FREIGHT ANALYSIS FRAMEWORK: ISSUES AND PLANS

24 September 2004

The Freight Analysis Framework (FAF) estimates commodity flows and related freight transportation activity among states, sub-state regions, and major international gateways. The FAF also forecasts changes in those flows and activity based on shifts in economic conditions, availability of transportation facilities, and other factors. This paper outlines a plan for improving the FAF to continue meeting the information requirements of public agencies related to commodity flows and freight transportation activity. Specific projects are listed to maintain and improve FAF methods, source data such as the Commodity Flow Survey (CFS), and applications of FAF estimates and forecasts to transportation issues.

This plan incorporates comments on the draft posted on the Web in April 2004. Since the plan will evolve as FAF improvements proceed, ongoing comments are welcomed and should be directed to Rolf Schmitt at 202-366-9258 or <Rolf.Schmitt@fhwa.dot.gov>.

SUMMARY

The Office of Freight Management and Operations of the Federal Highway Administration (FHWA) designed the FAF as a policy analysis tool for the U.S. Department of Transportation (DOT). Since the initial release of FAF results in 2000, the FAF has become a major data product for the larger transportation community.

To make the FAF a more effective tool for measuring and analyzing the changing world of freight transportation, FHWA plans to:

-- integrate more completely the FAF with data from the Economic Census;

-- assure quality of FAF data for the benchmark years;

-- provide timely updates to FAF data products;

-- assure that FAF methods and products are transparent and can be reproduced;

-- help state and local governments make effective use of FAF products in conjunction with local understanding of freight activity; and

-- continue to work with customers to improve the usefulness of FAF products.

FHWA is pursuing a three-pronged strategy to achieve these ends. First, FAF methods will be improved to provide a more accurate and timely characterization of freight flows through two major products:

-- Origin-Destination Database of commodity flows among the 106 to 114 CFS regions plus major international gateways, benchmarked every 5-years and updated annually with provisional estimates. The 2002 benchmark Origin-Destination Database will

include forecasts every 5 years from 2010 to 2035; the 2007 benchmark Origin-Destination Database will include forecasts through 2040.

-- Network Flow Database of commodity movements assigned to major transportation facilities, with forecasts and updates corresponding to the Origin-Destination Database.

Second, FAF data sources will be maintained and improved. Third, methods for using the FAF as a context for local issues will be developed through the Freight Model Improvement Program.

The Freight Model Improvement Program goes well beyond the FAF to enhance both the state of the art and the state of practice in freight modeling at the national, regional, and local scales. The program is targeted primarily on models for estimating and forecasting commodity flows and vehicle/vessel activity, and secondarily on models for turning flows and activity into safety exposure, environmental consequences, economic consequences, and other societal costs and benefits. The program also emphasizes improvements in local data collection to support freight models.

The planned FAF improvements and the Freight Model Improvement Program are designed to improve the quality of published information, encourage development of local knowledge in lieu of dependence on default values from national surveys and overextended models, minimize competition with private vendors and dependence on proprietary data, and focus FHWA resources on improvements in the completeness and timeliness of the FAF and on the development of complementary analytical tools. The FAF will continue to be a national policy analysis tool and serve as a starting point for understanding state and local freight activity. The FAF will provide a framework--rather than become a substitute--for local data collection and analysis to support small-area planning and project design.

INTRODUCTION: WHY WE CARE

The FAF provides basic information on the flow of commodities among regions and along major intercity transportation links. This information is essential for understanding key trends and issues such as:

-- growth in freight transportation activity throughout the United States, and the pressures created by that growth on the Nation's transportation systems;

-- patterns of merchandise trade with domestic and international partners and the economic growth potential associated with that trade;

-- volumes of traffic passing through a location between distant origins and destinations, indicating the effects of external traffic on local transportation facilities and the importance of local facilities to distant places;

-- markets served by different modes of transportation and intermodal combinations;

-- locations exposed to risks of hazardous materials incidents and other safety aspects of freight transportation;

-- energy use and environmental consequences of freight transportation;

-- efficiency and productivity of logistical systems supporting the Nation's economy; and

-- likely impacts of transportation policies on efficiency, economic productivity, safety.

As Abraham Lincoln said on the subject of federal funding for internal improvements, "...statistics will save us from doing what we do, in the wrong places. ... The surplus, that which is produced in one place to be consumed in another; the capacity of each locality for producing a greater surplus; the natural means of transportation, and their susceptibility for improvement; the hindrances, delays, and losses of life and property during transportation, and the causes of each, would be among the most valuable statistics in this connection." [1]

WHAT THE TRANSPORTATION COMMUNITY WANTS

Over the past three years, the Bureau of Transportation Statistics (BTS) and FHWA have convened two expert panels of the Transportation Research Board (TRB) to discuss requirements and strategies for freight data [2], the design of the CFS [3], and future directions for the FAF [4]. In its report on a conceptual national freight program, the first panel called for data on:

-- origin and destination;

-- commodity characteristics, weight, and value;

-- modes of shipment;

-- routing and time of day; and

-- vehicle/vessel type and configuration.

When the panel was reconvened to review the FAF, it emphasized that the desired data should be available at a level of geographic detail to support project design and planning. The panel also expressed the wish that freight activity statistics be based on enhanced data collection programs rather than on estimates from models. A separate expert panel reviewed the CFS and recommended continuation and enhancement of the survey as a basic data source.

Many customers of the FAF and related data programs may not need the level of geographic detail desired by the FAF review panel, but some customers want additional data elements such as circuity, delay, reliability, shipper and carrier costs, and other freight network performance measures. Customers have also asked for national indicators such as the value, tons, and ton miles by modes of transportation and type of commodity for all freight shipments, revenue and vehicle miles of trucks and trains, and travel times.

Appendix A lists information desires of the TRB panel members and other members of the transportation community. Few customers have expressed a willingness to do without updates to the FAF data in the years required to implement a national freight program.

WHAT THE FAF PROVIDES DOT

The FAF was designed to be a policy analysis tool for DOT. Detailed outputs from the FAF are available to all offices within DOT, and include:

1. For each county of origin, estimates for 1998 and forecasts for 2010 and 2020 of the tons of freight moved in the United States by county of destination, type of commodity, and mode of transportation.

2. For shipments through a region or location, estimates for 1998 and forecasts for 2010 and 2020 of the tons of freight moved by county of origin, county of destination, type of commodity, and mode of transportation.

