4.0 Travel Impacts, User Benefits, and Accessibility

This section describes results of completing the Appalachian Development Highway System (ADHS) in terms of:

Travel Impacts. The highway capacity additions that corresponded to the completion of ADHS corridors were coded into the multi-region travel model described in Section 2.0. The model measures changes in the driving conditions for autos and trucks (further separated into non-freight trucks and commodity-based trucks), generating estimates such as traffic volume, aggregate travel time, and speeds.

User Benefits. Based on the results of the travel network model, user benefits due to highway improvements (travel-time savings, operating costs, emissions cost, and safety) are estimated in monetary terms and compared to the no-build scenario. The value of time varies depending on trip purpose and vehicle.

Accessibility. In addition to monetized user benefits, the travel model results also are used to determine accessibility gains to workforce, employment centers, transportation facilities such as airports, and other regional points of significance. The theory behind this analysis is that by improving highway speed, travelers would be able to access destinations and markets farther away within the same drive time radius.

4.1 TRAVEL IMPACTS

The travel model for the ADHS study area was run using several population growth scenarios. As pointed out earlier in this report, Woods & Poole (W&P) provided a scenario that was slightly more aggressive than the forecast supplied by Global Insight (GI). As a result of the two forecast alternatives, the travel model produced two alternative travel impact scenarios. In essence, travel impacts are measured by determining the difference in total VMT and VHT in the no-build and the alternative build case (ADHS completion). The resulting difference is the effect that the ADHS completion has on transportation system performance. Travel impacts are reported for two forecast years – 2020 and 2035. Table 4.1 shows VHT results for the Global Insight forecast.

Table 4.1 Daily VHT Based on Global Insight Forecast
Thousands

Thousand VHT	Total	All Trucks	Automobile	Non-freight Trucks
2020				
No-Build	11,966	2,852	8,024	1,091
Alternative	11,664	2,741	7,895	1,028
Difference	-303	-111	-128	-63
2035				
No-Build	20,658	7,163	11,695	1,801
Alternative	19,901	6,728	11,491	1,681
Difference	-758	-435	-203	-119

Source: Cambridge Systematics, Inc.

Travel impacts based on the Global Insight forecast show a decline in daily travel-time savings (VHT) for all vehicle categories (trucks, autos and non-freight trucks) in 2020 reflecting the travel efficiencies of completing the system. The VHT impacts for 2020 were approximately equal for all trucks and automobiles. Total VHT reduction in 2035 is projected to be significantly larger, reflecting the growth of traffic volumes and benefits from completing the ADHS. In 2035, truck VHT reductions constitute more than half of total VHT decline in that year.

In Table 4.1, the VHT difference for the Global Insight forecast across all vehicles types is estimated to be approximately 303,000 per day in 2020 and 758,000 per day by 2035. In annual terms, this corresponds to approximately 212 million fewer hours of travel in 2035 as the growth in travel-time savings from 2020 to 2035 reflects savings compared to traffic volumes and congestion without the completed corridors. A significant share of the total VHT savings is for freight truck trips due to: a) the long-distance nature of the trips; b) strong annual growth in freight truck tonnage (2.5 percent per year); and c) strong diversion to significantly faster and/or more direct routes.

Over the same time period, total VMT across the entire highway network is projected to increase slightly by 2035 after an initial decline in 2020. This increase in traffic was driven by the growth in vehicle miles traveled for the automobile trip category. Route diversion for auto trips onto the ADHS corridors is projected to substantially increase projected VMT on ADHS highways. The increase in VMT on ADHS completed corridors is 124 percent in 2020 and 142 percent in 2035, indicative of improved travel performance on these routes.

Changes in VMT due ADHS completion can stem from two dynamics: 1) reductions in VMT based on the use of more direct routes offered by ADHS corridors; and 2) increases in VMT as some trips divert from more direct but slower local roads to faster but less direct ADHS corridors. In the case of truck trips, the resulting drop in VMT in 2020 and 2035 for both forecast scenarios

implies that on net, the more direct routes offered by ADHS corridors reduces truck VMT as compared more circuitous routes often chosen by trucks to stay on major (e.g., Interstate) roadways. While truck VMT in the entire ARC region are estimated to fall slightly, freight truck VMT on ADHS corridors is estimated to increase dramatically. Consistent with the travel efficiency-based user benefits, freight truck VMT on to-be-completed ADHS corridors is expected to be four times greater in 2035 than under no-build conditions.

