HAM-75 LINN ST TO HOPPLE ST & WESTERN HILLS VIADUCT INTERCHANGE
PID 114161 & 113361

CERTIFIED TRAFFIC REPORT

JUNE 2021

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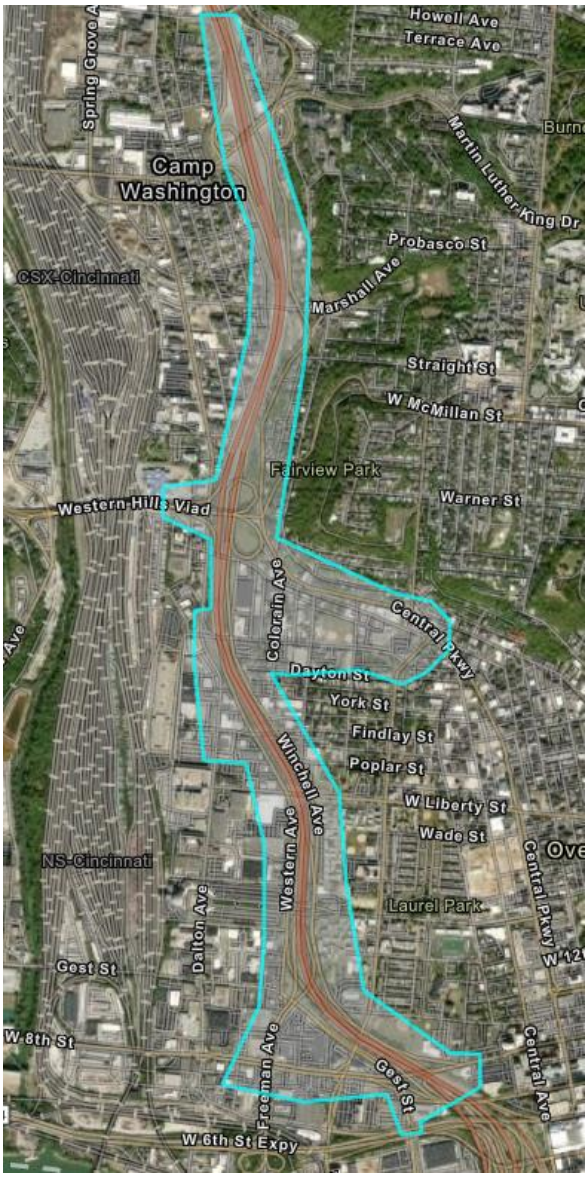
1. INTRODUCTION

Certified traffic is requested for PID 114161 and PID 113361 in Cincinnati. The combined study area for these two projects covers I-75 from Hopple Street on the northern limits to Linn Street at the southern limits with 25 adjacent arterial intersections. This study area includes the Western Hills Viaduct (WHV) Interchange, which has forecasts developed for three alternative configurations. The future configuration of the study area includes the Alternative I Brent Spence Bridge design as evaluated in the Environmental Assessment. The main roadway access changes to the project corridor occur at the WHV Interchange, the I-75 ramps near Ezzard Charles, and access removal of Linn Street and Gest Street intersection. The remaining project locations maintain existing geometric configuration. The project study limits are mapped in Figure 1.

Figure 1: Project Study Limits



The certified traffic forecasts use 2021 base year traffic counts with an opening year forecast of 2028 and design year of 2048. The forecasts rely on the Ohio-Kentucky-Indiana Regional Council of Governments (OKI) travel demand model with a base year 2015 and horizon year of 2050. This technical memorandum provides detail on the project extents, forecasting inputs, forecasting methodology, and the final certified traffic plates.

2. PROJECT DESCRIPTION

The certified traffic request is for two projects PID 114161 and PID 113361. The description for these projects as determined in the early coordination meeting notes is listed below.

PID 114161

Reconstruction of I-75 from Findlay St. to just south of Marshall Ave. This is the northern end of the Brent Spence Bridge Corridor Project. Project includes the construction of a new interchange on I-75 to connect to the new Western Hills Viaduct (WHV). The WHV project is being developed by the City of Cincinnati.

PID 113361

Reconstruct and widen I-75 from just north of the Linn St. overpass to the northern limits of the bridge over Findlay St. Replace the Linn St. overpass with I-75 and reconstruct Gest Street from Freeman Avenue to US 50. The reconstruction of Gest Street will eliminate the roadway connection from Gest St. to Linn St. The pedestrian access from Gest to Linn St. shall be replaced. Replace the Ezzard Charles Drive overpass over I-75, reconstruct portions of Western Ave., cul-de-sac West Court St., and construct new I-75 ramps to and from Freeman Ave., Western Ave., and Ninth St.

The forecast for these two projects covers the I-75 mainline from Hopple Street on the northern limits to Linn Street at the southern limits with 25 adjacent arterial intersections.