3. For segments on major highways, rail lines, and waterways, estimates for 1998 and forecasts for 2010 and 2020 of the tons of freight moved by county of origin, county of destination, and type of commodity; and for highway segments, the number of trucks.

Measures of the transportation system performance available from the FAF are limited primarily to truck vehicle miles of travel by highway level of service. Truck travel times can be imputed based on relationships between volume, capacity, and speed. FAF outputs can support estimation of a variety of other performance measures.

Unless the FAF user specifies changes in modal shares as part of a scenario, the FAF forecasts changes in modal shares of freight movement only if the volume of commodities historically shipped by one mode is forecast to grow at a different rate than the volume of commodities shipped by another mode. The FAF is not sensitive to shipment costs by mode or similar policy variables.

FAF estimates and forecasts are used in a variety of policy studies. FHWA incorporates FAF forecasts of truck volumes into the Highway Economic Requirements System to calculate investment needs for the biennial report on *Status of the Nation's Highways, Bridges, and Transit: Condition and Performance*. The Federal Motor Carrier Safety Administration used the FAF to estimate the consequences of hours of service rules and the air quality effects of allowing Mexican trucks to operate north of the border. The Maritime Administration is using the FAF to analyze the market potential of short sea shipping.

WHAT THE FAF PROVIDES CUSTOMERS OUTSIDE DOT

Maps and national statistics from the FAF have become very popular with the transportation community. Because the FAF contains proprietary data, FAF outputs for distribution outside DOT are confined to the following:

1. For each state or major international gateway of origin, estimates for 1998 and forecasts for 2010 and 2020 of the tons of freight moved in the United States by state or major international gateway of destination, type of commodity, and mode of transportation.

2. For each state, major international gateway, and major metropolitan area of origin, maps of estimated flows for 1998 and forecasted flows for 2010 and 2020 along major routes by range of tonnage and mode of transportation.

3. For segments on major highways, maps of estimates for 1998 and forecasts for 2010 and 2020 showing ranges of the number of trucks using the segment and the tons of truck-carried freight. For rail and waterway segments, maps of data for 1998 and forecasts for 2010 and 2020 showing ranges of tons of freight.

FAF maps and the State Freight Transportation Profiles developed by FHWA from FAF data have been used extensively in presentations to state executives and the public. Because commodity flows are the physical linkages among regional economies, FAF data have been applied to subjects other than transportation. For example, the Department of Agriculture has used the FAF to estimate the geographic reach of contamination in the food supply after farm products move through the manufacturing and wholesale sectors of the economy.

WHAT THE FAF WAS NOT DESIGNED TO PROVIDE

As use of the FAF became more widespread, customers began to focus on additional information needs beyond the FAF's initial capabilities. Examples include:

--   estimates of commodity flows for geographic units smaller than counties;

--   flows of commodities by local (intracounty) trucking;

--   flows of commodities by pipelines;

--   origin-destination or network flows of commodities by hazard class;

--   origin-destination or network flows that are less than three years old;

--   updates of origin-destination and network flows;

--   network flows by season or time of day;

--   transportation costs;

--   capacity constraints and performance indicators for rail and water facilities; and

-- policy-sensitive mode split models and related analytical tools.

ISSUES FOR IMPROVING THE FAF

Since the FAF is being used for purposes beyond its original design, improvements are planned to serve evolving requirements of the transportation community. These improvements are intended to balance geographic detail, completeness, accuracy, and timeliness. Other issues, such as temporal variation and estimates of user costs, remain for future FAF improvement plans.

Geography

What level of geographic detail in the origins and destinations of commodity flows do public agencies require?

-- Federal applications of the FAF require origin-destination data for states, major metropolitan areas, and major ports or border crossings. Data on flows among individual counties are used primarily to estimate volumes and value of commodity movements and numbers of commodity carrying vehicles on major segments or nodes of the transportation network.

-- States desire commodity flow data at the county level to understand freight movements and economic dependencies within their borders. Sub-state geographic detail is desired for flows to and from neighboring states, and states or multi-state regions are adequate geographic detail for flows to and from distant trading partners.

-- Metropolitan and rural planners also desire county-to-county commodity flow data to understand freight movements and economic dependencies within and across their borders, and more aggregate geography for external commodity movements.

-- Project planning by states, metropolitan planning organizations, and local governments requires data on commodity flows among sub-county geographical units for local traffic within the project area, and among states and major metropolitan areas for freight movements that go significant distances beyond the project area.

For domestic commodity flows, geographic detail includes:

-- 50 states;

-- 106 regions for the 1997 CFS (which may increase to as many as 114 regions for 2002), including large state portions of major Metropolitan Statistical Areas and balances of the state listed in Appendix B;

-- 172 Economic Areas defined by the Bureau of Economic Analysis, based on aggregates of counties that often cross state lines;

-- 370 Metropolitan Statistical Areas defined by the Office of Management and Budget, also based on aggregates of counties that often cross state lines;

-- 465 urbanized areas defined by the Census Bureau, based on developed land that rarely follows state or county boundaries;

-- 3,141 counties and county-equivalent jurisdictions;

-- approximately 25,000 places identified by the Census Bureau;

-- approximately 33,000 zip codes identified by the U.S. Postal Service and used for tabulations by the Census Bureau; and

-- approximately 65,000 census tracts identified by the Census Bureau and similar to traffic analysis zones used in metropolitan planning.

Commodity flows in the FAF were estimated among counties and large freight activity generators such as ports, and then assigned to a highway network. A matrix of county-to-county flows by 20 commodity types and 5 modes has 987 million cells. While a large number of those cells should be empty, the statistical requirements of reliably estimating even a small fraction of that matrix exceeds what can be reasonably measured nationwide by surveys and current reporting systems. For example, the CFS requires observations of over 10 million shipments to estimate reliably flows among only 106 regions.

If supplemented with additional information, the CFS provides a robust base for the FAF to estimate flows by mode and commodity among the regions described in Appendix B. Neither the FAF nor the CFS can reliably estimate flows among smaller units of geography without supplemental data on local economic activity, freight generators, and transportation facilities.

In addition to domestic flows, the FAF currently identifies flows to and from major international gateways such as ports and border crossings. These flows can be extended to identify foreign origins of imports and destinations of exports, either by country or continent, with appropriate processing to resolve differences between trade and transportation data. [5]

Modal and Commodity Coverage

The FAF includes all major freight transportation modes except pipelines. The volume and value of crude petroleum, natural gas, and refined products moved by pipeline is substantial, but the geography of those flows is hard to determine. Shipments of a given commodity are generally intermingled in the pipeline network, and origin-destination patterns must be imputed rather than measured directly. Geographic detail is generally limited to regions containing several states.

