Rural Transportation Planning: How to Effectively Plan, Implement, and Communicate an Access Management Study

Prepared by:

Stephen Aldrich, PE, PTOE, Vanasse Hangen Brustlin, Inc., 115 South 15th Street, Richmond, VA 23219, Tel. (804) 343-7100, Fax (804) 343-1731, e-mail: saldrich@vhb.com,

Richard Lockwood, PE, Vanasse Hangen Brustlin, Inc., 115 South 15th Street, Richmond, VA 23219, Tel. (804) 343-7100, Fax (804) 343-1731, e-mail: rlockwood@vhb.com, and

Harold Paxton, Virginia Department of Transportation, 1401 East Broad Street, Richmond, VA 23219, Tel. (804) 371-8866, Fax (804) 225-4785, e-mail: Harold.Paxton@virginiadot.org.

ABSTRACT

Over the past decade, states have experienced a shortage of highway funds needed to keep up with transportation growth. When this occurs, both transportation studies and construction projects are drastically cut back. In most cases, urbanized areas tend to consume the largest percent of available funds. Hardest hit for transportation study and construction funds usually are the rural areas. This makes it difficult to establish need and fiscal priorities in rural areas. The answer: Access Management becomes the most valuable transportation and land use management tool for maintaining the integrity of rural highways.

Transportation planning experience shows that the neglected rural arterials of today become the over-developed suburban arterials of the future. Anticipation of transportation needs and wants of others, with an in-depth appraisal of their present highway system, helps identify how one can manage long-term growth and ensure safe and efficient transportation solutions.

The U.S. Route13/Wallops Island Access Management Study, completed by the Virginia Department of Transportation in May 2002, is a successful example of such a project. The 69-mile corridor on Virginia's isolated rural eastern shore peninsula serves interstate travelers, town residents, farm equipment, tourists, bicyclists, school buses, long haul truckers and commuters. This major access study, for the Commonwealth, looked primarily at ways to make the access to the roadway safer and more efficient. Just to name a few of the concerns that had to be addressed included: the road contains more than 1,300 driveways--most without adequate turn lanes, almost 300 median crossovers, intersecting cross roads that do not line up from one side to the other, antiquated drainage culverts that can be dangerous if you happen to leave the highway, variable-width medians and numerous speed change zones.

This paper will address how we effectively planned, implemented, and communicated the outcome of an access management study based on lessons learned on this very successful Virginia experience.

Topics covered will include:

- Performing a needs and infrastructure assessment
- Using GIS for innovative data collection, design, and analysis
- Effectively linking community and interagency involvement
- Creating a conceptual solution using state-of-the-art graphic and techniques
- Involving and informing public and private interests
- Assistance localities with zoning ordinance
- Developing guidelines for future access studies
- Turning the plan into a reality

INTRODUCTION

Rural roads make up a large percentage of total road system inventory in the Commonwealth of Virginia. The maintenance of these roads are often overlooked in favor of more heavily-traveled urban and suburban roadways. The Virginia Department of Transportation (VDOT) maintains over 58,000 roadway miles, and is the third highest state in control of road miles. In Virginia, primary funding is allocated statewide by formula to nine construction districts. Hampton Roads Construction District has 10 % of the 8,050 statewide mileage and receives approximately 12 % of the $1,860 million state primary allocation. The Eastern Shore where Route 13 is located in the Hampton Roads District has 27 % of the primary mileage and receives less than 0.5% of the $227 million District annual primary budget.

Funding priorities typically focus in more heavily traveled urban and suburban roadway corridors. As a result, many of these rural roads are older facilities, designed with older, outdated design standards. It is hard to argue against this logic when you compare crash rates, fatality rates, and average daily traffic volumes. The long-term impact on the rural roadway infrastructure can be devastating.