There are 3 build options evaluated for the WHV Interchange, these options are variations of the original Alternative I evaluated for the Brent Spence Bridge project.

a) Option 1: Preferred Alt I (connections to Harrison Ave and Spring Grove Ave)
b) Option 2: Preferred Alt I with no connections to Harrison Ave and Spring Grove Ave
c) Option 3: Preferred Alt I with 2-way connection at Harrison Ave

The Western Hills Viaduct design options and the preliminary design concept for PID 113361 are shown in **Appendix C-1.**

There is no development information associated with this forecast. The traffic growth are based on the OKI travel demand model. The travel demand model was calibrated as part of the BSB project using a base year 2015 and Horizon year 2045. As part of a follow-up study completed by HNTB in 2019, the OKI model was extrapolated to 2050 using preliminary demographic data, these 2050 traffic assignment are used for the 2028 and 2048 traffic projections presented in this report. Additional growth rate considerations include a target minimum growth rate of 0.45% per year recommended by OKI based on the current 2020 calibrated demand model.

3. FORECAST PARAMETERS

The forecast limits include the I-75 mainline and ramps between Linn Street and Hopple Street. The weave forecast is provided for I-75 NB between WHV Interchange and Hopple street Interchange. There are 25 intersection forecasted, which include:

- Spring Grove & Harrison
- Spring Grove & Bank
- Dalton & Findlay
- Western & Gest
- Western & Findlay
- Western & Liberty
- Western & Ezzard Charles Dr.
- Western & Ezzard Charles Dr.
- Freeman Ave/Ramps & Gest
- Linn & 8th
- Linn St & Gest (intersection removed in build alternative)
- Gest & US50
- Winchell & Harrison
- Winchell & Bank
- Winchell & Findley
- Winchell & Liberty
- Winchell & Ezzard Charles Dr.
- Winchell & Ezzard Charles Dr.
- Central Pkwy & Western Hills Viaduct
- Linn & Court
- Patterson & Harrison
- Mound & 8th
- Colerain & Central
- Brighton & Central Pkwy
- Brighton & Central Ave
- Linn & Central Pkwy
- Linn & Bank

The forecasts include the opening year 2028 and design year 2048 for the study limits. Three sets of forecasts are developed for the study area to cover the WHV Interchange options. The certified traffic plates include AADT, AM DHV, PM DHV for opening year and design year of the 3 Build alternatives. The design hour truck % (TD) and 24-hour truck (T24) are also compiled in the traffic plates for each alternative. The truck factors reflect the truck percentages obtained with the year 2021 traffic counts and which are shown in the traffic adjuster spreadsheets.

4. OTHER STUDIES

Forecasts from other studies are not directly referenced by this project. Although the travel demand model was calibrated for the Brent Spence Bridge project and includes the Alternative I design, but all traffic counts and the forecasting methodology are independent from the previous study.

5. DATA SOURCES

The traffic counts were collected in 2021. Traffic counts from 2018 are used as a reference to measure impacts of COVID-19 pandemic and to fill in data gaps that were not covered by the 2021 counts. The turning movement traffic counts are listed in **Appendix C-2** and short term link counts are listed in **Appendix C-3.**

The study area land use assumptions rely on the OKI travel demand model. The version of the model is based on the BSB project model that has a calibration year of 2015. The model was altered by HNTB in 2019 to incorporate preliminary 2050 socioeconomic data provided by OKI. This model was reviewed and accepted by ODOT Forecasting and Modeling group for application on this project. The model network is coded to include the Brent Spence Bridge Alternative I with the three alternative options at the WHV Interchange. See **Appendix B-2** for more details on the traffic model used for the forecasting. Screen captures of the traffic assignments are provided in **Appendix C-4** (Daily Existing 2015 model), **Appendix C-5** (Daily 2050 Alternative 1), **Appendix C-6** (Daily 2050 Alternative 2), **Appendix C-7** (Daily 2050 Alternative 3), and **Appendix C-8** (Peak Period travel demand at WHV for build alternatives).

In addition, to the above stated travel demand model version, the project team sought feedback from OKI on a recommended minimum growth rate based on the current 2020 base year OKI model. OKI conducted a query of the project corridor on I-75 from Martin Luther King Drive to W Liberty Street for years 2030 to 2050 and found a typical growth rate of 0.6%. From this information they recommended a minimum growth rate target for the project corridor of 0.45%. This minimum growth rate is applied as a target minimum were applicable. Exceptions occur from base year counts to opening year 2028 where there are volume reductions based on access changes, however, the growth from 2028 to 2050 does follow the recommended minimum rate.

