

2. DATA COLLECTION

Collection of documentation and existing data for this study began in July 2002 and included current planning reports and related documents, as-built plans, crash data, the existing regional transportation model, and existing traffic counts. Collection of new traffic data began in August 2002 and included tube counts, turning movement counts, photography, and videotaping. The data collection task also included development of base mapping for the study area through digital aerial photography.

2.1 References and Existing Documentation

To establish a solid basis and a clear approach for this study, Kimley-Horn made use of current policies, manuals, and other references and obtained documentation related to existing and historical conditions for the I-95 corridor and associated roadways within the larger (regional) study area.

2.1.1 References

Transportation policies, manuals, and guidelines with respect to planning and design not only provided the foundation for the standards that were required for this study, but they also guided the development of recommended solutions that would meet the needs of the study corridor. These references included:

- *AASHTO Policy on the Geometric Design of Highways and Streets*
- *Highway Capacity Manual*
- *VDOT Road Design Manual*
- Other transportation planning and engineering references

A complete list of the references used in this study is included in **Appendix A** of this report.

2.1.2 Existing Documentation

Documents were collected from a variety of sources, including VDOT, Hanover County, the Town of Ashland, the RRPDC, FHWA, and Kings Dominion. In addition, Kimley-Horn conducted an in-house review of traffic studies within the study area performed during the previous four years. The documents provided insight into regional transportation goals and issues, as well as planned and programmed transportation projects. The documents included:

- Hanover County Comprehensive Plans (1998 and 2003 publications), including the current Land Use Plan and Major Thoroughfare Plan
- Town of Ashland Comprehensive Plan (2002), including the current Land Use Plan
- Ashland 2020 Transportation Plan
- 2023 Richmond Area Long Range Transportation Plan (LRTP)
- Reports and memos from RRPDC
- Guidelines from FHWA
- Traffic studies by various consultants for the corridor, surrounding roadways, and land development projects

- Land use studies for rezoning cases, conditional use permits, special exceptions, etc. in Hanover County
- Previous interchange studies for the Lewistown Road and Kings Dominion interchanges

A detailed list of the existing documentation reviewed for this study is included in **Appendix B** of this report.

2.2 Existing Data

The early identification of existing information formed a basis for the analysis of the corridor and helped the team identify additional data and other information needed to be collected in the field by the study team. This existing data included:

- Roadway plans for previous, ongoing, and planned projects, from VDOT, Hanover County, the Town of Ashland, and Kings Dominion
- Existing traffic counts, including counts from VDOT and the RRPDC
- Crash data, including the exact locations of accidents with the type of accident noted, from VDOT, Hanover County, and Town of Ashland sources
- The current MINUTP Richmond Regional MPO Travel Demand Model, with horizon year of 2023, from VDOT
- GIS mapping and aerial photography on CD from VDOT

2.2.1 Roadway Plans

Roadway plans collected and reviewed included:

- As-built plans for I-95 in the study area, dating from the late 1950's to the 1980's
- Proposed improvements for Lewistown Road, Lakeridge Parkway, and Ashcake Road in the vicinity of the I-95/Route 802 interchange
- Proposed improvements for the Route 54/Hill Carter Parkway intersection (approximately 400 feet west of the existing Carter Road intersection on Route 54)
- Draft roadway and parking lot concepts for Kings Dominion

For the study area, these plans proved to be useful in identifying existing geometric deficiencies, understanding the future roadway network in the study area, and developing interchange concepts. The information from these plans supplemented the base mapping developed for this study, as described in Section 2.4 below.

2.2.2 Crash Data

VDOT TMPD provided data related to crashes within the study area. TMPD, in close coordination with the Virginia State Police and police and sheriff's departments throughout Virginia, maintains a graphical information system (GIS) database of crashes. For this study, the information provided included three years of crash data history, from January 1, 1999 through December 31, 2001, for the I-95 mainline and for Route 802, Route 54, and Route 30 in the vicinity of the I-95 interchanges.