This paper describes the efforts conducted to develop and implement an access management plan on U.S. Route 13, a primarily rural highway corridor, on Virginia's Eastern Shore. The location of this study corridor is shown in Figure 1. U.S. Route 13 is a primary route for travel between the Hampton Roads area (Norfolk, Virginia Beach) and Maryland, Delaware and other northeastern states. Virginia's Eastern Shore is primarily rural in character with major agricultural industries in poultry, tomatoes, potatoes, corn, and grain. Many of these farms have fields accessible only from U.S. Route 13. During planting and harvesting seasons (March through October), farm equipment on U.S. Route 13 is commonplace.

FIGURE 1
U.S. Route 13 Corridor Study Location Map

The need for better access management was identified by the Accomack-Northampton Planning District Commission (A-N PDC), which completed a conceptual corridor study for U.S. Route 13 in 1999. The A-N PDC is the planning agency for Virginia's Eastern Shore, which includes Northampton County and Accomack County. U.S. Route 13 is the only primary arterial serving these counties with 10 incorporated towns and 10 unincorporated communities.

The Virginia Department of Transportation (VDOT) initiated the U.S. Route 13/Wallops Island Access Management Corridor Study with three goals:

1. Conduct a more detailed roadway needs assessment than the prior study prepared by the A-N PDC in order to develop road improvement priorities;
2. Focus on developing access management solutions and guidelines to preserve corridor integrity; and
3. Improve access along the entire 69-mile corridor and to the Wallops Island area to promote high-tech growth related to the aeronautics industry.

VDOT officials and A-N PDC officials required this study to include elements that could be used by both VDOT and the local governing bodies to improve access management along U.S. Route 13. To accomplish this, the study team, led by the consulting firm Vanasse Hangen Brustlin, Inc. (VHB), included the following elements in the work program:

1. Conceptual roadway and intersection improvement plans to correct existing deficiencies and guide future development;
2. Corridor-wide access management guidelines to manage access on both U.S. Route 13 and on the intersecting side streets;
3. Sample model zoning ordinance development for adoption by the local counties and towns to enforce good land use-based access control;
4. Detailed public outreach to public officials and to the general public to elicit concerns about access and safety conditions on their "main street."

U.S. ROUTE 13 CORRIDOR

The portion of U.S. Route 13studied is located on the peninsula known as the Eastern Shore of Virginia. U.S. Route 13 runs down the center, or spine, of this peninsula dividing many of the towns and farms. , To the south is the Chesapeake Bay Bridge Tunnel (CBBT). This facility is a 17-mile tolled crossing of the Chesapeake Bay connecting U.S. Route 13 to Virginia Beach and the rest of the Hampton Roads Metropolitan area. U.S. Route 13 is generally a four-lane divided highway with posted speed limits of 45 miles per hour (mph) in many of the towns and 55 mph in the more rural areas. The southbound travel lanes were originally constructed in the 1930's, and the northbound lanes were added when U.S. Route 13 was widened in 1960. As a result, the horizontal geometry of the newer northbound travel lanes is significantly better due to evolving road design standards over a 30-year period.

U.S. Route 13 carries approximately 8,200 vehicles per day over the Chesapeake Bay Bridge Tunnel and approximately 17,000 vehicles per day at the Maryland State Line vehicles during the spring season. Summer traffic increases to 12,000 to 21,500 vehicles per day, respectively. The year-round population along this 69-mile long corridor is only 45,000. Portions of U.S. Route 13 are undivided with some of these segments having a center two-way left-turn lane. The vast majority of the corridor is characterized by farmland, isolated single-family homes, small businesses, schools, and churches. Obviously, this is not a congested highway corridor, but a typical rural arterial corridor. Many of the above-statistics are the greatest impediments to obtaining funding for needed improvements, particularly when compared to other projects in VDOT's Hampton Roads District. Efforts by VDOT in the past to improve access management conditions amounted to closing underutilized median crossovers. This however has often met significant resistance from effected residents and has proved to politically challenging. What had been missing was a plan and a unified vision to reinforce the need for access management improvements on U.S. Route 13 within VDOT and to gain support for better management of access locally.