6. EXISTING TRAFFIC VOLUME

The existing traffic volumes represent the year 2021. The balanced AADT and unbalanced peak hour traffic counts are in the Appendix of the Count Evaluation memorandum (**Appendix B-1).** The count evaluation memorandum details the methodology for adjusting the traffic counts to 2021 AADT. This includes a discussion on COVID-19 factoring, expansion factors for turning movement counts, procedures for identifying count outliers, and an overview of the project design hour volume development factors.

7. DESIGN TRAFFIC VOLUMES

The design traffic volumes are developed using the NCHRP 255/765 forecasting approach with 2021 traffic counts, 2015 existing travel demand model, and 2050 build travel demand model for each alternative. ODOT's adjuster spreadsheets are used to calculate forecast targets for each of the build alternatives. The smoothing and balancing of the traffic volumes

is completed outside the adjuster spreadsheet using a network-based analysis to minimize the difference between the balanced volumes and the target volumes. This balancing process also accounts for a target minimum growth rate of 0.45% per year recommended by OKI. The section below details the input assumptions for the adjuster spreadsheet and the balancing methodology. The key factors and constraints applied in the adjuster spreadsheets include:

- 0.45%/year linear compounded growth rate minimum applied in the NCHRP255_link sheet
- 1.16 design hour factor for AM and PM counts. This factor is applied globally for all counts except for the NB I-75 mainline which uses a proxy K-factor that results in a design hour factor of 1.49. The 1.16 design hour factor is standardized for this project based on the review of the 2019 ODOT peak hour to design hour factors for urban interstates and urban arterials.

7.1 INTERSECTION FORECASTING PROCESS AND ASSUMPTIONS

The adjuster spreadsheet is setup for every intersection in the project corridor for each of the three alternatives. Within the spreadsheet, the *NCHRP255_link*, *PM_turns*, *AM_Turns*, and *24_turns* sheets are populated. Methodology and assumptions for each of the 4 sheets are listed in the section below.

NCHRP255_link

This sheet holds the daily link forecasting data, which includes: 2021 balanced AADT traffic counts, 2015 existing daily model, and 2050 build daily model. The growth rates are calculated using the NCHRP 255/765 process as prescribed by ODOT's forecasting manual. The resultant growth rates for each link is checked against a minimum growth rate of 0.45%/year. If the resultant growth rate from the NCHRP 255/765 equations is below this threshold the equations in columns AO and AP are highlighted in yellow and the equation is changed to be a compounded linear growth rate equation using the count data and a growth rate of 0.45% per year. There is one exception to the rule, Mound Road & 8th Street intersection, which is expected to have a traffic reduction due to access changes on NB I-75. High growth rates (above 3% per year) were reviewed, but no manual adjustments were made for the project intersections.

24_turns

The growth rates calculated from NCHRP255_link sheets are carried to the 24_turns sheet. Existing 2021 AADT (auto and trucks) by turn movements are entered into the sheets. No turn model volumes were used for this project. The volume balancer, as set by ODOT in the spreadsheet, is used to converge the turn volumes to the forecasted link volumes. No link volume forcing is used in these sheets. The resultant 2028 and 2048 daily volumes are used as forecast targets in the balancing and smoothing methodology outside the adjuster spreadsheet. Volumes are not carried back into the spreadsheet after balancing, instead a summary table is provided to compare the target volumes for each turn movement and the resultant balanced volumes as a reasonableness check (**Appendix C-9**).

PM_turns

The PM peak is identified as the design peak hour. The growth rates calculated from NCHRP255_link sheets are carried to the PM_turns sheet. The unbalanced peak hour turn counts are entered into the sheets for passenger vehicles and trucks. The intersection adjuster spreadsheet uses a peak hour to design hour factor of 1.16 as identified from ODOT's 2019 tables and presented in the count evaluation memo. The DHV factor is entered directly into column N of the spreadsheet. The rest of the forecasting process follows the procedure outlined for the daily turn forecasts.

AM_turns

AM_turns sheet follows the same procedure as the PM, except the DHV factor of 1.16 is carried over from the PM_turns sheet.

7.2 RAMP AND MAINLINE FORECASTS

The ramp and mainline forecasts are also calculated using the adjuster spreadsheet, with the same DHV methodology as described for the intersections, which use the 1.16 design hour factor. The one exception is the freeway mainline ATR count location at Findley Street, which uses the proxy K-factor method. This location has an identified 30th hour K and D factor. The DHV factor for this site is calculated to be 1.49.

The ramp and mainline forecast targets are combined with the intersection forecast targets in the balancing and smoothing process. The balanced volume is not reported in the adjuster spreadsheet.

The weave volume for NB I-75 between WHV and Hopple Street Interchange is computed using ODOT's weave analysis spreadsheets. The input and output data from this analysis are summarized in **Appendix C-11.** Both the travel demand model and Streetlight data were considered for input into the weave analysis. Streetlight was determined as the best dataset. Based on the travel demand modeling, the weave volume is anticipated to be very similar between the three alternatives, and is therefore is forecasted to be equal for all three alternatives.