2.2.3 MINUTP Model

The study team also obtained the current regional MINUTP transportation model from VDOT. Termed the Richmond/Tri-Cities Regional Highway Network, the model contains current MINUTP files for running MINUTP assignment. The base year of the model is 1998, and the horizon year is 2023. At the time of this study, this model was the one currently adopted by the MPO, and it includes relevant socioeconomic data and roadway projects depicted in and adopted in Comprehensive Plans from towns, cities, and counties throughout the Richmond area. An update of this model, with a horizon year of 2026, is due to be completed in September 2003.

As discussed in Section 3 (Analysis and Findings) of this report, the MINUTP model was used to assist in deriving estimated traffic volumes for year 2025, the future year condition of this study. It is important to note that the model contains socioeconomic data based on assumptions developed in 1998. This study examined those assumptions, and through close coordination with VDOT and the study's TAC, the study team updated those assumptions based on data and information gathered during the course of this study. The result was an updated set of future year traffic volumes used in the analysis.

2.2.4 Existing Traffic Data

Existing traffic data collected for this study included counts from VDOT's automated traffic recording stations on the I-95 mainline. Traffic data was also available from the published reports described in Section 2.1 above and listed in **Appendix B**.

For the I-95 mainline, northbound and southbound traffic volumes were obtained in 15-minute intervals from the permanent VDOT 24-hour count station located at the southern end of the study area, between Route 802 (Lewistown Road) and Route 656 (Sliding Hill Road). From the permanent count station, 7-day data sets were compiled for the following 3 periods:

- May 13-19, 2002
- August 12-18, 2002
- September 30-October 6, 2002

These periods were chosen so that comparisons could be drawn between non-summer traffic conditions with Kings Dominion in operation (May 13-19, 2002), summer traffic conditions with Kings Dominion in operation (August 12-18, 2002), and non-summer traffic conditions with Kings Dominion closed (September 30–October 6, 2002). A summary of these counts is included in **Appendix C**.

2.3 Field Data Collection

While existing documentation and data provided a good foundation for the baseline conditions, current traffic volumes and conditions needed to be verified. As part of the data collection effort of this study, additional traffic counts and field observations were necessary to effectively analyze existing conditions and to complete the derivation of traffic volumes for all segments within the study area for the current year (2002). In addition to data from published sources, data collected from the field included:

- Daily traffic counts
- Peak hour turning movement counts
- Photographic inventory of the corridors within the study area
- Video inventory of the corridors within the study area

The collection of traffic information was conducted from August to November 2002. Photos and videos were taken during visits to the study area throughout the course of the project. This collection effort resulted in a data set that the study team and the TAC could rely on in formulating responsive solutions.

2.3.1 Daily Traffic Counts

To gather information on average daily traffic (ADT) volumes for the study area, tube counts were conducted by Kimley-Horn and O.R. George & Associates. Tubes were placed on interchange ramps, arterials, and collector streets. With respect to traffic counts on the I-95 mainline, VDOT provided daily traffic counts as described in Section 2.2.4 above.

ADT counts were conducted over a period of three days (72 hours) to capture travel characteristics on different days and to estimate daily traffic volumes on roadways throughout the study area. Weekday counts were conducted on ramps and roadways in the vicinity of the Route 802 and Route 54 interchanges. Weekend counts were conducted for the Kings Dominion interchange ramps and Route 30. The locations of all ADT counts are listed below:

Interchanges

- I-95 / Route 802 Interchange (Exit 89) – Weekday
 - Northbound I-95 off-ramp approach
 - Northbound I-95 off-ramp left-turn movement to westbound Lewistown Road
 - Northbound I-95 on-ramp
 - Southbound I-95 off-ramp approach
 - Southbound I-95 off-ramp left-turn movement to eastbound Lewistown Road
 - Southbound I-95 on-ramp
- I-95 / Route 54 Interchange (Exit 92) – Weekday
 - Northbound I-95 off-ramp right-turn movement to eastbound Route 54
 - Northbound I-95 off-ramp (loop) to westbound Route 54
 - Northbound I-95 on-ramp from westbound Route 54
 - Northbound I-95 on-ramp (all vehicles)
 - Southbound I-95 off-ramp left-turn movement to eastbound Route 54
 - Southbound I-95 off-ramp right-turn movement to westbound Route 54
 - Southbound I-95 on-ramp from eastbound Route 54
 - Southbound I-95 on-ramp from westbound Route 54
- I-95 / Route 30 Interchange (Exit 98) – Summer weekend
 - Northbound I-95 off-ramp to Route 30
 - Northbound I-95 on-ramp from Route 30
 - Southbound I-95 off-ramp to Route 30
 - Flyover ramp to Kings Dominion west parking lot (bi-directional)

- Southbound I-95 on-ramp from Kings Dominion west parking lot (prior to the merge with the southbound ramp from Route 30)
- Southbound I-95 on-ramp from eastbound Route 30 (prior to the merge with the southbound ramp from Kings Dominion west parking lot)
- Southbound I-95 on-ramp (loop) from westbound Route 30

Arterials and Collectors

- Air Park Road – Weekday, bi-directional
 - South of Lewistown Road
 - North of Patterson Park Road
- Route 54 – Weekday, bi-directional
 - East of Cottage Green Drive, west of Carter Road
 - West of Cottage Green Drive, east of U.S. Route 1
- Route 30 (Kings Dominion Blvd) – Summer weekend, bi-directional
 - East of I-95, west of Theme Park Way
 - On the overpass crossing I-95
 - East of U.S. Route 1, west of I-95
- U.S. Route 1 – Weekday and weekend, bi-directional
 - North of Route 30, south of Doswell Road (Route 688)
 - North of Route 54, south of College Avenue
 - South of Route 54, north of Myrtle Street
 - South of Lewistown Road, north of Old Telegraph Road

2.3.2 Turning Movement Counts

To supplement turning movement counts (TMC's) from recently published data sources, a number of additional TMC's were conducted from August through November 2002 by Kimley-Horn and Associates and O.R. George & Associates. These TMC's were conducted at following intersections:

- Route 802 / U.S. Route 1 – Weekday
- Route 802 / Ashcake Road – Weekday
- Route 54 / U.S. Route 1 – Weekday
- Route 30 / U.S. Route 1 – Weekday and Saturday
- Route 30 / I-95 southbound ramps – Saturday
- Route 30 / I-95 northbound ramps – Saturday

The 72-hour ADT counts were used to identify the weekday and weekend peak periods at specific locations in the study area. Weekday AM and PM peak periods were typically 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM, respectively. The weekend peak period at Kings Dominion was found to be 9:00 AM to 12 Noon.

It is important to note that the data collected in the field, combined with counts for the I-95 mainline (provided by VDOT) and data from recent studies, allowed the study team to obtain a thorough understanding of the existing traffic conditions for the entire project area. These

current traffic conditions and the projection of future conditions are described in Section 3 of this report.

The data from both the ADT counts and the TMC's were provided during the study process to VDOT TMPD and the TAC members in the form of a technical memorandum and appendices.

2.3.3 Photographic Inventory

A study area photo inventory of the roadway network was completed in April 2003. Pictures were taken at locations along I-95, Route 30 (Kings Dominion Boulevard), Route 54 (England Street), and Route 802 (Lewistown Road). Photos included in the inventory placed emphasis on the following:

- Existing laneage
- Roadway signage
- Roadway features (shoulders, horizontal and vertical bridge clearances, guardrails, intersections, etc.) including any features deficient by today's standards
- Potential sight distance issues and other safety concerns



The photos were used to assist in the analysis and in developing concepts for roadway and interchange improvements. Representative photos are included in Section 3 of this report.