NEEDS ASSESSMENT

If not for a public concern for access management and a growing concern within VDOT, a corridor study of this magnitude might not have been conducted on this kind of highway corridor. There are certainly many highways in urban and suburban areas in Virginia that on first glance could use access management more urgently than a predominantly rural, under-populated highway corridor. Unfortunately, for some of those areas, the battle may have already been lost. In other parts of the state, including the outer suburbs of the Washington, D.C. area (such as

Fredericksburg, Leesburg, Manassas, and Gainesville), country roads have been transformed into four to eight-lane urban arterials with insufficient access control. The time to plan started too late. It is also clear that access management is not just an urban solution, and that it is just as important in rural areas.

The manner in which the adequacy of this highway corridor was evaluated was very different from a typical corridor study. Access management can best be understood on a spatial level (distance between driveways or median crossovers, for instance), and it readily lends itself to spatial analysis. The use of Geographic Information Systems (GIS) was therefore an obvious choice as the platform from which to collect data, array many different and disparate types of data, and to analyze this data to provide a better picture of the transportation needs and deficiencies of U.S. Route 13. GIS was used to summarize geometric data, traffic data, crash data, physical obstructions, such as utility poles and drainage culverts, and access management features as shown below in Table 1. Much of this data was already available, some of it already in GIS format, others required some conversion, and a few data elements were field measured and manually entered into GIS database format.

TABLE 1
Corridor Data Arrayed in GIS Database

Traffic and Geometric Data	Environmental Data	Safety Concerns	Access Management Features
Right of Way width	Wetlands	Crash data	Type of median
Number of travel lanes	Prime farmlands	Utility poles	Median width
Shoulder width	Groundwater	Drainage inlets	Turn Lanes
Posted speed limits	Threatened & endangered species	At-grade rail crossings	Driveways by use
Traffic signals			Driveways by intensity

Spatial analysis using a GIS platform proved extremely useful for access management. Critical to the analysis of the safety and geometric adequacy of the roadway was a comparison between many of the data elements above. By recording shoulder width, lateral clearance of utility poles, driveways, median crossovers, and presence of concrete drainage grates in the median and comparing this data with recorded crash reports, the overlapping data showed what locals already knew:

5. Utility poles in general are located too close to the roadway edge (many within the VDOT ideal 30-foot clear zone, particularly in the mid-portion of the corridor;
6. Outdated drainage inlets in the median stick above the ground surface and pose a solid obstruction for vehicles;
7. The highest crash experience occurs in the commercial areas in the Towns of Exmore and Onley, precisely where commercial driveway density is at its highest.
8. Fatalities most often occur in remote rural stretches of road with either long straight roadway sections or areas with tight horizontal geometry.

Figure 2 displays the Oak Hall area, located in northern Accomack County displaying a combination of individual data and data analysis. Individual crashes, driveway locations, and obstructions are displayed along the corridor. The color bands shown on both sides of the road are a dynamic measurement of driveway density. Oak Hall has one of the highest driveway densities recorded along U.S. Route 13 (39 driveways per mile in the northbound direction and 34 driveways per mile in the southbound direction). Fortunately, the majority of these driveways serve single-family homes. Along this stretch of road, crashes were most frequently associated with drivers either turning into or out of their driveways.

Access Management Findings

Presentation of access management features is as important as the examination of crash data and substandard geometry to understanding the needs of a highway corridor. Access management often is viewed on a macro-system level using access management classifications to define appropriate access conditions. This typically requires that a larger jurisdiction such as a county or more typically the state, develop uniform standards based on the classification of the roadway. In Virginia, however, where there is no statewide access management program in place. A micro-analysis is more relevant to revealing how other local roadway features, such as width of the roadway shoulder, turn lanes, and property boundaries affect the quality of access.

FIGURE 2
Access Management Features Identified Using GIS

Figure 3 displays a summary of access management features in Accomack County (the northern of the two counties on Virginia's Eastern Shore. A total of 1,312 driveways were recorded on U.S. Route 13, with 57 percent of these driveways serving single-family homes.