Local trucking is another major gap in the FAF. The FAF estimates intercounty movements of commodities by truck, but not intracounty movements. Intracounty commodity movements are a significant share of truck movements under 50 miles, which comprise roughly one-third the value and two-thirds the weight of commodity movements captured in the 1997 CFS. Half of all trucks (excluding pickups, vans, and minivans) in the 1997 Vehicle Inventory and Use Survey were identified as operating

primarily within 50 miles of their base, and those local trucks accounted for roughly one-fourth the mileage of all trucks (excluding pickups, vans, and minivans).

A comprehensive catalog of commodity flows excluded from the FAF has not been compiled. Municipal solid waste, household goods movements, and other missing flows are not as large in the national picture as pipelines and local trucking, but may be locally significant and warrant local analysis.

<u>Modal and Commodity Detail</u>

The subdivision of modes by the types of vehicles or vessels used to carry the commodities is very important. For example, slow freight trains carrying bulk commodities and fast freight trains carrying intermodal containers and trailers have very different speed and capacity characteristics, and ro-ro ships are very different from container ships and from bulk carriers. The FAF attempts to reflect variation in highway vehicle capacity by distributing commodity flows among three types of trucks, while other FHWA models use up to 13 truck types.

With respect to commodity detail, the FAF uses the Standard Transportation Commodity Classification (STCC) system. Flows are estimated at the 4-digit level and typically reported at the 2-digit level of commodity detail. Because STCC codes were developed primarily to support the regulation of railroads, the STCC has excellent detail for commodities typically carried by rail and inadequate detail for commodities typically carried by truck or air cargo.

The Standard Classification of Transported Goods (SCTG) is an alternative to the STCC system, developed by the Census Bureau, DOT, Statistics Canada, and Transport Canada to classify more evenly commodities across all modes in a form consistent with the Harmonized System. The SCTG is linked to the Harmonized System to ensure compatibility with international trade data. The Harmonized System continues to evolve, though most changes are below the level of detail of the SCTG. Joint development of the SCTG with Canada ensures comparable data across the border. CFS data have been reported by SCTG since 1997.

<u>Network Coverage and Representation of Truck Movements</u>

The FAF converts commodity flows between places into commodity flows and vehicle activity over major segments and nodes of the transportation network. The transportation networks used in the FAF include most rail and water routes, the larger harbors and other major transfer points, and most major highways.

The FAF assigns county-to-county commodity flows to 243,380 miles of highways, representing the most important freight routes among 3.9 million miles of public roads. FAF routes cover 54 percent of the National Highway Planning Network, including all of the Interstate System (about 46,000 miles), the balance of the National Highway System (about 115,000 miles), the balance of the National Truck Network (about 47,000 miles designated by 23 CFR 658), and additional connectors and other roads (about 35,000

miles). Tonnage is converted into truck payloads, each payload is assumed to be a truck movement, and the resulting truck flows are calibrated against truck counts provided by the states. Most of the truck counts are reported through the Highway Performance Monitoring System.

The accuracy of estimated truck flows over the highway network depends on many factors:

-- Estimates of individual county-to-county flows from nationally collected data are subject to significant error.

-- The relationships between the geographical patterns of commodity flows and vehicle movements are not precise since trucks often pick up and drop off shipments as part of a tour or carry the shipment for only part of the way between the shipper and the consignee.

-- The routing algorithms for distributing the commodity flows among alternative paths through the FAF portion of the National Highway Planning Network neither reflect many important elements of routing decisions such as weather nor are based on observations of actual truck routing behavior.

-- Commodity-carrying trucks use roads not represented by the FAF portion of the National Highway Planning Network, especially between nearby counties where local roads may provide more direct connections.

-- County centroids and major traffic generators represented in the FAF may not be close to the actual origins and destinations of freight within a county.

-- Assumptions about payloads and capacity utilization are supported by very little data, especially for overweight operations.

-- Estimates of empty backhauls are based on very limited data and assumptions about equipment imbalances.

-- The accuracy of roadside truck counts varies significantly from state to state and within some states.

-- Truck counts are not limited to commodity carrying trucks. Larger trucks in construction, garbage removal, and other activities not related to freight account for between 10 and 20 percent of vehicle miles of travel for all trucks bigger than pickups and vans.

The FAF purports to estimate truck movements, but actually estimates longer distance flows of commodities by truck, converts those flows into truck payloads, assigns payloads to a limited number of highways, and makes a crude calculation of empty backhauls. Given the many limitations of current information on truck movements and on freight network assignment, the FAF would be more accurate if applied to a more generalized representation of intercity corridors rather than to specific segments of the

highway network. The FAF would also be more reliable if flows were reported as truck payload equivalents (TPEs) rather than as the movement of individual fleets of trucks.

TPEs are not a new concept in other modes. Maritime container capacity and volumes are typically reported in TEUs (twenty-foot equivalent units), and rail moves are typically reported in car loadings. The FAF already converts tons into payloads, but the conversion factors are based in part on proprietary data and have not been revealed.

Tons by commodity can be reasonably converted into TPEs with a transparent and readily understandable formula. TPEs can be based on the average payload by 2-digit SCTG reported every five years in the Vehicle Inventory and Use Survey, or on a maximum payload based on cubic and weight capacity of trucks specified in current law, or some other construct that is acceptable to the shipper and transportation communities. TPEs could be defined for each commodity class across all types of commodity carrying trucks, or could be defined by commodity for individual categories of commodity carrying trucks.

Timeliness

Estimates of freight activity more than a year old suffer a significant loss in credibility, especially in periods of rapid economic change. While data up to 5 years old are probably adequate for long-range planning, the business community and public decisionmakers are not likely to use estimates of conditions that are more than a year old. Timeliness is even more important for managing freight operations and making private investments.

Some data for the FAF, particularly at border crossings, are collected monthly, but most are annual or quinquennial. Key data from the Economic Census are collected for years ending in 2 and 7. While CFS data are collected during the census year, other Economic Census data are collected after the end of the year so that respondents can summarize the year's activity. One or more years following data collection are required for data processing, quality assurance, and publication, after which a year or more is required for integrating the data into the FAF. FAF numbers for year X are not released until X+3 or X+4. The 1998 base year will not be replaced until a 2002 base year is calculated in 2005 or 2006.

