Alternatives Analysis Report, Volume 1: Master Planning Summary

SR 0030-A10 Corridor Improvements
ECMS #E03289

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Contents

Executive Summary **1**

Introduction **1**

Methodology **2**

Project Background 2

Technical Approach 3

Preliminary Alternatives **10**

Concept Brainstorming 10

Screening-Level Assessments 11

Detailed Alternatives **13**

Corridor-Wide Assumptions 13

Intersection-Level Alternative Combinations 15

Detailed Alternatives Analysis 19

Preliminary Proposed Alternative **21**

Preliminary Proposed Alternative Development 21

Preliminary Proposed Alternative Analysis 24

Preliminary Proposed Alternative Refinement 25

Summary and Next Steps **27**

Future Design Implications 27

Corridor Segmentation and Schedule 28

Preliminary Engineering 29

References **30**

Supporting Technical Volumes

(under separate cover)

Traffic Analysis Details .... **Volume 2**

Safety Analysis Details .... **Volume 3**

Benefit-Cost Details .... **Volume 4**

LIST OF EXHIBITS

Exhibit ES-1: Preliminary Proposed Alternative Concept Map ES-1
Exhibit 1: Route 30 Projects Corridor Limits 1
Exhibit 2: Baseline Pavement Condition Ratings 3
Exhibit 3: Highway/Traffic Classification and Design Volume Summary 4
Exhibit 4: Highway Design Criteria 4
Exhibit 5: 2045 No-Build Traffic Operational Deficiencies 5
Exhibit 6: Observed Annual Crash Frequencies (1997-2016) 6
Exhibit 7: Sample Preliminary Environmental Constraints Mapping 7
Exhibit 8: Preliminary Alternative Sub-Areas 10
Exhibit 9: Preliminary Corridor/Project Segmentation and Intersection Focal Points 12
Exhibit 10: Route 30 Typical Section – Existing Four-Lane Undivided 14
Exhibit 11: Route 30 Typical Section – Four-Lane Divided Option for Detailed Alternative 1 14
Exhibit 12: Route 30 Typical Section – Five-Lane Option for Detailed Alternatives 2 and 3 15
Exhibit 13: Detailed Alternative Combinations 17
Exhibit 14: Jughandle Intersection Examples 18
Exhibit 15: Preliminary Interest Areas for Improved Connections 18
Exhibit 16: Detailed Alternatives Analysis Summary (from Opening Year through 2045) 20
Exhibit 17: Preliminary Proposed Alternative Intersection-Level Improvements 21
Exhibit 18: Preliminary Proposed Alternative Concept Map 22
Exhibit 19: Preliminary Proposed Alternative Access/Jughandle Map 23
Exhibit 20: Preliminary Proposed Alternative Analysis Summary (from Opening Year through 2045) 24
Exhibit 21: Preliminary Corridor/Project Segments 28
Exhibit 22: Preliminary Project Schedule 28

LIST OF APPENDICES

Appendix A: Baseline Report Series .... *(electronic files attached)*

Appendix A1 – Historic Resource Survey Form........ 2016.04.25

Appendix A2 – Geophysical Management Survey 2016.04.25

Appendix A3 – Corridor Safety Study 2016.04.29

Appendix A4 – Traffic Report for Base and No-Build Conditions 2016.09.28

Appendix A5 – Traffic Model Calibration and Validation Report........ 2016.09.28

Appendix A6 – Highway Deficiency and Design Criteria Report 2017.01.10

Appendix A7 – Project Purpose and Needs Statement........ 2017.05.31

Appendix A8 – Preliminary Environment Constraints Mapping 2017.06.19

Appendix B: Preliminary (Screening-Level) Alternatives Evaluation Summary .... *(electronic files attached)*

Appendix C: Public/Stakeholder Outreach Summary .... *(electronic files attached)*

Executive Summary

Pennsylvania Department of Transportation (PennDOT) Districts 12-0 and 11-0 have advanced a corridor-wide master planning effort for State Route 0030 Section A10 (SR 0030-A10, US Route 30) through the alternatives development and evaluation phase. This effort falls under the broader *Route 30 Projects* program that focuses on planning, designing, and creating solutions for a six-mile stretch of US Route 30 that traverses North Huntingdon Township from the 10th Street intersection in Irwin Borough, Westmoreland County (PennDOT District 12-0) to State Route 48 in North Versailles Township, Allegheny County (PennDOT District 11-0).

Route 30 Projects
Purpose & Need Summary:

Modernize the US 30 corridor infrastructure, thereby improving the safety, mobility, and economic vitality of the corridor.

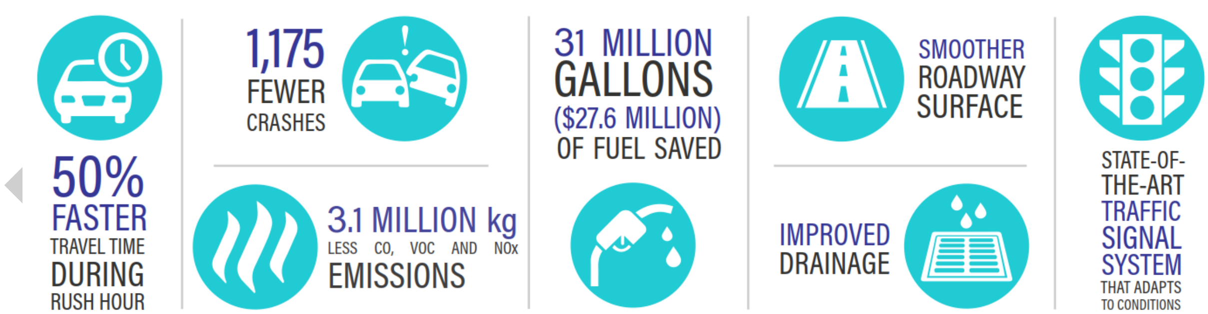
The Alternatives Analysis for the project considered safety, multimodal mobility, and travel time reliability to identify possible transportation solutions for modernizing the Route 30 corridor. Stakeholder and public input gathered from extensive outreach activities was combined with engineering evaluations of traffic operations, safety, and highway and drainage deficiencies to develop the project's purpose and need. In response to purpose and need, alternative evaluations considered 4-lane and 5-lane primary alternatives with 40 secondary (intersection-specific) alternatives in various combinations throughout the corridor.

The Preliminary Proposed Alternative was identified as a four-lane divided roadway with median barrier and jughandle turnarounds at key intersections (Exhibit ES-1). This configuration was determined to best meet the project's purpose and need while also providing substantial benefits that outweigh the capital costs and potential impacts of the overall project. The Preliminary Proposed Alternative (including safety and operations refinements based on agency, stakeholder, and public feedback) resulted in the highest Benefit-Cost Ratio (BCR) among the set of options considered. Key project benefits also include the following:

Route 30 Projects
Benefit-Cost Summary:

Total Monetized Benefits = $106.1M
Total Conceptual Costs = $100.4M

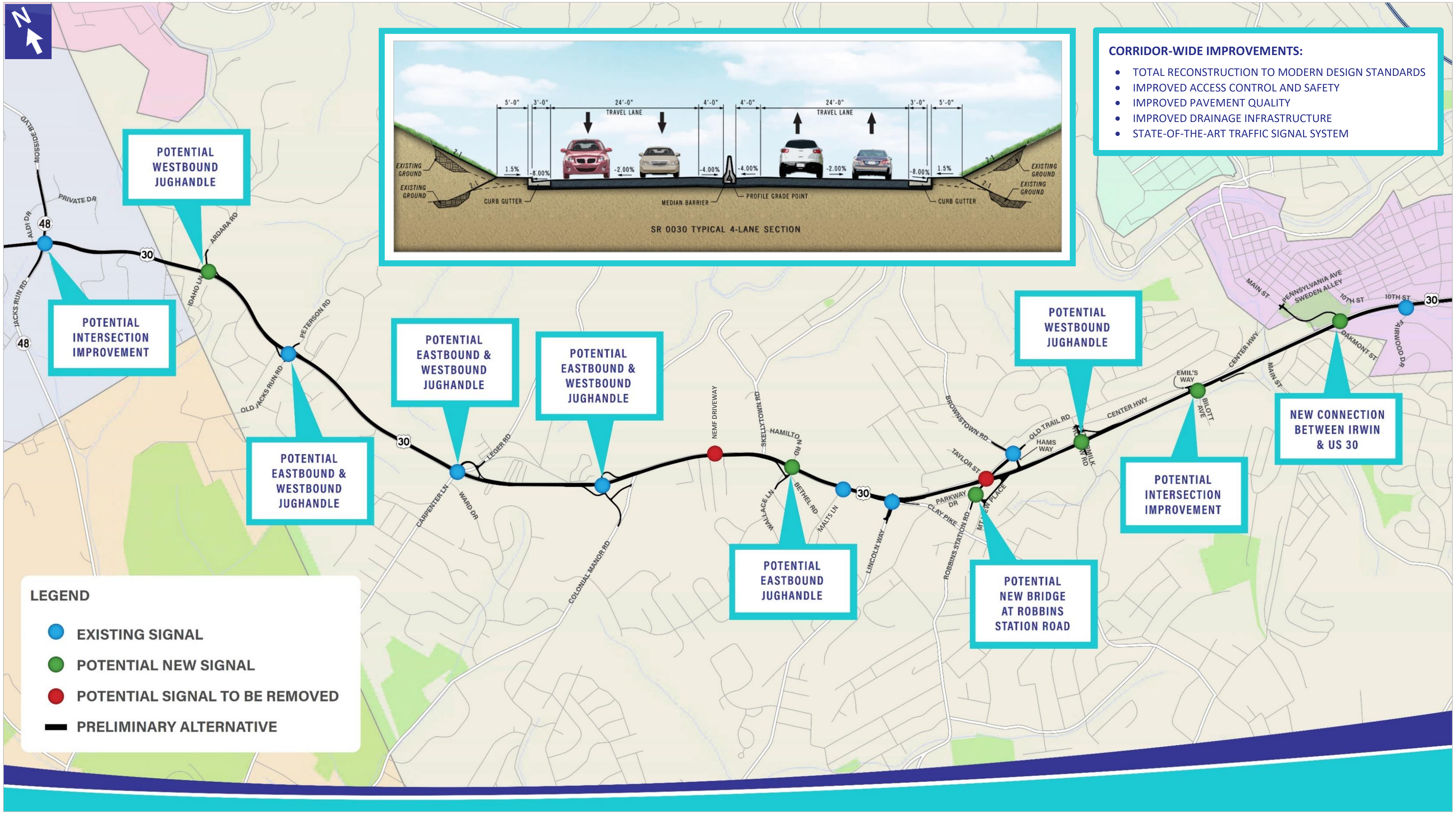
Overall Benefit-Cost Ratio = 1.06



As the Preliminary Proposed Alternative continues to advance through the project development process, the corridor/project will be divided into at least two segments for further study, design, and construction. Segment breakpoints are anticipated at the intersection of US 30 and Malts Lane. Subject to change pending future project funding levels and availability, the western segments are currently scheduled for design and construction through year 2022, while the eastern segments are scheduled through year 2024.

Next steps for the project will include preliminary engineering and refinement of the conceptual alignments in this Master Planning Summary to minimize property, environmental, and utility impacts. Preliminary Engineering will include ongoing outreach to stakeholders and the public. Updates will also be advertised on the project website at Route30projects.com.

Exhibit ES-1: Preliminary Proposed Alternative Concept Map



Introduction

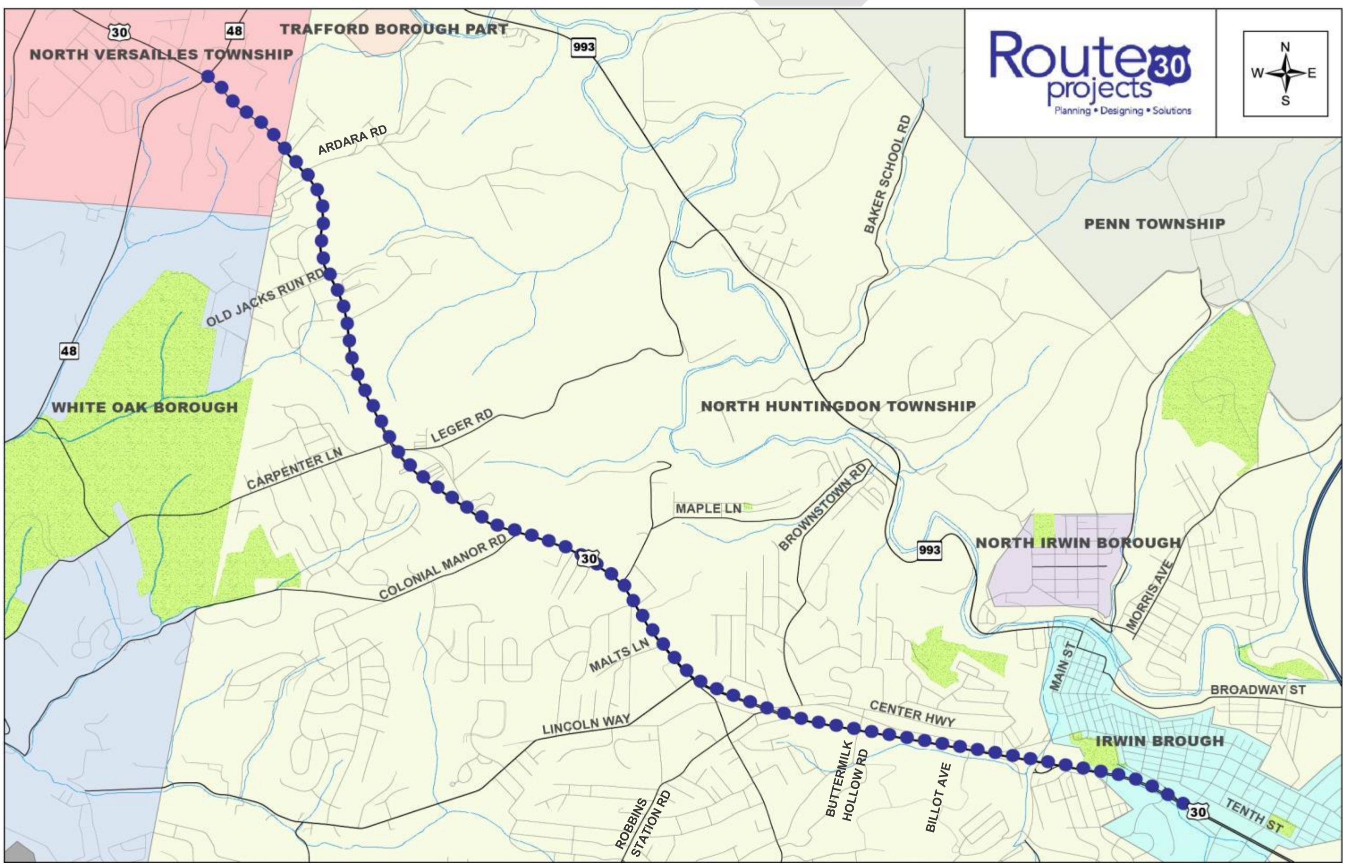
Pennsylvania Department of Transportation (PennDOT) Districts 12-0 and 11-0 have advanced a corridor-wide master planning effort for State Route 0030 Section A10 (SR 0030-A10, US Route 30) through the alternatives development and evaluation phase. This effort falls under the broader *Route 30 Projects* program that focuses on planning, designing, and creating solutions for a six-mile stretch of US Route 30 that traverses North Huntingdon Township from the 10th Street intersection in Irwin Borough, Westmoreland County (PennDOT District 12-0) to State Route 48 in North Versailles Township, Allegheny County (PennDOT District 11-0) (Exhibit 1).

Route 30 Projects
Alternatives Analysis Report Series:

Volume 1: Master Planning Summary
Volume 2: Traffic Analysis Details
Volume 3: Safety Analysis Details
Volume 4: Benefit-Cost Details

This report, specifically, is Volume 1 of the Alternatives Analysis Report series and serves as the master planning summary for the overall alternatives development and evaluation process, including findings through the selection of a proposed set of improvements for the end-to-end project corridor.

Exhibit 1: Route 30 Projects Corridor Limits



Methodology

Project Background

Development of the *Route 30 Projects* program commenced in late summer 2015. Initial efforts included background information gathering, data collection, field inventories, engineering analyses, and related efforts aimed at establishing and understanding the existing, or baseline, transportation and infrastructure conditions throughout the project corridor. Electronic reference copies of all relevant Baseline Reports are included in Appendix A.

Route 30 Projects Baseline Report Series (Appendix A):

2016.04.25 – Historic Resource Survey Form
2016.04.25 – Geophysical Management Survey
2016.04.29 – Corridor Safety Study
2016.09.28 – Traffic Report for Base and No-Build Conditions
2016.09.28 – Traffic Model Calibration and Validation Report
2017.01.10 – Highway Deficiency and Design Criteria Report
2017.05.31 – Project Purpose and Needs Statement
2017.06.19 – Preliminary Environmental Constraints Mapping

Technical data and analyses were also supplemented with agency, stakeholder, and public outreach to help inform the overall project insights and development of alternatives. Coordination efforts included input from a Project Advisory Committee made up of key agency, emergency services, municipal, county, and regional planning personnel; a broader stakeholders group that invited community business, civic, and freight leaders; and a series of open-house style public meetings coupled with web-based public survey opportunities.

Route 30 Projects Public/Stakeholder Outreach:

2015.09.08 – Project Advisory Committee Meeting 1
2016.02.05 – Project Stakeholder Meeting 1
2016.03.02 – Public Meeting 1 (plus 30-day Web Survey 1)
2016.06.27 – Utility Coordination Meeting 1
2017.08.22 – Project Advisory Committee Meeting 2
2017.08.31 – Project Stakeholder Meeting 2
2017.10.05 – Public Meeting 2 (plus 30-day Web Survey 2)

Route 30 Projects Purpose & Need Summary:

Modernize the US 30 corridor infrastructure, thereby improving the safety, mobility, and economic vitality of the corridor.

The baseline reports culminated in formal documentation and approval of a Project Purpose and Needs (P&N) Statement in accordance with PennDOT's *Publication 319 (Needs Study Handbook)*, which provides guidance consistent with Pennsylvania Act 120 of 1970, the National Environmental Policy Act (NEPA) of 1969, and the Federal Highway Administration's (FHWA) *Planning and Environmental Linkages* and *Linking Planning and NEPA* initiatives. [1] Purpose is an overarching statement as to why the project is being pursued and the objectives that will be met to address the transportation problems or deficiencies; while the project Needs are tangible fact-based problems that provide the foundation for the statement of Purpose.