In addition to the absolute number of driveways, one-directional driveway densities were also determined using dynamic segmentation. The driveway density at one location was calculated based on the density of driveways located approximately one-half mile to the north and south of the location being measured. Driveway densities in the 30-40 driveways per mile range [18-24 driveways per kilometer] were found in built-up areas. In general, one of the findings of this study was that driveway densities in excess of 10-12 driveways per mile [6-8 driveways per kilometer] create turbulence in the flow of traffic, justifying a wider shoulder or exclusive right-turn lanes to accommodate right-turning traffic. This is equivalent to an average driveway spacing of 440 feet to 530 feet [264 to 318 meters].

A total of 271 median crossovers were identified over the 69-mile corridor (average of one crossover every 1,200 feet [one crossover every 720 meters]. During the data collection process, the following information was identified for each median crossover:

- Median width (measured perpendicular to U.S. Route 13)
- Width of crossover (measured parallel to U.S. Route 13)
- Presence and length of left-turn lanes
- Use of crossover by larger vehicles (school buses, tractor-trailers, and farm equipment)

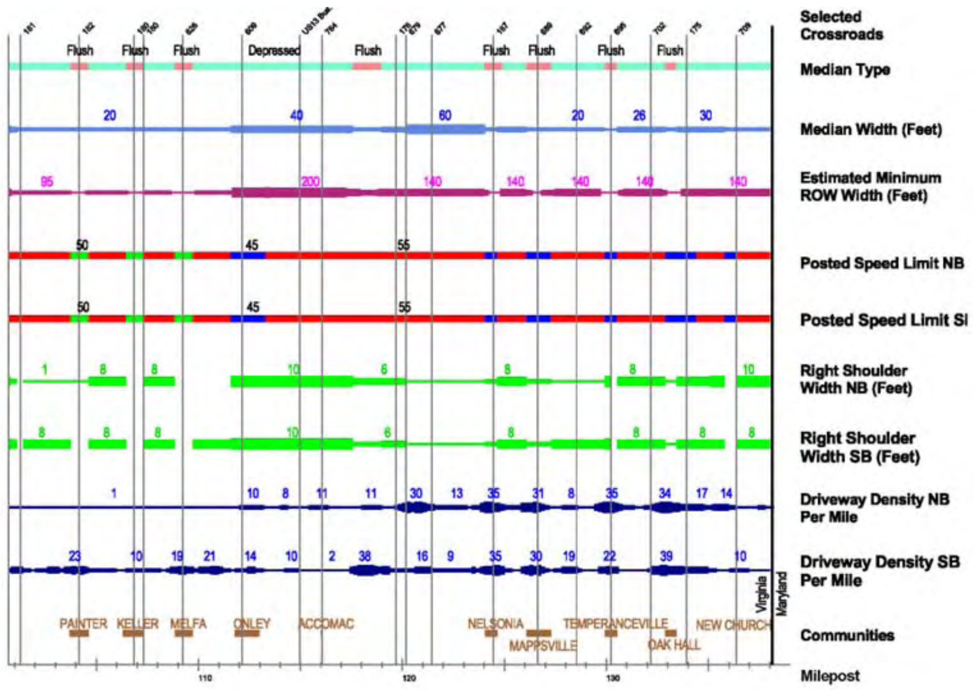

FIGURE 3
Access Management Corridor Features

The existing median on U.S. Route 13 typically varies from a low of 20 feet in the southern portion of the study area to over 40 feet. Forty-seven percent of all median crossovers were found to have a median width less than 30 feet. Given the heavy use of U.S. Route 13 by larger vehicles (tractor trailers, school buses and farm vehicles), the ability of the existing median to safety accommodate these longer vehicles became a key safety concern.