More timely data may eventually come from electronic manifests and other intelligent transportation systems, but such systems are years away from being deployed through the freight transportation system to provide an adequate picture.

The near-term solution is to develop a system for provisional estimates. Just as the Census Bureau estimates population every year from various sources before doing a complete count once each decade, FAF estimates can be updated by correlating flows with key indicators that are reported annually. Such provisional estimates do not require the extensive data integration and recalibration process of calibrating a new FAF base case.

While a provisional estimates system can provide annual updates to the FAF, it cannot meet the needs for real-time data for freight operations. As in the case of geographic detail, the FAF cannot be a substitute for local data collection and local knowledge.

Temporal Variation

The contribution of highway freight movements to general traffic congestion and the consequences of general traffic congestion on the timeliness and reliability of highway freight movements depend on whether or not trucks are operating during congested periods of general travel. Rail freight has a similar issue on tracks occupied at certain times of the day by passenger trains.

The FAF makes no estimates by time of day. Methods for such estimates have been proposed, but rely heavily on assumptions about dispatching patterns and intermediate stops. The few time-specific data sets--including vehicle classification counts, a study of travel time in freight-significant corridors, and the one-time Nationwide Truck Activity and Commodity Survey--have not been used to explore whether data-driven methods can be developed and at what level of commodity and geographic detail.

The FAF makes no estimates by season. The volume of commodities to be moved varies by season, especially for agricultural products and goods sold mainly during the Holidays. The availability of routes also varies by season, such as the elimination of northern inland waterways by winter weather. Except for monthly reports of transborder shipments, seasonal variation in origin-destination flows and network use is averaged out of most data used in the FAF.

Shipper and Carrier Costs

The FAF does not estimate shipper and carrier costs, even though cost is a key measure for predicting modal diversions and evaluating transportation investments and policies. Cost models for each mode and data on rates charged by for-hire carriers are available from private sources. Rate data can be used as an approximation of costs; however, rates do not always vary consistently with costs, and significant portions of the trucking industry (especially large portions of private trucking) are not covered.

Analysis Tools

Analysis is FAF's middle name, yet the FAF lacks robust and user-friendly tools for analyzing transportation issues. FAF forecasts of modal shares are not sensitive to policy variables, and policy-sensitive inputs to the FAF are not readily accessible to the FAF user for "what-if" analysis. There are relatively few performance measures, and few relate to transportation costs and the business community's bottom line. Links between FAF and benefit-cost analysis are limited.

Previous sections indicate the variety of applications of FAF data at the federal level. Direct links between the FAF and highway investment, cost allocation, and truck size and

weight models would ensure greater consistency and validity of national freight policy analysis.

Several customers have expressed interest in applying the FAF to analyses at state and local levels. Methods for linking FAF with statewide investment, revenue forecasting, and local travel demand models warrant investigation. FAF methods are not necessarily the best approach for local freight forecasting, but should be considered among several modeling strategies in efforts to improve the state-of-the-art.

Passenger Travel

For the FAF to answer policy questions about the relationship of passenger travel and freight movements and the relationship of local and long distance transportation, the FAF needs to be supplemented with estimates of intercity passenger flows and volumes of local passenger and freight activity. FHWA's Office of Policy has estimated intercity passenger flows with data from the American Travel Survey, and data from the National Household Travel Survey and the journey-to-work data from the Decennial Census could be used to estimate local passenger travel. Local traffic should be characterized in ways that can be made to approximate the local affects of national or statewide policy changes.

Public Data

As noted in the minority report on the conceptual national freight program, no one data source captures the complete picture of freight activity by commodity, origin, destination, mode, route, and time of day because no single entity tracks all those characteristics [2]. The FAF is constructed from a variety of public data sources, such as the CFS, the Rail Waybill, Waterborne Commerce Statistics, the Transborder Surface Freight Data Program, the Highway Performance Monitoring System, and the Vehicle Inventory and Use Survey. Each source has limitations, and each could be improved. At a minimum, these sources must be maintained if the FAF is to be kept up to date.

Commercial Data

The FAF is constructed in part on commercial data products, purchased by FHWA with proprietary restrictions. These data are more up-to-date and detailed than estimates generated directly from public data sources; however, the quality of the commercial data and methods used to integrate that data with control totals from public data sources have not been revealed in adequate detail. Moreover, detailed FAF results cannot be distributed beyond DOT under the current contract. Like vinegar and wine, a cup of proprietary data added to a vat of public data makes a vat of proprietary data.

The use of commercial data products in benchmark FAF estimates creates problems of transparency and availability at the federal level. Recent proposals to use FAF data for apportioning federal funds underscored the problem. If subjected to legal challenge, the problems of transparency would undermine FHWA's ability to defend effectively apportionments based on FAF estimates.

Problems of transparency and availability appear to be less important for forecasting and for applications at the state and local levels. Private vendors and proprietary data sources are the mainstay of many forecasts and freight planning studies.

Future Data Sources

The TRB review of the FAF recommended that FHWA place greater emphasis on the development of new data rather than on making do with models. [4] This often requires a long-term effort. For example, technical development, institution building, and funding arrangements for the CFS consumed 13 years between the initial proposal for conducting the CFS and delivery of CFS data products.

Near-term opportunities for new data include the International Trade Data System and an ongoing FHWA study of travel times in significant freight corridors. Manifests, customs declarations, and other information will soon be combined in the International Trade Data System for all modes except pipelines. Traditional problems of using trade data for transportation should be resolved with proper analysis and editing to correct for inaccurate locations of domestic destinations of imports, inaccurate locations of domestic origins of exports, missing information on the mode used between the international gateway and the domestic origin and destination, and missing information on transshipments. When BTS establishes a portal to the International Trade Data System for DOT and implements the requisite analysis and editing procedures, these data will replace transborder data now used in the FAF. The travel time study tracks the location of vehicles through satellite communications and global positioning systems, and should produce an improved empirical basis for the speed and routing calculations in the FAF.

In the longer term, new forms of real-time administrative data may become available to supplement or replace some of the data sources of the FAF as shipment tracking and inventory control systems are developed by major shippers to manage costs, as traffic monitoring for highway operations becomes more widespread, as information systems to manage interstate commercial vehicle permits and taxation become more robust, and if tracking of domestic freight is implemented for homeland security. While nothing has been deployed widely enough to warrant active pursuit as a new data source at this time, continued monitoring of potential developments and encouragement of promising technologies through the Intelligent Transportation Systems program is worthwhile.