With this background in place, the *Route 30 Projects* Alternatives Analysis phase subsequently focused on developing and evaluating improvement options that would support the established P&N. Specifically for the US 30 project corridor, which was initially constructed in 1937 and displayed facility deficiencies that did not meet current PennDOT design standards, efforts explored improvements to: (1) safety conditions for the traveling public; (2) operational deficiencies to enhance mobility; (3) facility and infrastructure deficiencies to provide a reliable and sustainable facility; and (4) community and economic development constraints.

Analysis, refinement, and selection of a preferred set of improvement alternatives as detailed throughout this report effectively closes out the first phase of the *Route 30 Projects* program. Moving forward, Phase 2 of the program will conduct preliminary design; Phase 3 will complete final design; and Phase 4 will construct the final project improvements. It is anticipated that the overall master plan will ultimately be implemented in stages or sections throughout the corridor based on final project priorities and funding availability.

Technical Approach

The overall development and evaluation of improvement alternatives for the *Route 30 Projects* program built onto the foundations of the various Baseline reports (see Appendix A). Efforts involved a broad variety of interdisciplinary perspectives coupled with a mixture of qualitative and quantitative technical approaches alongside agency, stakeholder, and public outreach and coordination. Collectively, these efforts informed the insights and findings documented throughout the Master Planning Summary. The following sections summarize key background methodologies and relevant standards used throughout this process.

Roadway

Baseline roadway and infrastructure details were investigated and documented as part of the *Route 30 Projects Highway Deficiency and Design Criteria Report* (1/10/2017) and as summarized in the *Project Purpose and Need Statement* (5/31/2017). Summary deficiencies included the following:

- Existing shoulders < 8-12' DM2 requirement, and existing lanes < 11-12' DM2 requirement
- Concerns related to clear zones, sight-distance, skewed intersection geometry, and falling rock
- Pavement issues including mostly fair to poor pavement condition ratings (Exhibit 2), plus a 1937 concrete base layer that is over 80 years old (compared to PennDOT policy recommendations that would typically recommend its replacement beyond 55 years).

Exhibit 2: Baseline Pavement Condition Ratings

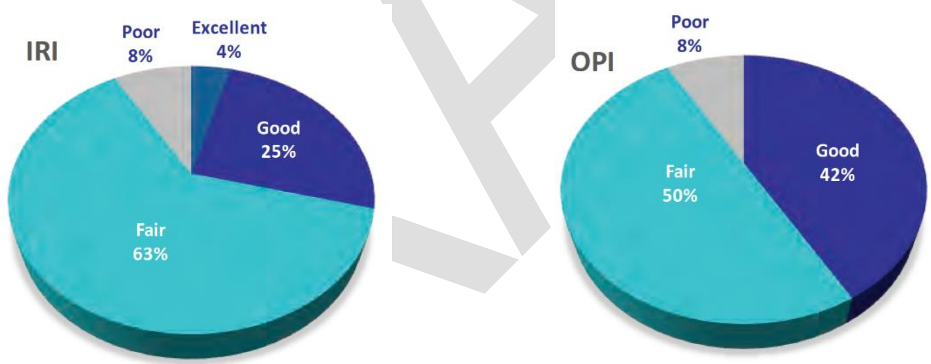


Exhibit Note: Per PennDOT's *Publication 242 (Pavement Policy Manual)*, **IRI** (International Roughness Index) represents pavement smoothness or ride quality based on a measure of vehicle response to surface texture, faulted or uneven roadway surfaces, and pavement surface irregularities; while **OPI** (Overall Pavement Index) represents overall pavement conditions based on a combination of IRI, distress types (e.g. cracking, edge deterioration, rutting) and severity. [2]

Highway investigations were coupled with existing and projected traffic volume assumptions to establish summary design volumes for the project corridor (Exhibit 3). Preliminary design criteria were also established in accordance with PennDOT's *Publication 13M (Design Manual 2, Highway Design)* (DM2) for reference throughout the development and conceptual design of improvement alternatives (Exhibit 4).

Conceptual design for the alternatives analysis also included the development and refinement of typical sections, as well as conceptual geometric alignments for the various intersection-level improvements. Such details were used to determine key construction quantities for the alternatives. Corresponding unit costs (from recent projects) were obtained from PennDOT's *Engineering and Construction Management System* (ECMS) to support the development and comparison of alternative cost estimates, as detailed in *Volume 4: Benefit-Cost Details*.

Exhibit 3: Highway/Traffic Classification and Design Volume Summary

Highway Classification		
Federal Functional Classification	Principal Arterial/Other Highways	
Roadway Typology	Regional Arterial, Suburban Corridor	
Traffic Design Volumes	**West of Lincoln Way**	**East of Lincoln Way**
AADT (2015 Base Year)	20,800	26,800
AADT (2025 Opening Year)	22,200	28,200
AADT (2045 Design Year)	25,100	31,100
K	10.5%	11.0%
DHV	2,650	3,400
Truck %	4%	4%
Directional Distribution	51%	53%

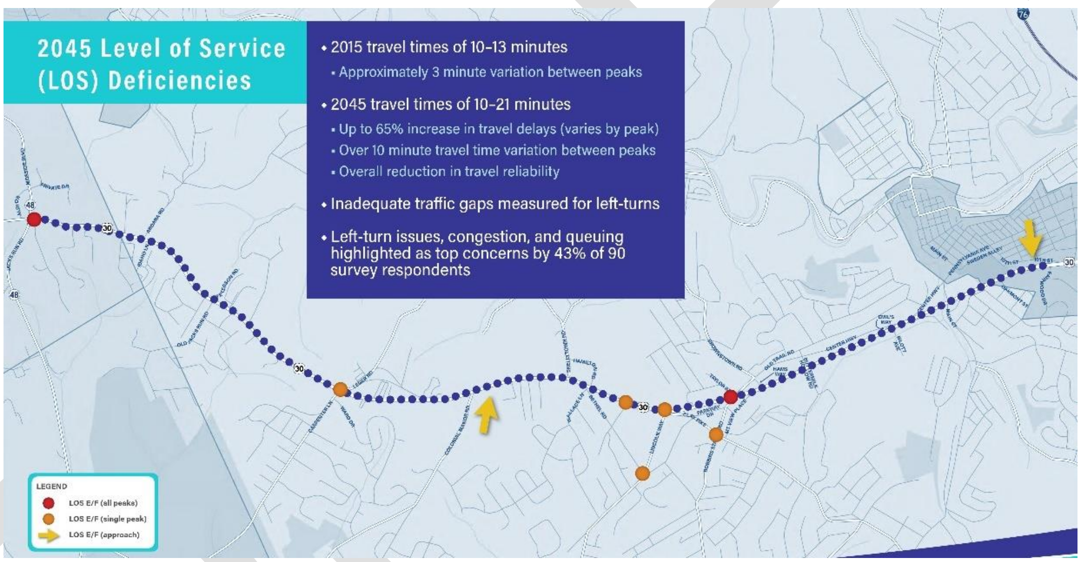
Exhibit 4: Highway Design Criteria

Criteria	**Existing Conditions**	**Recommended Criteria (PennDOT DM2)**	**Proposed Criteria**
Design Speed	*40 MPH*	35-55 MPH	45 MPH
Lane Width Curb to Curb: Thru Lanes: Center Turn Lanes: Offset to curb	*Varies 44' to 60'* *4 Lanes – Varies 10.5' to 12'* *1 Lane – Varies 0' to 11'* *Varies 4' – 6'*	4 to 6 lanes; 11' to 12' Median for Left Turn 16' to 18'	4 Lanes – 12'; 5 Lanes – 11' 16' Center Turn lane (Where required)
Shoulder Width	*Varies 0' to 9.5'*	8' to 12'	Curb Gutter and/or 8' Shoulder
Sidewalk Width:	*None*	5' to 6'	5'
Cross Slope Maximum: Minimum:	*N/A* *2.0%*	6.0% (Tangent) 2.0% (Tangent)	6.0% 2.0%
Vertical Grade Terrain: Maximum: Minimum:	*Rolling* *N/A* *N/A*	Rolling 7.0% 0.5%	Rolling N/A N/A
Horizontal Radius Minimum:	*N/A*	643'	Minimum Curve 643'
Sight Distance (Min) Stopping:	*N/A*	360'	360 min.
Clear Zone Width:	*N/A*	Varies 14' to 24'	Varies 14' to 24'
Bridge Width:	*50' (Curb-to-curb)* *52.5' (Out-to-out)*	Required Lane Widths Plus Shoulders Each Side	Required Lane Widths Plus Shoulders Each Side
Vertical Clearance:	*N/A*	16'-6"	N/A

Traffic

Baseline traffic analyses were documented under the *Route 30 Projects Traffic Report for Base and No-Build Conditions* (9/28/2016), the related *Traffic Model Calibration and Validation Report* (9/28/2016), and as summarized in the *Project Purpose and Need Statement* (5/31/2017). These studies incorporated historic and new traffic data including traffic volume counts, corridor travel time and delay measurements, queuing observations, left-turn/right-turn gap studies, and other traffic-related details in accordance with PennDOT and *Highway Capacity Manual* (HCM) methodologies. Local origin-destination (O-D) data, future development plans, and regional growth estimates supported the development of corridor-wide traffic volume assumptions for Base Year 2015 and Future Year 2045 travel conditions. Data was combined to develop project-specific travel demand and traffic operations models for baseline and future travel conditions using Trafficware's Synchro software and PTV's VISUM/VISSIM software. From these efforts, it was determined that roadway congestion is a significant issue along the US 30 corridor (Exhibit 5). Specific operational deficiencies included HCM-based level-of-service (LOS) failures[1], excessive queuing, and corridor travel and access concerns based on travel time delays, inadequate turning gaps, and traffic signal cycle failures (i.e., waiting through more than one entire traffic signal green phase without passing through an intersection).