INCORPORATING LOCAL CONCERNS INTO ACCESS MANAGEMENT PLAN

The public involvement program employed for this study was intensive and multi-faceted. It included:

1. One-on-one coordination with local political officials.
2. The development of a study management team that included federal, state, and local officials.
3. A regular technical advisory group, held through the A-N PDC to present preliminary results from local officials and obtain feedback.
4. A community involvement committee, composed of a wide range of interests, including agriculture, the poultry and trucking industries, schools, environmental interests, the NAACP, area business leaders, and county officials.

The roles of the above efforts to both inform and to obtain feedback was extremely valuable to developing an understanding of local concerns that needed to be addressed in order to develop a successful plan.

Integrating Public Concerns into Plan

The public involvement process resulted allowed the study team to develop a plan that applied access management to address local access and safety issues not just an application of access management for its own sake or to satisfy a more regional standard. During the community involvement meetings and again at public meetings, four key major concerns were identified:

1. Location of schools along U.S. Route 13 and concerns for safety of buses while stopped on U.S. Route 13 and while turning onto U.S. Route 13.

2. Presence of longer vehicles, including school buses and tractor-trailers, in areas with inadequate-width medians.
3. Presence of farm equipment on U.S. Route 13, and the need to accommodate their use.
4. Fear of turning onto or off the highway due to the mixture of local traffic with through traffic.

This study was blessed with a very involved community involvement committee, which helped the study team to identify most local concerns and problems upfront. This added to the credibility of the team during the public information meetings where few new concerns were raised by the general public.

Communicating the Benefits of Access Management

One of the challenges of any access management project is in communicating the goals and objectives of good access management. This study emphasized throughout, particularly during public outreach, that VDOT could not enforce an access management program without the support of the localities that control land use decisions. So first, we had to explain how improved access standards, zoning ordinances, and conceptual improvement plans all work together to prevent continued degradation of corridor capacity and safety.

A literature search of access management programs in other states and government-sponsored research was a key starting point in the development of access management guidelines for this study. This included a review of research reports, including several Transportation Research Board publications and of statewide access management programs in Colorado, Florida, Michigan, Montana, New Jersey, and Washington State.

Listening to local concerns, however, proved to be as critical in developing access management guidelines. Several concerns were very clear relating to access onto and off U.S. Route 13. The Eastern Shore has an older population than the state as a whole, and during the public meetings, team members heard many residents voice their fears of turning out of their driveways, turning off the road into their driveways due to the narrow shoulders, and even crossing U.S. Route 13 at a traffic signal under a green light. Much of this concern was based on real incidents many involving tractor-trailers. The mixture of through traffic, much of it traveling interstate with a high percent of heavy vehicles, and local residents who have to rely on U.S. Route 13 as their “main street” can be a volatile combination. The presence of most commercial businesses, schools, and churches directly on U.S. Route 13 makes it almost impossible for the average citizen to avoid crossing over or traveling on U.S. Route 13 several times a day.

Access management guidelines developed for the U.S. Route 13 Corridor are shown below in Table 2. These guidelines, admittedly, are a qualitative application of accumulated knowledge, as no quantitative research was conducted during this study. Some of these standards were developed based on national research findings and experiences in other states, while others were developed by adapting existing VDOT standards and evolving access management practices within the state.

Model Zoning Ordinances – Involving the Localities

The role of local government in managing access is extremely important, as access is often predetermined based on land use decisions. Without a statewide, enforceable framework, an effective local access management plan requires joint cooperation between the state transportation agency and local officials. In fact, one of the potential barriers to a statewide program in general in Virginia is due to the historical importance of local government. This is not unique to access management, as localized, innovative corridor or locality-based programs are emerging across the state (traffic calming including roundabout intersections in Fauquier County, and red light cameras and transportation impact fees in Northern Virginia) in lieu of a statewide program.