2.3.4 Video Inventory

Stationary and mobile videotape records were made within the project study area to document existing conditions. Looking north and south from the Route 30 (Kings Dominion Boulevard) interchange, stationary videotape records were captured on Saturday August 24, 2002, from 9 am to 12 pm. This stationary video coverage coincided with the weekend peak period in this location. A summary of the findings from these stationary video observations is included in Section 3 of this report.

In addition to stationary video, mobile video was captured in April 2003 along the I-95 mainline, at ramps, Route 30, Route 54, and Route 802. Video images were captured continuously on these facilities to provide a record of existing conditions in the study area and to assist in the analysis and development of conceptual solutions.

2.4 Photogrammetric Base Mapping

In preparation for developing alternatives and outlining concepts for long-term improvements, Kimley-Horn researched the availability of existing aerial photography and digital mapping for the study area. In addition to as-built plans, mapping information received from VDOT included digital aerial photography as part of a GIS database. However, the pixel size of this photography was approximately 20 feet, which proved to be too large for the

purposes of this study. Other existing mapping was available from Hanover County in the form of a GIS centerline file, but this data did not prove to be useful for conceptualizing roadway designs.

Through coordination with VDOT, Hanover County, and the Town of Ashland, it was agreed that new photogrammetric (digital aerial) base mapping for the study area was needed to meet the goals and objectives of this study. Such mapping was needed for:

- Developing realistic conceptual solutions for the interchanges within the study area, including horizontal and vertical considerations to ensure feasibility
- Integration into modeling software to analyze existing and future traffic conditions on current geometry and on proposed concept geometry
- Presenting possible solutions in a graphical representation that builds consensus for the results of the study
- Developing a high-quality final report, readily useable for public presentations by TAC members and other stakeholders of the study

To provide the base mapping, Air Survey Corporation (ASC), a VDOT-certified aerial survey company, flew the study area on February 14, 2002 and compiled a digital aerial photo base map. Using a fully calibrated RC-30 precision mapping camera mounted in a twin-engine aircraft, two flight lines were flown to cover the entire I-95 corridor from the I-295 interchange to the Caroline County line, including the parallel section of U.S. Route 1. Color aerial photography was obtained at a nominal negative scale of 1 inch = 1,200 feet.

Following the flight of the study area, the aerial photography was geo-referenced, i.e., tied to the geodetic state plane by ASC through a ground survey of approximately 16 control points. The resulting geo-referenced aerial photography was then compiled at a scale of 1 inch = 200 feet, with planimetric features for roadway edges of pavement. Roads and bridges were horizontally and vertically located within the study area. Trees, streams, houses, and other structures were also identified. With the aerial photography geo-referenced and ortho-rectified, ASC provided a MicroStation compatible file of planimetric data, a complete set of color contact prints, and a MrSID (Multi-resolution Seamless Image Database) format image file of the color photography at one-foot per pixel resolution.

Thus, through this study, VDOT has obtained digital plan vector data in Microstation format and a digital geographically referenced *.tif file having a pixel width of 2 feet. Note that the mapping complies with National Map Accuracy Standards as outlined in the "Reference Guide Outline Specifications for Aerial Surveys and Mapping," published by the U.S. Department of Transportation. Note also that this mapping can be used for further study of improvement projects, including any environmental and location studies to be undertaken by VDOT or other agencies. More precise mapping would be necessary to develop roadway and bridge construction plans.

The photogrammetric mapping proved to be an excellent tool for both analysis and display of alternative concepts. Using the base mapping, correct dimensions of lane widths, lengths of weaving areas, acceleration/deceleration lanes, tapers, ramps, etc. were conveyed on the Preliminary Solutions, Alternative Concepts, and Preferred Concepts (discussed in Section 4 of this report). The base mapping also provided a basis to build a digital network that could be incorporated for display into the CORSIM (traffic operations modeling) environment. The mapping helped ensure geometric and geographic accuracy in the CORSIM operational analysis.