Exhibit 5: 2045 No-Build Traffic Operational Deficiencies



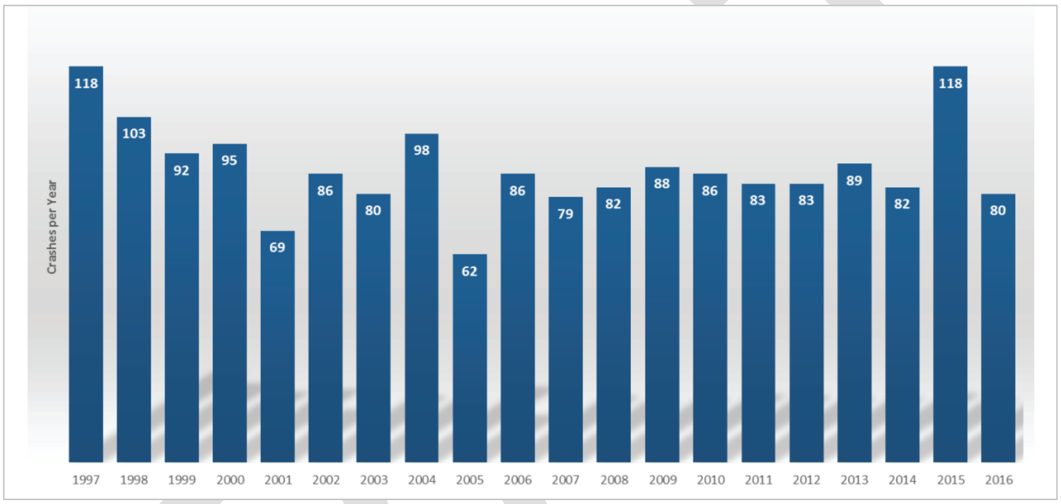
Following completion of the Baseline traffic analyses, traffic data sets and models were evolved to support continued traffic analysis of the improvement alternatives. Updates included, for example, supplemental traffic counts to further investigate intersection-specific details, and traffic signal warrant analyses per the 2009 *Manual on Uniform Traffic Control Devices* (MUTCD) and PennDOT's Traffic Signal Warrant Analysis Workbook to help determine if/where new traffic signal installations were appropriate. Traffic forecasting and modeling revisions also refined the previously-developed baseline tools to help predict how future traffic patterns and operations might change under the various improvements (e.g., with new signals, side-street connections, turn-lanes, jughandle turnarounds, access restrictions, etc.). This approach supported the traffic insights and alternative comparisons throughout this *Volume 1* of the Alternatives Analysis Report series. Comprehensive traffic analysis discussions and detailed results are documented separately under *Volume 2: Traffic Analysis Details*.

[1] Detailed as part of HCM methodologies, Level-of-Service (LOS) is a letter-grade based on delay (by movement, approach, or overall intersection) in which LOS A represents the best operating conditions and LOS F represents the worst. [6] Generally, LOS C/D or better is deemed acceptable, while LOS E/F reflect progressively failing traffic conditions.

Safety

Baseline safety analyses were documented under the *Route 30 Projects Corridor Safety Study Report* (4/29/2016)[2] and as summarized in the *Project Purpose and Need Statement* (5/31/2017). These assessments included a review of crash rates, crash characteristics, crash clusters, AASHTO's *Highway Safety Manual* (HSM) perspectives as derived from PennDOT's HSM Analysis Tool Spreadsheet, and a compilation of anecdotal crash insights from project advisory committee and stakeholder perspectives. Based on historic crash data (Exhibit 6), the annual crash frequency (crashes per year) was equivalent to almost two crashes per week, and the overall corridor experienced a higher than expected number of injury crashes per year. Driver error – typically speed or judgement related – was also cited as a factor in 94% of all US 30 crashes.

Exhibit 6: Observed Annual Crash Frequencies (1997-2016)



Insights from the Baseline analyses were subsequently referenced to help identify the locations for and types of improvement alternatives considered for the project. The HSM aspects of the overall safety study approach were also evolved to quantitatively evaluate the safety performance of various improvements in terms of their influence on crash frequency. This influence was derived by applying Crash Modification Factors (CMF) from the HSM, the *Pennsylvania CMF Guide*, and/or the FWHA's *CMF Clearinghouse* to predict the change in expected crashes per year associated with a proposed improvement based on adjustments to one or more of the following:

- **Observed Crashes**: Documented crashes per year for the project/corridor-specific crash history period
- **Predicted Crashes**: Estimated crashes per year based on facilities with similar characteristics
- **Expected Crashes**: Estimated crashes per year based on a combination of observed and predicted data

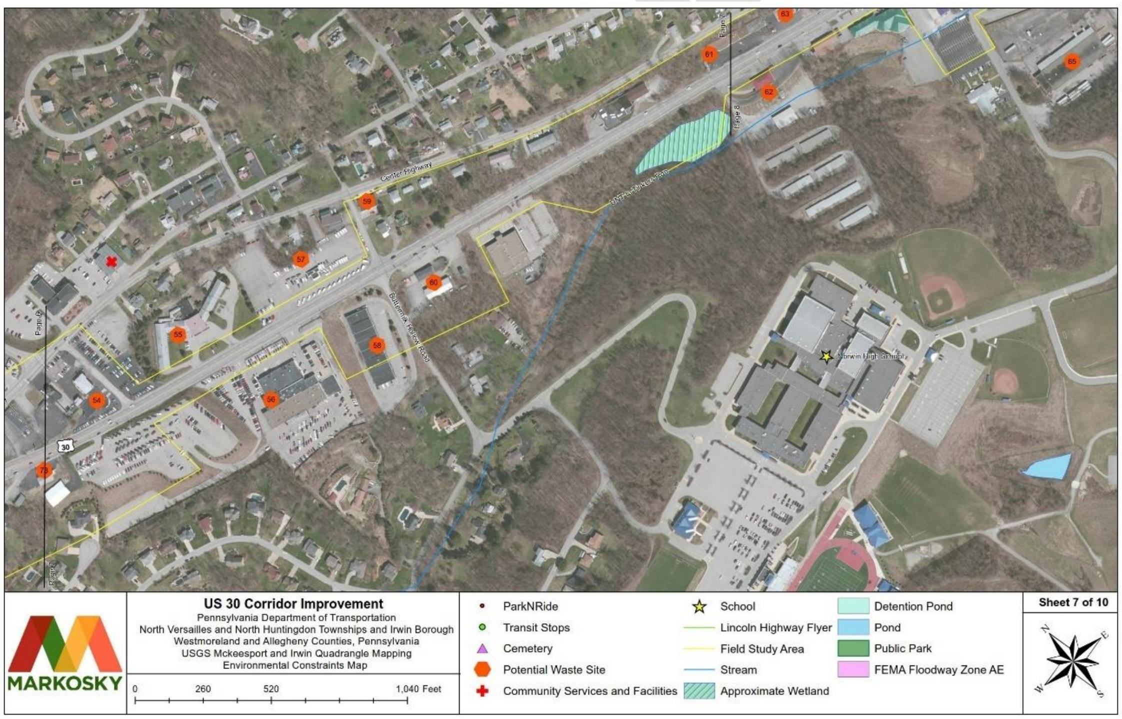
This methodology was carried out to determine segment, intersection, and corridor-wide crash reductions over the life of each set of alternatives (through Design Year 2045). It also allowed crash benefits to be monetized and accounted for in benefit-cost estimates and the comparison/selection of proposed alternatives as summarized throughout this *Volume 1* of the Alternatives Analysis Report series. Comprehensive safety analysis discussions and detailed results are documented separately under *Volume 3: Safety Analysis Details*.[2]

[2] Per requirements summarized in PennDOT's *Publication 46 (Traffic Engineering Manual),* all safety-related details/reports shall be confidential pursuant to 75 Pa. C.S. §3754 and 23 U.S.C. §409 and may not be published, reproduced, released, discussed, disclosed, or used in litigation without written permission from PennDOT. [7]

Environmental

Baseline environmental features were investigated and documented as part of the *Route 30 Projects* Alternatives Analysis to identify potential environmental features within the project corridor and determine potential impacts to these resources under each alternative. This effort was led by the design team's environmental scientists (Markosky Engineering) and conducted in accordance with PennDOT methodologies. The task began with the investigation of readily available environmental data to identify known environmental resources in the project area. Background data sources utilized for this effort primarily included the Southwestern Pennsylvania Commission (SPC) GIS data for Southwestern Pennsylvania; Pennsylvania Department of Environmental Protection (PADEP) *eMapPA* online webtool; the United States Fish and Wildlife Service (USFWS) *National Wetlands Inventory Wetland Mapper*; the Pennsylvania Natural Heritage Program (PNHP) *Pennsylvania Natural Diversity Inventory (PNDI) Online Environmental Review Tool*; and the Pennsylvania Spatial Data Access (PASDA) *Pennsylvania Geospatial Data Clearinghouse*. Environmental resources identified in the project area were included on a working environmental constraints map (sample per Exhibit 7; full set per Appendix A) for use by field crews to conduct a cursory confirmation of the data. Field crews used the constraints map during field surveys to verify the background data and include any additional environmental features not identified through background research.