The travel impacts based on the Woods & Poole population and economic forecasts (Table 4.2) show a similar pattern. VHT decreases significantly across all categories over the study period. Additionally, VMT decreases slightly for all modes by 2020 while in the longer term VMT goes up as a result of the increase in VMT for autos.

Table 4.2 Daily VHT Based on Woods & Poole Forecast
Thousands

Thousand VHT	Total	All Trucks	Automobiles	Non-freight Trucks
2020				
No-Build	12,467	2,967	8,322	1,178
Alternative	12,136	2,840	8,195	1,102
Difference	-330	-127	-127	-76
2035				
No-Build	20,321	7,607	12,714	2,074
Alternative	19,540	7,115	12,426	1,919
Difference	-781	-493	-289	-155

Source: Cambridge Systematics, Inc.

It also is worth noting that the inclusion of terrain factors was a significant adjustment factor in this analysis. States, such as Tennessee, are increasingly including terrain factors into their travel models to reflect slower speeds (especially for trucks) with mountainous, steep grades. Visits to the selected corridors (e.g., Corridor H in West Virginia) confirms the exceptional differences in travel speeds between completed and uncompleted corridor sections due to steep grades on two-lane roads.

4.2 USER BENEFITS

User benefits as a result of the completion of the ADHS consist of a variety of different factors:

Travel-Time Savings. The travel model estimates the difference in VHT as a result of the to-be-completed ADHS corridors. The time savings are monetized by using values of time differentiated for autos, $13, and trucks, $29 consistent

with values from FHWA's Highway Economic Requirements System (HERS). These are relatively conservative assumptions compared to other published reports (e.g., Texas Transportation Institute's Urban Mobility Report uses an hourly commercial vehicle operating cost of $77.10/hour in 2005 dollars).

Fuel and Nonfuel Costs. These costs are calculated by using the difference in VMT for the build and no-build scenario and applying it to cost factors. For example, fuel costs are valued at $2.98 per gallon for autos and $2.83 per gallon for trucks.

Safety Benefits. Highway crash fatalities and injuries can be significant costs for businesses and households. In the case of capacity expansion of the ADHS network and changes in functional class, accident rates are expected to decline and the resulting difference in accidents (segmented by property damage only, injuries, and fatal accidents) is monetized using estimates for such costs from FHWA, differentiated by travel modes.

Travel-Time Reliability. Reliability can be measured by assessing the variability of travel time or the time that is needed to be on time at least 95 percent of the time. These time savings, such as reduced planning time due to system improvements, can be monetized by applying the same unit costs as for travel-time savings calculations.

Total user benefits in 2020 for both population and employment forecast scenarios, as well as differentiated by trip purpose and vehicle type are shown in Table 4.3. In total, both scenarios show approximately $1.4 billion in user benefits with a significant share of benefits accruing to the nonfreight truck categories. Travel-time reliability benefits have been excluded from this table.

Table 4.3 Summary of User Benefits in 2020

Million 2006 Dollars	Global Insight	Woods & Poole
Freight	$375.87	$400.81
Nonfreight	$511.29	$614.56
Business Automobile	$78.63	$77.60
Nonbusiness Automobile	$392.20	$387.05
Total	$1,357.98	$1,480.01

Source: Cambridge Systematics, Inc.

As shown in Table 4.4, user benefits net of reliability benefits are significantly larger in 2035 compared to 2020. More than half of total user benefits are now generated by freight trucks, which is consistent with the strong growth rate of goods movement projected by the FAF data, strong diversion of freight trucks to newly completed ADHS corridors, as well as the long-distance hauls impacted. When the two growth scenarios are compared, the Woods & Poole scenario creates total user benefits that are nearly 20 percent greater than the Global Insight numbers based on higher volumes of traffic.

Table 4.4 Summary of User Benefits in 2035

Million 2006 Dollars	Global Insight	Woods & Poole
Freight	$2,534.36	$2,708.79
Non-freight	$965.76	$1,259.34
Business Automobile	$129.67	$186.36
Non-business Automobile	$646.81	$929.57
Total	$4,276.61	$5,084.07

Source: Cambridge Systematics, Inc.