7.3 FORECAST BALANCING AND SMOOTHING

All the forecast targets developed with the adjuster spreadsheets are compiled in one database to complete a network wide balancing procedure. The procedure uses a non-linear regression analysis to minimize the difference between the target forecasts and the balance forecasts. The result from the process is then manually reviewed and adjusted to best conform with forecast targets, minimum growth rate of 0.45% per year, desired K-factors, as well as to conform with high level trends observed from the travel demand modeling. Consistency checks are performed on all the forecasted volumes to ensure that the future year volumes are greater than existing year (unless directly impacted by an access change), and the difference between the alternatives are logical.

Most of the ramp, mainline, and intersection volumes are consistent between the 3 alternatives. The exceptions are the intersections along Harrison Avenue, Central Parkway, Spring Grove Road, and Western Hills Viaduct. The OKI travel demand models indicate some differences outside of this extent; however, given the level of precision of the model and other

considerations such as minimum growth rates, these volume differences are not carried into the forecasts. The main differences between the 3 forecasts are listed below, these differences are guided by the OKI travel demand model with interpretation applied by the project engineer.

1) Western Hills Viaduct Screenline- volumes are consistent along the WHV screenline west of I-75 for Alternative 1 and 3. Alternative 2 has some volume reductions due to loss of access.
2) Local rerouting on Central Parkway, Harrison Avenue, and Spring Grove. The volumes are adjusted on these roads based on placement of WHV connections.
3) NB I-75 entrance ramp volume at WHV – The total entrance ramp volume is consistent between the three alternatives. The only difference for this ramp is the additional access point in Alternative 3 from Harrison Avenue. This additional access reduces the volume entering the CD road north of Liberty.

In addition to the WHV alternatives, all alternatives account for the I-75 mainline and ramp changes near Ezzard Charles and the removal of the Linn Street and Gest Street intersection. The most notable impact of the I-75 ramp changes occurs for NB I-75 with the removal of the entrance ramp from 9th Street. The travel demand model indicates a large decrease in volume from 9th Street to Winchell Avenue based on this access change. This movement is one of the few locations forecasted to have lower volumes than the existing counts. For Linn Street and Gest Street intersection, the travel demand model was coded with this intersection intact. An adjuster spreadsheet was setup to forecast the intersection movements. The forecasted volume was than rerouted locally to account for the removal of the intersection traffic.

One other noteworthy location is the SB I-75 entrance ramp from Western Avenue (south of Ezzard Charles). This ramp is modeled and forecasted based on the future connections to I-75 as planned with the Brent Spence Bridge corridor Alternative I. The design for PID 113361 has this ramp terminating at 7th Street although the forecast assumes additional access points downstream. This discrepancy should be considered when applying the forecasted volumes as the ramp without the additional connection would be lower than forecasted.

A comparison of the forecast target (as found in the adjuster spreadsheet) and the final balanced volumes are summarized in table form in Appendix C-9.The unsmoothed traffic forecasts can be viewed in diagram form in the adjuster spreadsheets found within the project files.

7.4 DESIGN TRUCK FACTORS

Design truck factors are developed for each of the three build alternatives. The truck factors are based on existing turn movement counts and short term link counts. The design factors are calculated within the adjuster spreadsheet and reported on traffic plates. The truck factors are established for unique roadway links in the study limits. Turn movement design truck factors are not reported, however, turn movement truck volumes are summarized in the adjuster spreadsheet and available within the count files if desired to be used for operational analysis.

7.5 CERTIFIED TRAFFIC PLATES

Certified traffic plates are developed for the 3 Build alternatives. The traffic forecasts are the same for areas outside of the Western Hills Viaduct Interchange influence area. The traffic plates are in **Appendix A,** and are organized in the following sub appendices:

- Appendix A-1: Daily Build Alternative 1 (2028 & 2048)
- Appendix A-2: AM DHV Build Alternative 1 (2028 & 2048)
- Appendix A-3: PM DHV Build Alternative 1 (2028 & 2048)
- Appendix A-4: Truck Factors – Build Alternative 1 (T24/ AM TD/ PM TD)
- Appendix A-5: Daily Build Alternative 2 (2028 & 2048)
- Appendix A-6: AM DHV Build Alternative 2 (2028 & 2048)
- Appendix A-7: PM DHV Build Alternative 2 (2028 & 2048)
- Appendix A-8: Truck Factors – Build Alternative 2 (T24/ AM TD/ PM TD)
- Appendix A-9: Daily Build Alternative 3 (2028 & 2048)
- Appendix A-10: AM DHV Build Alternative 3 (2028 & 2048)
- Appendix A-11: PM DHV Build Alternative 3 (2028 & 2048)
- Appendix A-12: Truck Factors – Build Alternative 3 (T24/ AM TD/ PM TD)