Exhibit 7: Sample Preliminary Environmental Constraints Mapping



During field surveys conducted for the project, the environmental scientists identified numerous gas/service stations, former gas stations, an auto salvage yard, a power substation, jurisdictional streams and wetlands, FEMA defined floodplains, schools, emergency service providers, a community Park (Irwin Park), a Park-n-Ride facility, and transit stops in the project area. The different alternatives proposed throughout the corridor were compared against the existing environmental features to qualify the potential number and type of environmental features impacted by the proposed activity. These details were documented internally as part of the Preliminary Alternatives screening-level assessments and related *Preliminary Alternatives Evaluation Summary* (7/10/2017).

Archaeological and Cultural Resources

Archaeological and cultural resource efforts supporting various stages of the Baseline and Alternatives Analysis phases of the *Route 30 Projects* program primarily focused on the following elements:

- **Geophysical Survey** – A geophysical survey took place in November 2015 within a portion of the Miller United Methodist Church (UMC) Cemetery and adjacent church parking lot to identify any anomalies that could potentially be unmarked historic burials that could be affected by the proposed roadway alterations. The survey consisted of Ground Penetrating Radar (GPR), Magnetometer, and Resistivity studies (Appendix A). These surveys were completed to identify the limits of interments and identify any constraints for future roadway work.

- **Above Ground Historic Properties** – This section of US 30 is part of the historic, early twentieth century, Lincoln Highway Corridor. The US 30 corridor within the project area was assessed for eligibility to the National Register of Historic Places in 2015 through preparation of a Pennsylvania Historic Resource Survey (PHRS) form (Appendix A). A determination of eligibility is anticipated as the project development process continues to move forward.

- **Preliminary Alternatives Evaluation** – Preliminary Alternatives screening efforts (as referenced later in this report) included cultural resource sensitivity within the project corridor. Through analysis of PennDOT's *Cultural Resource Geographic Information System* (CRGIS) database, review of the historical and archaeological sites and surveys data stored at the Pennsylvania State Preservation Office (PA SHPO), and assessment of the *Statewide Pre-contact Probability Model*, a Screening-Level Alternatives Assessment (June 2017) presented preliminary cultural resource sensitivity for historic and pre-contact (Native American) resources within nine subareas comprising the project corridor.

Future cultural resource analyses are anticipated within the project corridor. For above ground historic resources, such work will follow PennDOT's *Publication 689 (The Transportation Project Development Process: Cultural Resources Handbook)*; comply with all pertinent state and federal legislation, including Section 106 of the National Historic Preservation Act of 1966, as amended in 1980 and 1992; the National Environmental Policy Act of 1969; Code of Federal Regulations: Advisory Council on Historic Preservation (36 CFR 800), as amended; Commonwealth of Pennsylvania Act Nos. 1970-120 and 1978-273; and Executive Order 11593.

For archaeological studies, such work will follow PennDOT's *Publication 689 (The Transportation Project Development Process: Cultural Resources Handbook)*; the PA SHPO 2017 update of the *Guidelines for Archaeological Investigations in Pennsylvania*; Pennsylvania Historical and Museum Commission, *Archaeology Curation Guidelines*; Section 106 of the National Historic Preservation Act of 1966, as amended in 1980 and 1992; National Register Bulletin Guidelines for Evaluating and Registering Archeological Properties; Advisory Council's Handbook on the Treatment of Archaeological Properties; the National Environmental Policy Act of 1969; Code of Federal Regulations: Advisory Council on Historic Preservation (36 CFR 800 Parts 800.4 and 800.5), as amended; and the Commonwealth of Pennsylvania Act Nos. 1970-120 and 1978-273; and Executive Order 11593.

Utilities

Utility investigations supporting the alternatives analysis consisted primarily of a high-level review of the types and general locations of existing utilities along the Route 30 corridor and potential impacts or influence relative to the alternatives being considered. A call for design was placed through the Pennsylvania One Call System (PA One Call) to identify existing utility companies/contacts in the project corridor. Utility contact details were documented within the *Route 30 Projects Highway Deficiency and Design Criteria Report* (1/10/2017) for the following:

- CNX Gas Company
- Columbia Gas of PA, Inc. – Bethel Park
- Comcast (Allegheny Co.)
- Comcast Cablevision (Westmoreland Co.)
- Duquesne Light Company
- EQT Corporation
- Kriebel Minerals, Inc.
- North Huntingdon Township Municipal Authority
- North Huntingdon Township
- North Versailles Township
- Peoples Natural Gas Company, LLC
- Verizon Pennsylvania, LLC
- Municipal Authority of Westmoreland County
- West Penn Power
- Wilkinsburg Penn Joint Water Authority

Numerous utilities were identified that will likely be in conflict due to the various intersection re-configurations and roadway widening included throughout the alternatives. Existing utility poles, for example, are in close proximity to the existing US 30 roadway, and any widening will directly conflict with their present locations. Anticipated upgrades to drainage systems throughout the corridor may also introduce potential conflicts with underground natural gas, communication, sewer, and water facilities. From a cost estimation perspective and given the early stage of project development, potential utility impacts for each alternative were accounted for based on a utility cost assumption of 5% of the construction cost subtotal.

Right-of-Way

Right-of-way (ROW) investigations supporting the alternatives analysis focused on a high-level conceptual review of the potential number and type of impacts (e.g. commercial vs. residential; partial acquisition vs. total take) that may be associated with the various alternatives being considered. In general, ROW issues were identified as a significant concern along the US 30 corridor, and numerous business and residential properties are anticipated to be directly impacted by the alternatives. Horizontal and vertical alignment adjustments for road/intersection reconfigurations, sight distance improvements, or other modifications may require changes to cut and/or fill slopes that could introduce additional ROW conflicts. Also, considering the age and state of drainage infrastructure along US 30, it is anticipated that drainage system improvements will require off-site stormwater facilities, such as detention ponds, that would likely require ROW acquisition beyond the immediate footprint of the project.

Current ROW perspectives for alternatives analysis were limited to insights that could be obtained from available property/parcel information along the corridor based on existing GIS data files from *PennShare*, PennDOT's GIS Open Data portal, SPC, and/or North Huntingdon Township. Based on this information, approximately 300 parcels were identified within the project area alongside variable ROW limits. From a cost estimation perspective and given the early stage of project development, potential ROW impacts for each alternative were accounted for based on a variable cost scale (derived from anecdotal insights from companies that have performed ROW acquisition for the District) that assumed the following:

- ROW Acquisition = $10,000 per acre
- Commercial Take = $500,000 per parcel
- Commercial Take (vacant lot) = $200,000 per parcel
- Residential Take = $125,000 per parcel

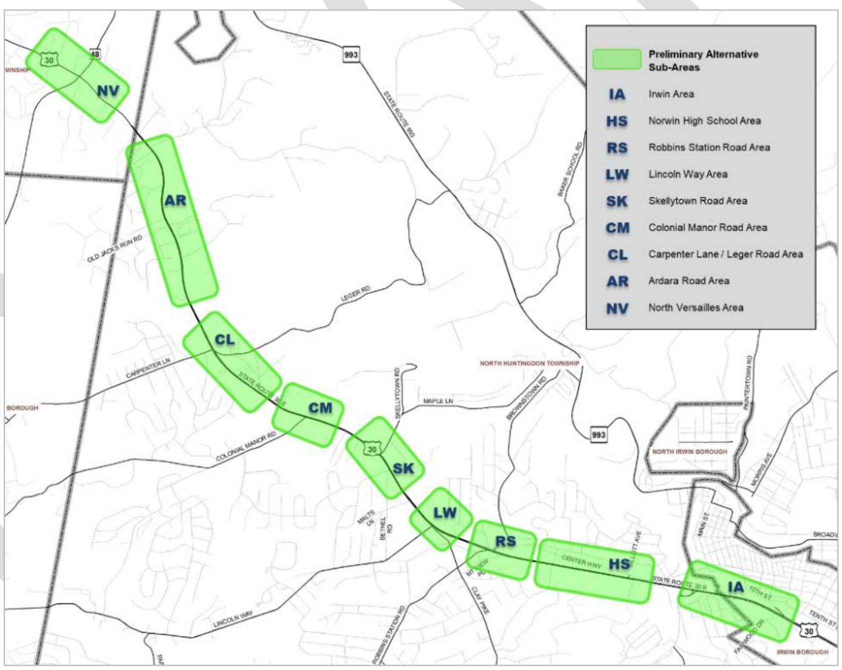
Preliminary Alternatives

Concept Brainstorming

Development of an initial set of preliminary alternatives for the Route 30 corridor focused primarily on exploring site-specific concepts to address the previously-identified Purpose and Need, Baseline technical insights, and relevant anecdotal input by location. These efforts commenced with multi-day brainstorming workshops at which project team members representing all technical disciplines reviewed the available background information alongside aerial imagery and site knowledge to begin sketching improvement options. Through this exercise, nine sub-areas along US 30 began to surface based on corridor or intersection-specific engineering and improvement needs as described below (Exhibit 8).

