscribers—subscribe at [http://mailman.rc.usf.edu/mailman/listinfo/nctr](http://mailman.rc.usf.edu/mailman/listinfo/nctr)
- **Parking Management (Parking)** – discussion forum; 359 subscribers
- **Rural Transit Assistance Program (RTAP)** – discussion forum; 168 subscribers
- **Sustainable Transport Indicators** – 435 subscribers
- **Telework** – discussion forum; 386 subscribers
- **Transportation Demand Management (Transp-tdm)** – discussion forum; 2,211 subscribers