TABLE 2

Summary of Access Management Guidelines for the U.S. Route 13 Corridor

Criteria	Recommended Guidelines	Special Notes
Left-Turn Lanes	Construct at all full-access median crossovers	May not fully apply to directional crossovers
Two-Way Left-Turn Lanes	Provide 12 feet minimum, 14 feet desirable	Replace with non-traversable median when AADT exceeds 25,000 to 30,000 vehicles per day
Right-Turn Lanes	Require at all commercial entrances and side streets	Results in minimum lot frontage requirement
Shoulders	Widen/construct 10 feet wide min. outside and 3 feet min. median shoulders	Where residential driveway densities >10/mile, 12 feet min. outside shoulder
Driveway Spacing	400 feet minimum between commercial entrances	Results in minimum lot frontage requirement
Corner Clearance	U.S. Route 13 400 feet – upstream of cross street 250 feet – downstream of cross street	Vehicle storage needs may increase the 400-foot upstream requirement
	Cross Street 250 feet – upstream of U.S. Route 13 100 feet – downstream of U.S. Route 13	Use of restrictive median may reduce the 250-foot upstream requirement to 100 feet
Crossover Spacing	0.5 miles – full access 0.25 miles – directional access	Procedure needed for variances/modifications
Median Width	➢ Provide 50 feet minimum at major generators and cross streets by: ➢ Roadway widening ➢ Flare widening	Convert medians to directional access only or close median opening if median widening not feasible
	➢ Widen crossovers and lengthen left turn lanes at locations with heavy vehicle considerations (buses, tractor trailers)	Convert medians to directional access only or close median opening if median widening not feasible
Side-Street Connections	Counties require new development to provide secondary access to side-streets were feasible VDOT to construct new local road links	
Signal Spacing	Two miles in rural areas, 0.5 miles in developing areas, 0.25 miles in developed areas	
Signal Timing	Implement signal coordination in developed areas	
Clear Zone	Establish 30 foot recovery area beyond traveled way, where practical	In areas with curbing, min. clear zone can be reduced to 6 feet

One of the key successes of this study was in the involvement and interest of local government officials and the public in general in making this plan a reality. The inclusion of a model Highway Corridor Overlay District (HCOD) zoning ordinance bridged the gap within access management between those who control the road and those who control land use. This ordinance incorporates all of the access management recommendations as well as dealing with issues typically outside the domain of transportation agencies. The HCOD ordinance was developed to be adopted either in part or in its entirety and includes discussions on:

- Authority
- Intent
- Applicability
- Definitions of Access
- Access Management Guidelines
- Requirements for Traffic Impact Study
- Setbacks
- Signage
- Lighting
- Landscaping
- Redevelopment (Retro-fitting)

DEVELOPMENT OF CONCEPTUAL IMPROVEMENT PLANS

Conceptual roadway improvement plans were developed for the entire U.S. Route 13 corridor. First, access management improvements on the existing roadway alignment were explored. Through the detailed public involvement program and where existing solutions were found to significantly impact multiple homes or businesses, alternatives were identified to detour around some of the more built-up areas. This is critical, as much of the existing homes and businesses are located on land with an adequate groundwater supply. U.S. Route 13 is located on the high point of the peninsula (at an elevation of 45 to 50 feet above sea level) along a 5,000 feet-wide recharge spine. In addition, given the low elevation and with the Chesapeake Bay to the west and the Atlantic Ocean to the east, wetlands are a significant feature in the area and pose a potential obstacle to construction on new alignment.

Conceptual improvements were drafted using AutoCAD software, and then imported into the GIS database. This allowed for the development of road improvements with a base map showing existing constraints, such as wetlands, threatened and endangered species and prime farmland. This method also added the benefit of calculating construction quantities using GIS analysis.