Feedback

No matter how carefully data are collected and modeled, national programs will make errors for some commodity or locale. The quality and credibility of the FAF will benefit from an effective program that encourages customer review of FAF data products and accommodates corrections. The Census Transportation Planning Package, a special set of tabulations for transportation agencies from the Decennial Census, provides a useful precedent. If metropolitan planning organizations could demonstrate that journeys to work reported in the Decennial Census were not properly allocated among places of work and provide information for correcting the allocation, the Census Bureau revised the

tabulations. Data quality and local confidence in the data were both improved. Although similar feedback has been received for the initial FAF on an ad hoc basis, the FAF would benefit from a more consistent and aggressive effort to include customers in the quality assurance process.

THE PLAN

The FAF must be updated and improved to provide effective statistics for federal policy evaluation, the development of national investment and operations strategies, and the starting point for understanding freight activity at the state and metropolitan levels. FAF estimates for 1998 may already be a misleading characterization of today's freight activity.

The improved FAF should be benchmarked to the Economic Census, the Census of Agriculture, and other comprehensive freight data programs for the census years ending in 2 and 7 to provide the most complete, detailed, and statistically sound basis for estimates and forecasts, and the FAF should be updated annually with provisional estimates. FAF methods and outputs should be as transparent and reproducible as possible to maximize the FAF's utility and credibility. FAF data products should not exceed the geographic and commodity detail for which data quality is assured. Data quality of FAF benchmark origin-destination flow estimates should reflect the statistical standards developed for components of the Economic Census.

FHWA is pursuing a three-pronged strategy to make the FAF a more effective tool for measuring and analyzing the changing world of freight transportation. First, FAF methods will be improved to provide a more accurate and timely characterization of freight flows through two major products:

-- Origin-Destination Database of commodity flows among the 106 to 114 CFS regions plus major international gateways, benchmarked every 5-years and updated annually with provisional estimates. The 2002 benchmark Origin-Destination Database will include forecasts every 5 years from 2010 to 2035; the 2007 benchmark Origin-Destination Database will include forecasts through 2040.

-- Network Flow Database of commodity movements assigned to major transportation facilities, with forecasts and updates corresponding to the Origin-Destination Database.

Second, FAF data sources will be maintained and improved. Third, methods for using the FAF as a context for local issues will be developed through the Freight Model Improvement Program.

By focusing the FAF data bases on the 106 to 114 CFS regions rather than counties, the quality of published information will be much higher, competition with private vendors and dependence on proprietary data will be minimized, and FHWA resources can be focused on improvements in the completeness and timeliness of the FAF and the

development of complementary analytical tools. State and local governments will still be able to use the FAF as starting point for understanding freight activity in their CFS regions. The FAF will indicate where local data collection and analysis should be targeted to provide needed detail for local planning and project design, and indicate the volume and nature of freight movements through the local area. Development of local knowledge will be encouraged in lieu of dependence on default values from national surveys and overextended models.

The FHWA Office of Freight Management and Operations proposes the following specific activities in conjunction with its partners in DOT and the Bureau of the Census.

1.0: Origin-Destination Database

Content: value, tons, and ton miles of commodities by mode, commodity type, hazard class for hazardous materials, place of origin, and place of destination.

--   For benchmark years ending in 2 and 7 and forecast years ending in 0 and 5: modes are truck, rail, water, pipeline, air and truck-air, truck-rail, truck-water, rail-water, other; commodities are 2-digit SCTG with selected 3-digit breakouts; hazard classes are 1-digit DOT; and places are CFS regions and major international gateways and regions.

--   For provisional current year estimates: modes are truck, rail, water, pipeline, intermodal; commodities are 2-digit SCTG; hazard classes are 1-digit DOT; and places are CFS regions and major international gateways and regions.

Project 1.1: based on the scope of the 2002 CFS and results of project 3.1, identify supplemental data sources and estimation methods to estimate 2002 flows not covered adequately by the CFS. Identify candidate 3-digit breakouts of the SCTG for FAF flows based on the importance of the category, the variation of shipping patterns from the parent 2-digit category, and the ability to estimate flows for the 3-digit category. Identify candidate international gateways and appropriate level of foreign geography for international flows. This project may be subdivided among government-vendor teams by commodity-mode combination. Initiate work in the fourth quarter of FY 2004 and complete in the second quarter of FY 2005.

Project 1.2: identify and evaluate methods and data sources for creating forecasts and annual provisional estimates of the Origin-Destination Database. Methods and data may differ between forecasts and annual provisional estimates. Initiate work in the fourth quarter of FY 2004 and complete in the second quarter of FY 2005.

Project 1.3: based on the results of project 1.1, establish a draft benchmark Origin-Destination Database for 2002, prototyping with 1997 data. Create and validate a final benchmark Origin-Destination Database for 2002 and if practicable for 1997. Prepare draft database in the third quarter of FY 2005, then test and implement final procedures in the fourth quarter of FY 2005.

Project 1.4: based on the results of project 1.2, establish provisional current year estimates of the Origin-Destination Database, starting with provisional estimates for

2004. Prepare draft methods in the third quarter of FY 2005, then validate the methods and prepare final provisional estimates for 2004 in the fourth quarter of FY 2005. Establish a process for generating provisional estimates for each subsequent year 200x within three months of the end of CY 200x.

Project 1.5: based on the results of project 1.2, establish forecasts of the Freight Origin-Destination Database for years 2010, 2015, 2020, 2025, 2030, and 2035. Prepare draft methods in the third quarter of FY 2005, then validate the methods and prepare final forecasts in the fourth quarter of FY 2005.

Project 1.6: working with BTS, Transport Canada, Statistics Canada, INEGI, and the Secretariat de Communicacion y Transportes, extend the Freight Origin-Destination Database from project 1.3 into a North American Freight Origin-Destination Database for 2002 for flows among states, provinces, and territories of Canada, Mexico and the U.S. Initiate work in early FY 2006 and complete in early FY 2007.

2.0: Network Flow Database

Content: for the benchmark, annual provisional estimate, and forecast years and commodity, hazardous materials, and geographic detail of the Origin-Destination Database:

--   for each highway segment and major port or other major intermodal terminal, value, tons, and TPEs by commodity type, hazard class for hazardous materials, place of origin for domestic and export shipments, place of international origin and gateway for imports, place of destination for domestic and import shipments, place of international gateway and destination for exports, and range of shipment (less than 50 miles, 50-100 miles, greater than 100 miles); and

--   for each rail, waterway, and pipeline segment, value and tons of commodities by commodity type, hazard class for hazardous materials, place of origin for domestic and export shipments, place of international origin and gateway for imports, place of destination for domestic and import shipments, and place of international gateway and destination for exports.