Over 90 percent of automobile and non-freight truck benefits are estimated to accrue to the ARC region based on the mostly local origin-destination pattern of trips. However, over 65 percent of benefits to freight flows are external to the ARC region, reflecting the long-distance nature of the shipments impacted and the national importance of completing the ADHS to facilitate goods movement into, out of, and through the ARC region.

Reliability Benefits. In addition to the traditional user benefits, the impacts from improved reliability of transportation as a result of the project have been estimated. Reliability benefits are based on the concept that extra time needs to be planned in order to be on time at least 95 percent of the time. Hence, reliability benefits are measured by calculating the time savings due to the reduction in "planning time" as a result of the transportation improvements. In short, these benefits are the sum of monetized time savings due to the improved travel conditions stemming from ADHS completion.

For the entire ADHS region, these reliability benefits were estimated as equal to between $2.2 and $2.4 billion in 2020 and figures roughly five times as large in 2035 (Tables 4.5 and 4.6). The majority of these reliability benefits in 2035 accrue to freight trucks. The estimation of reliability benefits is relatively new and untested, and is, therefore, viewed as a standalone component of this analysis and has not been included in the benefit/cost analysis or the development of regional economic impacts in TREDIS.

Table 4.5 Summary of Reliability Benefits in 2020

Million 2006 Dollars	Global Insight	Woods & Poole
Freight	$756.78	$815.20
Non-freight	$843.85	$1,041.61
Automobile	$575.78	$573.05
Total	$2,176.41	$2,429.85

Source: Cambridge Systematics, Inc.

Table 4.6 Summary of Reliability Benefits in 2035

Million 2006 Dollars	Global Insight	Woods & Poole
Freight	$9,195.74	$9,977.73
Nonfreight	$2,144.38	$2,876.69
Automobile	$1,083.98	$1,692.99
Total	$12,424.10	$14,547.41

Source: Cambridge Systematics, Inc.

4.3 ACCESSIBILITY

Improved accessibility to labor, customer, buyer, supplier, and tourism markets can lead to net business attraction/retention gains. Expanded markets are gauged by determining the additional population and employment that is accessible within a given travel time due to ADHS highway network completion (e.g., population that is within a one-hour drive for customer and labor markets; employment that is within three hours for buyer and supplier markets). By reducing travel times, the completion of ADHS will effectively enlarge the catchment areas on which businesses can draw labor, customers, and suppliers. In the analysis, the size of the employment and population catchment areas was compared for the build and no-build scenarios in both growth scenarios. The differences, in percentage terms, show the gains in market accessibility (access to a larger number of consumers), and business attraction (in response to improved access to labor, suppliers, buyers, and other modal facilities) resulting from the interstate improvements. The accessibility measures include the following:

Labor and Consumer Markets – Percentage change in population accessible within a 60-minute drive time, which is a rough indicator of the impact of ADHS completion on the size of labor markets (representing available work-force and job opportunities), as well as the size of typical shopper markets; and

Buyer and Supplier Markets – Percentage change in employment (by place of work) accessible within a three-hour drive, representing the likely reach of same-day truck deliveries for parts suppliers to manufacturers and distributors.

Table 4.7 shows the aggregate results of this analysis. For the Global Insight growth scenario, the analysis shows improved accessibility for both labor and consumer markets, as well as buyer and supplier markets. Specifically, population accessibility increased by 3.7 percent due to ADHS completion while employment accessibility increased by 4.6 percent.

Table 4.7 Increased Accessibility 2035
Build versus No-Build

	Global Insight	Woods & Poole
Population	3.71%	3.91%
Employment	4.58%	4.64%

Source: Cambridge Systematics, Inc.

For the Woods & Poole scenario, the growth in population and employment accessibility is equal to 3.9 and 4.6 percent, respectively.

In addition to the employment and population measures, the accessibility analysis also includes connectivity measures to specific transportation system components. This analysis is based on the average drive time reduction in each county to transportation facilities. This study includes the following four connectivity measures:

Intermodal Rail Terminals;

International Gateways;

Marine Ports; and

Airports.

The results of the accessibility analysis, i.e., the incremental changes resulting from the completion of the ADHS, are presented in maps presented in Section 4.2 and Appendix B.

Regardless of which forecast was used, the overall benefits attributable to the ADHS completion across the study area are measurable and demonstrate the positive economic impacts the system has on the counties that are part of the network.