1. **Irwin Area** – from approximately 10th Street to Main Street
2. **Norwin HS Area** – from approximately Billot Avenue to Buttermilk Hollow Road
3. **Robbins Station Area** – from approximately Hams Way to west of Robbins Station Road
4. **Lincoln Way Area** – from approximately west of Robbins Station Road to Malts Lane
5. **Skellytown Road Area** – from approximately Malts Lane to east of Colonial Manor Road
6. **Colonial Manor Rd Area** – Colonial Manor Road intersection area
7. **Carpenter Lane/Leger Rd Area** – from approximately Crown Road to Lamont Drive
8. **Ardara Road Area** – from approximately Lamont Drive to Allegheny/Westmoreland County Line
9. **North Versailles Area** – from approximately Allegheny/Westmoreland County Line to west of Route 48

Exhibit 8: Preliminary Alternative Sub-Areas



While several early concepts were dropped from consideration based on substantial anticipated property, grade, geometric, or traffic impacts, 40 site-specific concepts were retained for further development. Retained concepts were evaluated for conceptual geometric layouts, analyzed for preliminary traffic impacts (see Volume 2), and reviewed through an interdisciplinary screening-level assessment process as described in the next section.

Screening-Level Assessments

Screening-level assessments of the preliminary alternatives were conducted based on three groups of project-specific criteria including: (1) potential benefits related to Purpose and Need, (2) potential opportunities related to *PennDOT Connects* policies, and (3) potential project impacts. Collectively, these groups encompassed 25 individual screening criteria and a mixture of qualitative/quantitative-based assessments that were applied to each of the preliminary alternative concepts being considered. Criteria included the following:

Purpose and Need: related potential project benefits directly to the specific needs identified in the *Project Purpose and Needs Statement* (5/31/2017) with summary criteria categories and sub-categories encompassing:

- Safety (*Crash Patterns at Intersections, Crash Patterns at Segments*)
- Operations (*LOS Failures and/or Queueing, Traffic and Access Deficiencies*)
- Infrastructure (*Roadway Design Deficiencies, Drainage or Pavement Issues*)
- Constraints (*Future Economic Development, Multimodal Infrastructure, Community Connectivity*)

***PennDOT Connects* Policy:** related potential project benefits directly to *PennDOT Connects* policy, which reflects a new approach to project planning and development that expands the department's requirements for engaging local and planning partners, collaborating with stakeholders, and considering projects in a holistic way for opportunities to improve safety, mobility, access, and environmental outcomes for all modes and local contexts. [3] Specific criteria meshed with the *PennDOT Connects* Project Initiation Form categories that include:

- Pedestrians/Bicyclists
- Public Transit
- Transportation System Management and Operation (TSMO) and Intelligent Transportation Systems (ITS)
- Freight, Economic Activity, and Manufacturing
- Stormwater and Green Infrastructure
- Health, Community, or Cultural Influence

Potential Project Impacts: related potential project impacts directly based on quantitative or qualitative multi-disciplinary technical perspectives of the design team, including categories/sub-categories as follows:

- Engineering Conflicts or Constraints (*Horizontal or Vertical Alignment, Structures or Culverts, Earthwork, Utilities, Constructability/MPT*)
- Public and Resource Impacts (*Commercial Property Impacts, Residential Property Impacts, Environmental Impacts, Historical, Archaeological, or Cultural Resource Impacts, Public Controversy*)

Outcomes of the screening-level assessments (Appendix B) were used to begin identifying areas for additional concept refinement, which in turn were used to facilitate outreach and coordination discussions at the second round of project meetings with the Project Advisory Committee and Stakeholders Committee. Discussions reviewed multiple concept options through each of the sub-areas listed below (see Volume 2 for details):

1. **Irwin Area** – three options including existing 10th Street upgrades or new connections to Main Street

2. **Norwin HS Area** – seven options including various combinations of intersection realignments, turn lanes, jughandles, or traffic signal installations at Billot Avenue/Emil's Way and Buttermilk Hollow Road

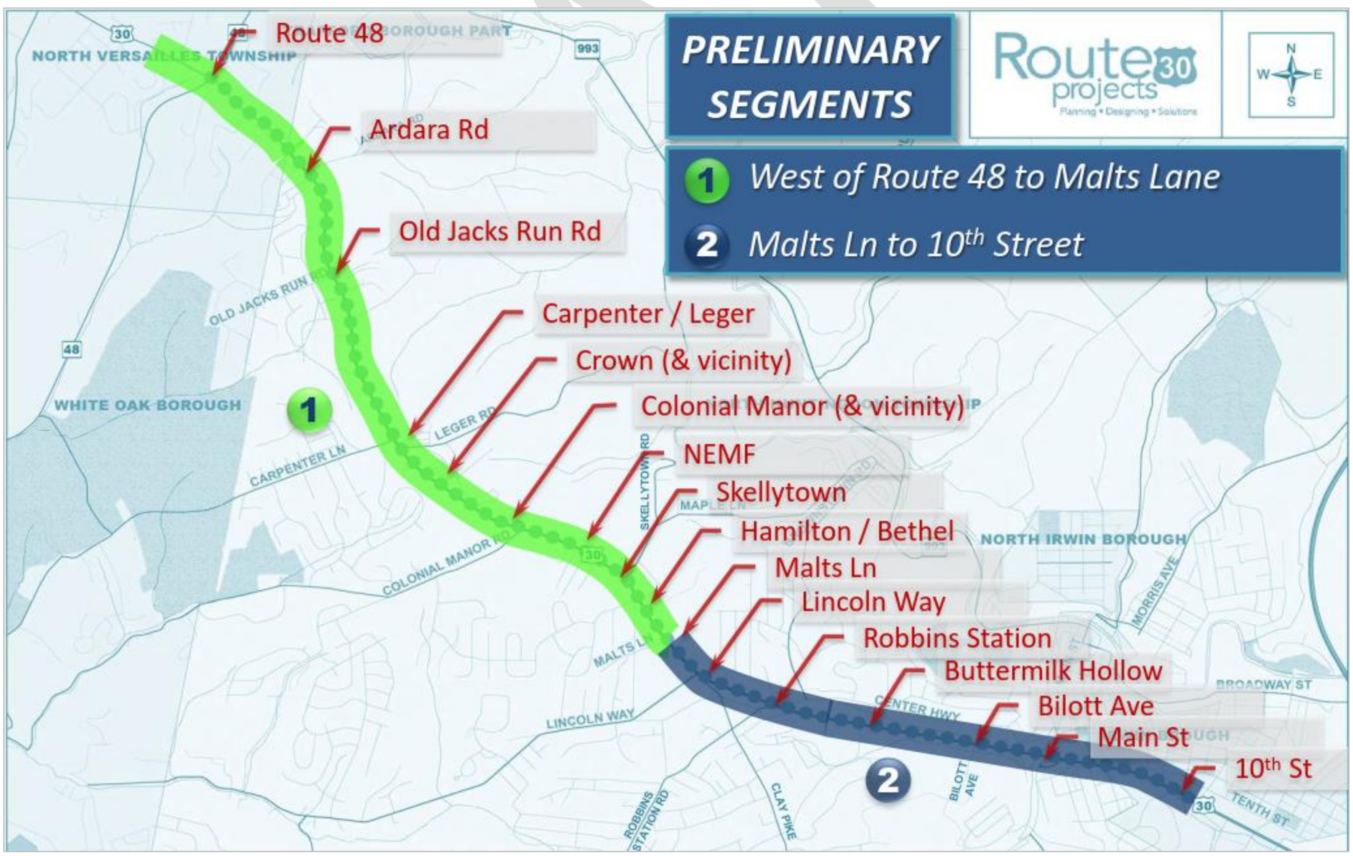
3. **Robbins Station Area** – four options including at-grade intersection widening, grade-separation with a new bridge on Robbins Station Road, or continuous flow intersection operations with displaced left-turns

4. **Lincoln Way Area** – two options for intersection widening, turn lanes, and adjustments to Clay Pike

5. **Skellytown Road Area** – four options for various combinations of intersection realignments, marginal access road connections, jughandles, traffic signal installations, or roundabouts at Skellytown Road or Bethel Road/Finchley Road
6. **Colonial Manor Rd Area** – three options for intersection realignments, turn lanes, or jughandles at Colonial Manor Road
7. **Carpenter Lane/Leger Rd Area** – three options for intersection realignments, jughandles, or geometric revisions at Carpenter Lane/Leger Road
8. **Ardara Road Area** – four options for various combinations of intersection realignments, jughandles, traffic signal installations, roundabouts, or side-street connections at Old Jacks Run Road and/or Ardara Road
9. **North Versailles Area** – three options including various combinations of intersection widening, turn lane modifications, or northeast quadrant connector roads at Route 48

Based on a combination of the Purpose and Need insights, screening-level assessments, and agency/stakeholder discussions, intersection focal points from the above list were organized across two major segments proposed for the overall *Route 30 Projects* corridor (Exhibit 9). This organization supported efforts to group the site-specific alternatives into broader corridor-wide alternatives for further analysis per the Detailed Alternatives section.

Exhibit 9: Preliminary Corridor/Project Segmentation and Intersection Focal Points



Detailed Alternatives

Corridor-Wide Assumptions

Coupling insights from the Baseline report series, Purpose and Need, outreach and coordination efforts, and the Preliminary Alternatives analyses, three complete corridor-wide alternatives were established for detailed analysis and consideration. While details in each alternative varied on an intersection-specific basis, overarching background assumptions that applied to all alternatives were established as follows:

Total Pavement Reconstruction: All Detailed Alternatives include full-depth removal/replacement of the existing roadway and shoulder pavement, including the 80-year old concrete base layer. This total reconstruction will essentially result in a brand-new facility throughout the *Route 30 Projects* corridor.