Project 2.1: identify and evaluate methods for creating the Network Flow Database from the Origin-Destination Database, the National Transportation Atlas Database, the Highway Performance Monitoring System, and other nationwide data bases. Methods and data may differ between the benchmark, annual provisional estimates, and forecast years. The assessment should include public and commercial network assignment models and data for estimating flows at the current level of FAF network extent and specificity; methods and data for aggregating assigned flows to the corridor level or estimating corridor-level flows directly; and methods for estimating commodity flows over the network within CFS regions and forecasting changes in those volumes in ways that are consistent with forecasts based on the Origin-Destination Database. Evaluation criteria should include availability of nationwide data to support the methods, practicality of implementing the methods within two years, and reliability of results for the chosen level

of network detail. Initiate work in the fourth quarter of FY 2004 and complete in the third quarter of FY 2005.

Project 2.2: working with the other operating administrations of DOT, develop and test prototype methods for estimating TPEs, and establish a community consensus on the best metric. Initiate development and testing in the fourth quarter of FY 2004 and complete in the first quarter of FY 2005. Develop a community consensus through TRB mid-year meetings and other forums in the first through third quarters of FY 2005.

Project 2.3: based on the results of projects 1.3, 1.4, 1.5, 2.1, and 2.2, estimate the Network Flow Database for the 2002 benchmark, provisional estimates, and forecast years. Develop and test draft estimates in the fourth quarter of FY 2005, and release final versions in the first quarter of FY 2006.

Project 2.4: based on the results of project 3.6, recalibrate the highway route assignments of the Freight Network Flow Database with data from the project on travel time in freight significant corridors and from the Nationwide Truck Activity and Commodity Survey, and develop alternatives for identifying time of day of flows in the Freight Network Flow Database. Conduct the work in the third quarter FY 2006 through the second quarter of FY 2007.

3.0: Major Source Data

Content: maintenance and enhancement of FAF source data.

Project 3.1: assist BTS and Census with the evaluation of CFS origin-destination data for 1997 and 2002 to determine areas where adjustments are required to improve the accuracy of the final data products from the 2002 CFS. CFS products will be finalized in the first quarter of FY 2005.

Project 3.2: based on the results of projects 1.1 and 3.1, work with Census and BTS to establish 2- and 3-digit SCTG ton-value and commodity-hazardous materials conversion tables based primarily on the 2002 CFS. Initiate work in the third quarter of FY 2005 and complete in the fourth quarter of FY 2005.

Project 3.3: based on the findings of projects 1.1 and 3.1, assist BTS and Census with the establishment of specifications for the 2007 CFS and the International Trade Data System to meet input requirements for the FAF, and the development of plans to meet those specifications. Specifications are needed in the second quarter of FY 2005, and plans should be developed in the balance of FY 2005.

Project 3.4: assist BTS in planning the migration of BTS Transborder Surface Freight Transportation Data Program to the International Trade Data System, especially in the development of quality assurance procedures. Initiate in FY 2004 and continue as long as required.

Project 3.5: continue to improve the accuracy, timeliness, and coverage of truck counts as part of or in addition to the Highway Performance Monitoring System. Initiate FHWA freight office involvement in the first quarter of FY 2005 and continue as long as required.

Project 3.6: develop a research database from the Travel Time in Freight Significant Corridors Study to improve calibration of FAF routing and time-of-day estimation methods. Initiate in FY 2004 and continue at least through the second quarter of FY 2006.

Project 3.7: work with BTS and other operating administrations of DOT to assure inclusion of critical capacity and performance attributes of highways, railroads, and waterways in the National Transportation Atlas Database to support the Freight Network Flow Database. Initiate in the FY 2004 and continue as long as required.

Project 3.8: identify and incorporate dynamic capacity attributes of highways by period (peak-off peak) in the National Highway Planning Network portion of the National Transportation Atlas Database to support enhancements to the Freight Network Flow Database. Initiate in the third quarter of FY 2006 and continue through the first quarter of FY 2007.

Project 3.9: work with Census and other operating administrations of DOT to assure continuation of FAF-critical elements in the 2007 Vehicle Inventory and Use Survey. Initiate in the second quarter of FY 2005 and continue as long as required.

Project 3.10: work with BTS and other operating administrations of DOT to maintain and update the crosswalk among SCTG, STCC, and Harmonized System commodity classifications. Initiate in FY 2005 and continue as long as required.

Project 3.11: work with BTS and other operating administrations of DOT to investigate alternative strategies in and beyond transportation for collection and use of nationwide, small-area data, and identify which strategies would apply to developing new data sources to meet the future needs of the transportation community. Initiate in the fourth quarter of FY 2004 and complete in the second quarter of FY 2005.

Project 3.12: work with the DOT Intelligent Transportation Systems Joint Program Office to explore the potential of the Electronic Freight Manifest to provide data to enhance the FAF. Continue in FY 2004 through a time to be determined.

4.0: Freight Model Improvement Program

Content: improved freight demand models, analysis tools, and training. The goal of the Freight Model Improvement Program is to enhance both the state of the art and the state of practice in freight modeling at the national, regional, and local scales. The program is targeted primarily on models for estimating and forecasting commodity flows and vehicle/vessel activity (including vehicle/vessel counts and miles traveled), and secondarily on models for turning flows and activity into public revenues, environmental consequences, economic consequences, and other societal costs and benefits. Major elements of the program are: (1) best practice assessments, training, tool development,

and other short-term improvements to local estimation and forecasting methods, including tools to apply national estimates to state and local transportation decisionmaking; (2) improvements to local data collection and integration to support freight demand estimation and forecasting methods; and (3) research to support long-term improvements in estimation and forecasting methods for national and local transportation analyses. The intent of the program is to establish a consensus of the transportation community on needed improvements and encourage vendors and others to meet those needs.

Project 4.1: establish a Web-based Freight Modeling Clearinghouse to monitor the state-of-practice and state-of-the-art in freight demand models and in applications of those models to transportation policy and planning at national, multi-state corridor, state, metropolitan, and local levels; to share results and obtain reactions to subsequent projects; and to provide a peer-to-peer exchange. Develop content and meta-data guidelines for sharing methods and results of local data collections and analyses. Initiate in the fourth quarter of FY 2004 and continue at least through 2006.