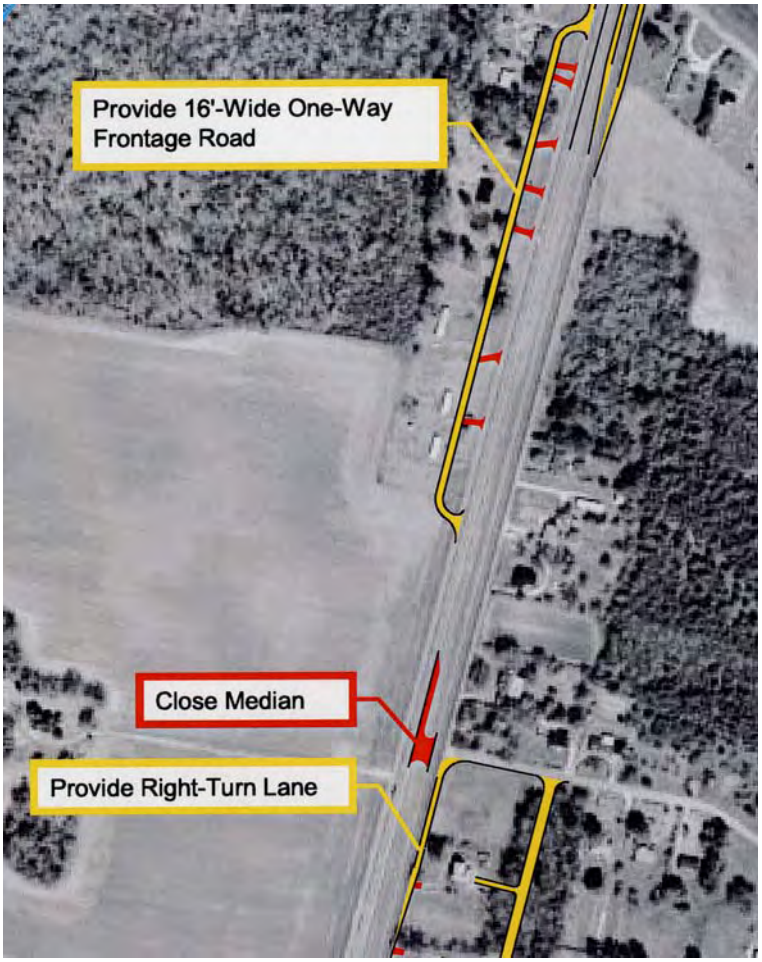

FIGURE 4
Residential Frontage Road Treatment

An example of these conceptual improvement plans are shown above in Figure 4 detailing a proposed residential frontage road.

The improvement plans were developed using the recommended access management treatments and guidelines as a whole, but improvements were developed with existing users in mind. Access management guidelines, including HCOD ordinances protect the long-term shape of a roadway corridor by shaping new development and re-development, but the reality is that many existing users (land uses) may never go away. Other land uses may fade over time and relocate off U.S. Route 13 as existing structures age (schools and churches) and commercial development replaces residential development. The improvement plans must try to accommodate both existing uses with retrofitting techniques and future development using the new design guidelines. More intrusive access management controls, such as purchase or acquisition of access rights or total relocation of access, while definitely more effective in modifying existing access on the road, is not likely to be implemented in the Commonwealth of Virginia in the near future.

TURNING THE PLAN INTO REALITY

The U.S. Route 13/Wallops Island Access Management Study with a 24-month study schedule was completed in May 2002. The study team then met with local officials, including meetings with the Accomack-Northampton Planning District Commission, Northampton County, Accomack County, the Town of Onley, and the Chesapeake Bay Bridge Tunnel District Commission. The plan was adopted in whole by Northampton County in June 2002, and they are currently establishing a highway corridor overlay district in their county ordinance. Accomack County established access management requirements into their zoning ordinance in April 2002. As a result, Accomack County actually begin implementing the access management guidelines and land use components while the study was still ongoing and not just on U.S. Route 13, but throughout the county. Since the completion of the study, the VDOT Resident Engineer reviews access and safety issues on U.S. Route 13 using the access management guidelines and the conceptual improvement plans as a guide.

One of the lessons of this last stage of this study is that implementation/local adoption is often overlooked as a desired outcome of a transportation study. A study typically ends with the delivery of the final product. Due largely in part to the relationship developed between local officials and VDOT during this study, the study team continued to work in the “sales” of this plan, well after contract completion.

ACKNOWLEDGEMENTS:

This study was sponsored by the Virginia Department of Transportation using federal State Planning Research (SPR) funds.