Design Standardization: As part of the total reconstruction effort, all lane width, shoulder, and other facility upgrades will be implemented in accordance with current PennDOT design standards (e.g. DM2).

Design Modernization: In addition to standardization, all Detailed Alternatives also assume modernization of key supporting infrastructure, most notably related to the drainage and traffic signal systems. Concurrent with the full-depth reconstruction, all existing drainage infrastructure (e.g. inlets, cross pipes, etc.) will be replaced or upgraded to current design standards. Traffic signal systems throughout the corridor will also be fully replaced to support the Preliminary Proposed Alternative's design and upgraded to include state-of-the-art signal communications systems with coordinated and/or adaptive traffic signal control.

Corridor Widening: All Detailed Alternatives include widening to support infrastructure, traffic, access, and safety upgrades throughout the corridor. Widening details vary by alternative with two primary sections being considered: four-lanes with median, and five-lanes with a center turn lane. Both options provide two continuous travel lanes in each direction on Route 30; key differences include the following:

- *Existing*: As documented in the *Route 30 Projects Highway Deficiency and Design Criteria Report*, existing typical sections on Route 30 vary and include undivided four-lane and five-lane segments with a mix of variable shoulder widths, no shoulder, or curbed sections. For comparison to the proposed options, however, the prevailing existing section in the corridor consists of an undivided four-lane roadway ranging from approximately 44' to 60' wide (Exhibit 11).
- *Four-Lane Option*: The four-lane option proposes a median barrier to divide and protect the opposing directions of travel (Exhibit 11). In this scenario, turns and side-street access throughout the corridor would be controlled and accommodated only at designated intersections and/or jughandle turnarounds based on the final alternative configuration. The four-lane option proposes curb and gutter to help narrow the section width, resulting in approximately 64' from curb to curb, excluding buffer areas (e.g. for guide rail, signage, utilities, etc.).
- *Five-Lane Option*: The five-lane option proposes a center turn lane configured as a continuous two-way left-turn lane (TWLTL) or via channelized/defined left-turn pockets (Exhibit 11). In this scenario, turns and side-street access throughout the corridor would be accommodated wherever the turn-lane facilities permit access based on the final alternative configuration. The five-lane option proposes 8' paved shoulders and a 16' center lane to accommodate the anticipated turning movements, resulting in approximately 80' from outside shoulder to outside shoulder, excluding buffer areas (e.g. for guide rail, signage, utilities, etc.).

Exhibit 10: Route 30 Typical Section – Existing Four-Lane Undivided

Exhibit 11: Route 30 Typical Section – Four-Lane Divided Option for Detailed Alternative 1

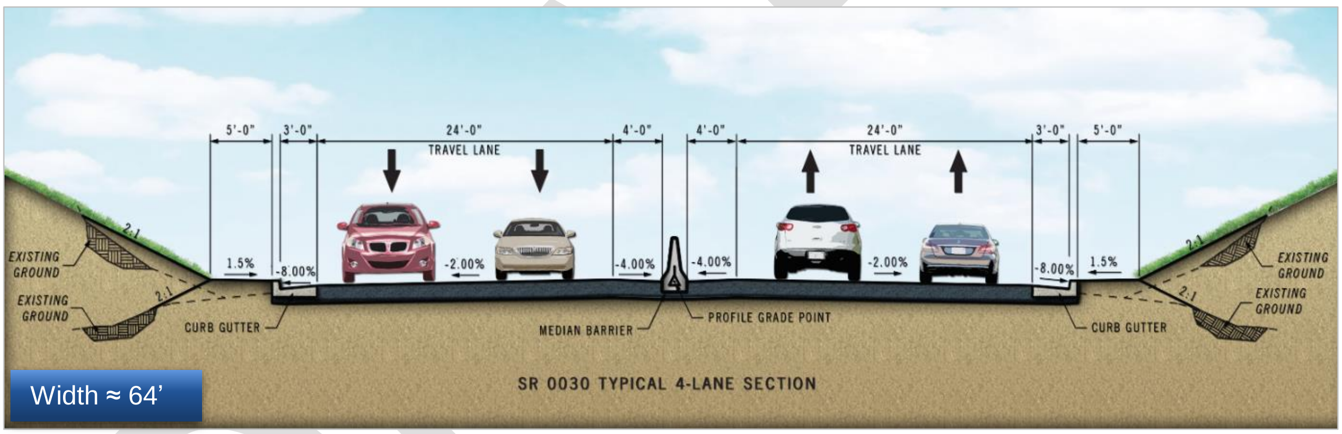
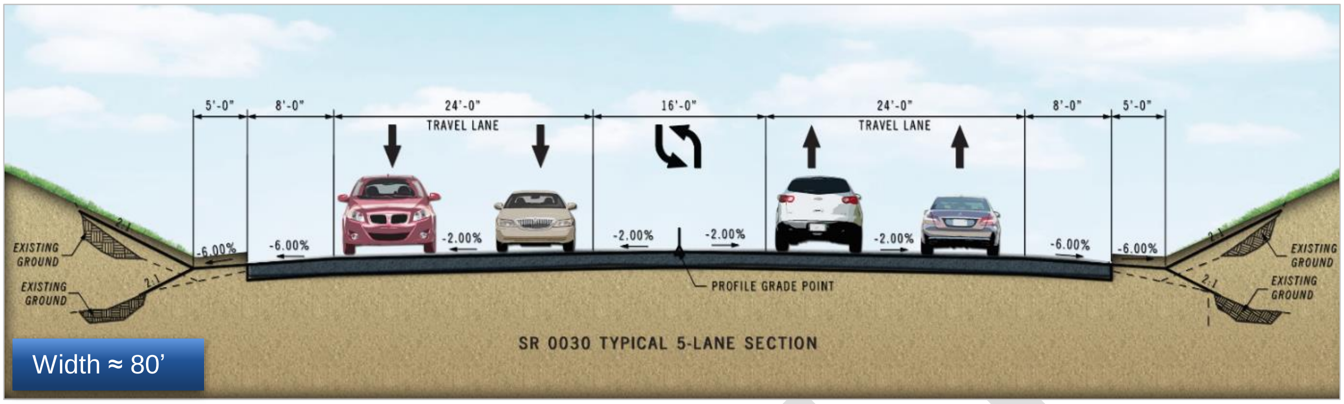


Exhibit 12: Route 30 Typical Section – Five-Lane Option for Detailed Alternatives 2 and 3



Intersection-Level Alternative Combinations

With the Route 30 typical sections defined above, intersection-level improvements for sub-areas from the Preliminary Alternatives review were grouped and combined with the typical section options to support the creation of three distinct end-to-end corridor alternatives. Detailed Alternative 1 uses the four-lane typical section, while Detailed Alternatives 2 and 3 each use the five-lane typical section.

Alternative 1 – Four-Lane Divided with Barrier

Alternative 1 consists of the four-lane divided typical section with median barrier (Exhibit 11) coupled with intersection-level improvements geared toward general access control throughout the corridor (Exhibit 13). Summary improvements include the following:

- *Jughandles:* With the four-lane divided section, new signalized turnaround locations (i.e., jughandle intersections) will be incorporated to accommodate access. Though site-specific designs will vary, conditions may be similar to access-controlled examples on US 22 in nearby Murrysville, Pennsylvania (Exhibit 14). Along Route 30, Alternative 1 proposes potential jughandles at: Buttermilk Hollow Road, Bethel Road / Finchley Road, Colonial Manor Road, Carpenter Lane / Leger Road, and Ardara Road.
- *Connections:* Enhancing road network connections and key access points throughout the corridor is also a focal point of Alternative 1. Such connections would benefit normal vehicular traffic as well as critical access points for schools, transit, freight, and community linkages. Four key areas (A-D) are illustrated in Exhibit 15. These areas encompass intersection realignments at Carpenter Lane / Leger Road (Area A), a new grade-separated overpass at Robbins Station Road (Area B), traffic signalization at Buttermilk Hollow Road and Billot Avenue (Area C), and a new direct roadway connection to Main Street in downtown Irwin (Area D).

Alternative 2 – Five-Lane with Center Turn Lane

Alternative 2 consists of the five-lane typical section with center turn lane (Exhibit 13) coupled with intersection-level improvements that help to facilitate corridor access and alternate road network connections (Exhibit 13).

- *Traffic Signals*: Unlike Alternative 1, jughandles are not required with Alternative 2's center turn lane and five-lane typical section. Full turning movement access is also generally proposed at all existing signalized intersections, plus new traffic signals (pending future design details and verification of traffic signal warrants) at Billot Avenue, Buttermilk Hollow Road, Skellytown Road, and Ardara Road.

- *Connections:* Similar to Alternative 1, road network connections and key access points throughout the corridor are enhanced, specifically including realignment at Carpenter Lane / Leger Road, signalization of connections to the Norwin school campus, and a new direct roadway connection to downtown Irwin. At the Robbins Station Road / Center Highway intersection, however, Alternative 2 assumes an innovative configuration with displaced left-turns from US 30 that crossover upstream/downstream of the main crossing point to allow for a more continuous flow of certain movements through a trio of interconnected signals (at the main intersection crossing, and one at each upstream/downstream left-turn crossover).