Project 4.2: work with the operating administrations of DOT to identify state-of-practice and best practice in freight demand forecasting models and in applications of those models to transportation policy and planning at national, multi-state corridor, state, metropolitan, and local levels. Produce an inventory with brief descriptions of existing models, data requirements of existing models, the questions that existing models attempt to answer, and the locations where those models are being used. Highlight methods and data for relating interregional flows to local levels, including but not limited to double constrained spatial interaction models and to iterative proportional fitting. Once the inventory has been complete and reviewed, evaluate the models to determine if the models provide accurate and effective answers to the questions they address, if the models answer the right questions, and if the problems are due to data limitations, inappropriate applications of existing models, or the lack of appropriate models to use. Identify short-term strategies, including training and tool development, to improve existing analysis tools and their use. Discuss draft findings through the clearinghouse. Initiate in the fourth quarter of FY 2004 and complete in the second quarter of FY 2005.

Project 4.3: work with the operating administrations of DOT to identify state-of-practice and best practice in local data collection to support local freight activity estimation and forecasting. Produce an inventory with brief descriptions of existing practices, and identify practices of local data collection used in allied fields. Identify short-term strategies, including training and tool development, to improve local data collection. Discuss draft findings through the clearinghouse. Initiate in the fourth quarter of FY 2004 and complete in the second quarter of FY 2005.

Project 4.4: based on the results of project 4.2, work with the operating administrations of DOT to identify new modeling strategies to estimate and forecast freight demand and initiate exploratory research by multiple vendors into promising strategies. Initiate in the third quarter of FY 2005 and complete in the fourth quarter of FY 2005.

Project 4.5: work with TRB to establish a short- and long-term research strategies for major improvements in the state of the art and state of practice in freight demand forecasting models and in applications of those models to transportation policy and planning at national, multi-state corridor, state, metropolitan, and local levels. Identify short-term research strategies based in part on projects 4.1 and 4.2 in the third quarter of FY 2005, and long-term research strategies based in part on projects 4.1 and 4.4 in the first quarter of FY 2006. Identify and evaluate alternative roles of DOT, the National Science Foundation, the American Association of State Highway and Transportation Officials (AASHTO), state DOTs, universities, and private vendors in improving existing models and developing new models in the first quarter of FY 2006. Convene a national conference in FY 2006 to establish and articulate a consensus on roles and road maps for improving the state of the art and the state of practice, similar in scope and effect to the Williamsburg conference on urban travel demand forecasting. [6] Include other DOT operating administrations, other interested federal agencies, AASHTO, and the Association of Metropolitan Planning Organizations in the development of the conference.

5.0: National Applications

Content: applications and extensions of the FAF to national policy issues, and planning for the third generation FAF.

Project 5.1: summarize the topics of ad hoc requests for FAF data, review FAF-based descriptive products such as the State Freight Profiles, and identify FAF inputs that users should be able to modify for policy analysis; develop specifications for a FAF scenario manager and a new family of products that meet customer requests more efficiently; and establish a review process to evaluate quality issues raised by customers and incorporate corrections into FAF products. Initiate in the second quarter of FY 2005 and complete in the third quarter of FY 2005. Continue to receive customer feedback through the Freight Modeling Clearinghouse in project 4.1 at least through 2007.

Project 5.2: work with the operating administrations of DOT to develop FAF-compatible, policy-sensitive modal diversion models and models for changes in local truck activity. Work is ongoing through 2007.

Project 5.3: based on the results of project 5.1, adapt revenue forecasting, benefit-cost, and other analysis tools to make effective use of FAF outputs, and adapt FAF methods and products to feed more effectively those tools and user-specified FAF scenarios. Initiate in FY 2006 and continue through FY 2007.

Project 5.4: implement portions the long term research strategy in project 4.5, exploratory research in project 4.4, and FAF management issues in project 5.1 to create the third generation FAF for national policy analysis. Initiate in the first quarter of FY 2006 and continue through FY 2007.

IMPLEMENTATION

To provide a fresh perspective on FAF improvements, Dr. T. Randall Curlee of Oak Ridge National Laboratory has been selected to manage (1) the evaluation of methods for creating the Origin-Destination and Network Flow Databases, (2) development of detailed specifications for establishing the Origin-Destination and Network Flow Databases, and (3) launching of the Freight Model Improvement Program. Dr. Curlee has extensive experience in directing the development of freight models for inland waterways, but is not aligned with any vendor or tied to previous work by Oak Ridge on truck and rail modeling. Dr. Curlee will utilize experience throughout the vendor and research communities, and the vendor community will be used to implement the Origin-Destination and Network Flow Databases and to explore new methods of freight modeling for the Freight Model Improvement Program. Dr. Curlee can be reached at 865-946-1461 or <curleetr@ornl.gov>.

Battelle will continue to manage the current FAF while the Origin-Destination and Network Flow Databases are under development.

CONCLUSION

The FAF has been a very successful product for FHWA and the freight community. FAF outputs have been accepted with relatively little scrutiny because they shed new light on the world of freight transportation. To continue this success, the FAF must continue to evolve and respond to user experiences, especially as problems with underlying methods and data are uncovered.

The planned FAF improvements and the Freight Model Improvement Program are designed to improve the quality of published information, encourage development of local knowledge in lieu of dependence on default values from national surveys and overextended models, minimize competition with private vendors and dependence on proprietary data, and focus FHWA resources on improvements in the completeness and timeliness of the FAF and on the development of complementary analytical tools. The FAF will continue to be a national policy analysis tool and serve as a starting point for understanding state and local freight activity. The FAF will provide a framework--rather than become a substitute--for local data collection and analysis to support small-area planning and project design.

A very aggressive program of enhancements to the quality, timeliness, and relevance of the FAF is proposed. The Office of Freight Management and Operations looks forward to working with its partners in FHWA, DOT, Census, and the private sector to assure that the FAF continues to meet the needs of the transportation community.

REFERENCES

[1] Internal Improvements, Speech of Mr. A. Lincoln of Illinois in the House of Representatives, June 28, 1848, *Cong. Globe*, 30th Cong., 1st Sess. 709-711 (1848)

[2] Transportation Research Board, *A Concept for a National Freight Program*, Special Report 276 (2003)

[3] Transportation Research Board, *Measuring Personal Travel and Goods Movement: A Review of the Bureau of Transportation Statistics' Surveys*, Special Report 277 (2003)

[4] Transportation Research Board, *Letter Report on the Freight Analysis Framework*, February 10, 2004.

[5] U.S. D.O.T., Bureau of Transportation Statistics, *Transportation Statistics Beyond ISTEA: Critical Gaps and Strategic Responses*, January 1998, p. 3.

[6] Highway Research Board, *Urban Travel Demand Forecasting*, Special Report 143 (1973).

APPENDIX A: AN IDEAL FREIGHT ACTIVITY DATA SET

Based on the deliberations of recent TRB panels, earlier discussions by TRB data committees, and customer reactions to initial FAF products, an ideal freight activity data set would include the following elements:

-- For the nation, the value, tons, and ton miles by modes of transportation and type of commodity for all freight shipments.

-- For each place of origin, current and forecasted tons, ton miles, value, and shipping cost of freight by place of destination, type of commodity, type of hazard if hazardous materials are involved, modes of transportation, and size of shipment.

-- For shipments through a region or location, current and forecasted tons, ton miles, value, and shipping cost of freight by place of origin and place of destination, type of commodity, type of hazard if hazardous materials are involved, and modes of transportation.

-- For surface transportation network segments or transfer points, current and forecasted number of vehicles, trains, or vessels using the segment or transfer point by time of day and the tons, value, and shipping cost of freight on those vehicles, trains, or vessels by place of origin and place of destination, type of commodity, type of hazard if hazardous materials are involved, mode of transportation, and type of vehicle or vessel.

-- Circuity, transit times, delay, reliability, shipper/carrier costs, and other freight network performance measures by mode.

-- All of the above for changes in the geography or mode of commodity movements, in network connectivity, or mode usage; or changes in policy that affect user costs, mode choice, and routing.

APPENDIX B: 1997 COMMODITY FLOW SURVEY (CFS) REGIONS

89 aggregations of Bureau of Economic Analysis areas used for the 1993 CFS were replaced by the following 106 regions to reflect more closely metropolitan planning organization boundaries and to be additive to states. For the 2002 CFS, metropolitan area boundaries will be adjusted to definitions established by the Office of Management and Budget in 2000, and the number of regions may increase to as many as 114.

Alabama
Alaska
Arizona: Phoenix-Mesa, AZ
Arizona: Remainder of State
Arkansas
California: Los Angeles-Riverside-Orange County, CA
California: Sacramento-Yolo, CA
California: San Diego, CA
California: San Francisco-Oakland-San Jose, CA
California: Remainder of State
Colorado: Denver-Boulder-Greeley, CO
Colorado: Remainder of State
Connecticut: Hartford, CT
Connecticut: Remainder of State
Delaware
District of Columbia: Washington, DC-MD-VA-WV (DC part)
Florida: Jacksonville, FL
Florida: Miami-Fort Lauderdale, FL
Florida: Orlando, FL
Florida: Tampa-St. Petersburg-Clearwater, FL
Florida: West Palm Beach-Boca Raton, FL
Florida: Remainder of State
Georgia: Atlanta, GA
Georgia: Remainder of State
Hawaii
Idaho
Illinois: Chicago-Gary-Kenosha, IL-IN-WI (IL part)
Illinois: St. Louis, MO-IL (IL part)
Illinois: Remainder of State
Indiana: Gary, IN
Indiana: Indianapolis, IN
Indiana: Remainder of State
Iowa
Kansas: Kansas City, MO-KS (KS part)
Kansas: Remainder of State
Kentucky: Louisville, KY-IN (KY part)
Kentucky: Remainder of State
Louisiana: New Orleans, LA
Louisiana: Remainder of State
Maine
Maryland: Baltimore, MD
Maryland: Remainder of State
Massachusetts: Boston-Worcester-Lawrence-Lowell-Brockton, MA-NH (MA part)
Massachusetts: Remainder of State
Michigan: Detroit-Ann Arbor-Flint, MI
Michigan: Grand Rapids-Muskegon-Holland, MI
Michigan: Remainder of State
Minnesota: Minneapolis-St Paul, MN-WI (MN part)
Minnesota: Remainder of State
Mississippi
Missouri: Kansas City, MO-KS (MO part)
Missouri: St Louis, MO-IL (MO part)
Missouri: Remainder of State
Montana
Nebraska

Nevada: Las Vegas, NV-AZ (NV part)
Nevada: Remainder of State
New Hampshire
New Jersey: New York-Northern New Jersey-Long Island NY-NJ-CT-PA (NJ part)
New Jersey: Philadelphia, PA-NJ (NJ part)
New Jersey: Remainder of State
New Mexico
New York: New York-Northern New Jersey-Long Island, NY-NJ-CT-PA (NY part)
New York: Buffalo-Niagra Falls, NY
New York: Rochester, NY
New York: Remainder of State
North Carolina: Charlotte-Gastonia-Rock Hill, NC-SC (NC part)
North Carolina: Greensboro-Winston Salem-High Point, NC
North Carolina: Raleigh-Durham-Chapel Hill, NC
North Carolina: Remainder of State
North Dakota
Ohio: Cincinnati-Hamilton, OH-KY-IN (OH part)
Ohio: Cleveland-Akron, OH
Ohio: Columbus, OH
Ohio: Dayton-Springfield, OH
Ohio: Remainder of State
Oklahoma: Oklahoma City, OK
Oklahoma: Remainder of State
Oregon: Portland-Salem, OR-WA (OR part)
Oregon: Remainder of State
Pennsylvania: Philadelphia-Wilmington-Atlantic City, PA-NJ-DE-MD (PA part)
Pennsylvania: Pittsburgh, PA
Pennsylvania: Remainder of State
Rhode Island
South Carolina
South Dakota
Tennessee: Memphis, TN-AR-MS (TN part)
Tennessee: Nashville, TN
Tennessee: Remainder of State
Texas: Austin-San Marcos, TX
Texas: Dallas-Fort Worth, TX
Texas: Houston-Galveston-Brazoria, TX
Texas: San Antonio, TX
Texas: Remainder of State
Utah: Salt Lake City-Ogden, UT
Utah: Remainder of State
Vermont
Virginia: Washington, DC-MD-VA-WV (VA part)
Virginia: Norfolk-Virginia Beach-Newport News, VA-NC (VA part)
Virginia: Remainder of State
Washington: Seattle-Tocoma-Bremerton, WA
Washington: Remainder of State
West Virginia
Wisconsin: Milwaukee-Racine, WI
Wisconsin: Remainder of State
Wyoming