Alternative 3 – Five-Lane Variation

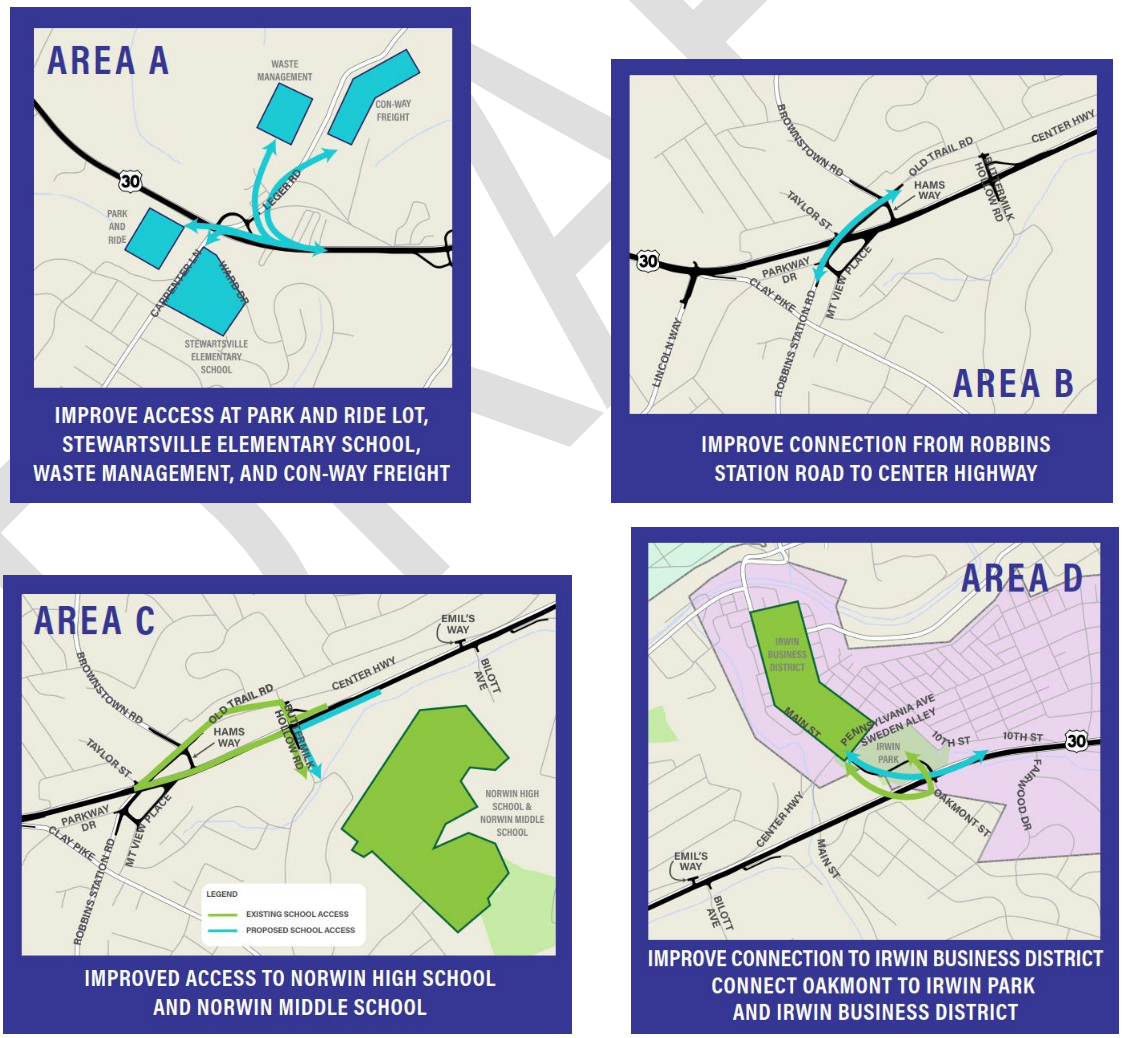
Alternative 3 is essentially a variation of Alternative 2 that still consists of the five-lane typical section with center turn lane (Exhibit 13), but modifies some intersection options such that fewer traffic signal installations or alternate road network connections are considered (Exhibit 13). These options maintain stop-controlled operations at Bilott Avenue and Buttermilk Hollow Road, but with left-turn lane additions. They also do not include a new direct connection to downtown Irwin, and they assume more traditional intersection widening at Robbins Station Road.

Exhibit 13: Detailed Alternative Combinations

Area	Alternative 1 Four-Lane Divided w/ Barrier	Alternative 2 Five-Lane w/ Center Turn Lane	Alternative 3 Five-Lane Variation
Corridor-Wide Alternatives			
US 30 Mainline	**4-Lane** w/ barrier and general access control	**5-Lane** w/ TWLTL	**5-Lane** w/ traditional widening (left-turn pockets)
Intersection-Specific Alternatives			
Irwin Area (IA-Series)	**IA-2B** New Main St Connection (Alignment B)	**IA-2A** New Main St Connection (Alignment A)	**IA-1** Existing 10^{th} St Upgrades
Norwin HS Area (HS-Series)	**HS-1A** Billot Ave Signal (Align. A) **HS-5** Buttermilk Hollow Signal w/ One Jughandle	**HS-1B** Billot Ave Signal (Align. B) **HS-3** Buttermilk Hollow Signal	**HS-2** Billot Ave Unsignalized w/ Left-Turn Pocket **HS-4** Buttermilk Hollow Unsignalized w/ LT Pockets
Robbins Station (RS-Series)	**RS-2** Robbins Station Bridge (w/ Taylor St Indirect Access)	**RS-3B** CFI w/ Displaced EB / WB Left-Turns	**RS-1** At-Grade Intersection Widening
Lincoln Way (LW-Series)	**LW-1** At-Grade Intersection Widening	**LW-2** At-Grade Intersection Widening w/ Clay Pike Shift	**LW-1** At-Grade Intersection Widening
Skellytown Rd Area (SK-Series)	**SK-3** Jughandle w/ Bethel / Finchley Realignment & Signal	**SK-1** Rear Marginal Road A w/ Skellytown Signal	**SK-2** Rear Marginal Road B w/ Bethel / Finchley Realignment & Signal
Colonial Manor Rd (CM-Series)	**CM-2** Colonial Manor Realignment w/ EB/WB JHs & Skellytown EB JH	**CM-1** Colonial Manor Realignment w/ RIRO at Existing	**CM-1** Colonial Manor Realignment w/ RIRO at Existing
Carpenter Lane and Leger Rd (CL-Series)	**CL-1B** Carpenter / Leger Realignment East w/ WB JH **CL-3A** Access control at Maryland Ln through Minnesota Ln w/ 4-Ln	**CL-1A** Carpenter / Leger Realignment East **CL-3B** Access control at Maryland Ln through Minnesota Ln w/ 5-Ln	**CL-2A** Leger Realignment West **CL-3B** Access control at Maryland Ln through Minnesota Ln w/ 5-Ln
Ardara Rd Area (AR-Series)	**AR-2** Ardara Realignment w/ Jughandles (Ardara & Old Jacks Run)	**AR-1** Ardara Realignment w/ Signal **AR-3** Local street connection (Dusty Rd to Old Jacks Run Rd)	**AR-1** Ardara Realignment w/ Signal
North Versailles (NV-Series)	**NV-4** SR 48 Intersection widening and turn-lane improvements	**NV-4** SR 48 Intersection widening and turn-lane improvements	**NV-4** SR 48 Intersection widening and turn-lane improvements

Exhibit 14: Jughandle Intersection Examples

Exhibit 15: Preliminary Interest Areas for Improved Connections



Detailed Alternatives Analysis

To better compare potential impacts or benefits of the set of Detailed Alternatives, analytical tools including results from traffic operations/simulation models and HSM-based quantitative safety analyses were used to define the overall operational, safety, and monetary costs and benefits of each alternative. System-wide measures of effectiveness (MOEs) included the following:

1. **Safety:** measured as the number of crashes reduced along the project corridor. Calculations were based on HSM methodologies to quantify changes in safety performance in terms of the number of expected crashes given each alternative's unique configuration of roadway characteristics, traffic volume, and historical crash history of similar roadways using a statistically rigorous approach (Volume 3).
2. **Travel Delay:** measured as vehicle hours of delay reduced. Estimates for travel delay as well as stops, fuel usage, and emissions (listed below) were computed from Synchro and VISSIM traffic modeling software, which used Base Year and Design Year traffic volumes with current and proposed roadway geometric alignments to determine the expected benefits through Year 2045 (Volume 2).
3. **Stops:** measured as the reduction in number of stops along the corridor (Volume 2).
4. **Fuel:** measured as the reduction in gallons of fuel usage along the corridor (Volume 2).
5. **Emissions:** measured as the reduction in kilograms (kg) of carbon monoxide (CO), volatile organic compounds (VOC), and nitrogen oxides (NOx) emitted by vehicular traffic along the corridor (Volume 2).

Changes in MOEs were defined relative to the No-Build conditions (i.e. the corridor without any future improvements). Research-based unit costs (in 2017 dollars) were also applied to the MOE values to monetize the benefits and estimate their equivalent dollar values for the overall corridor throughout the lifecycle of the project. This approach followed benefit-cost guidance from the U.S. Department of Transportation and applied a yearly 7% discount rate to compile equivalent 2017 monetary values of the future expected benefits for each year that an alternative was present (i.e. between opening day for the improvement through 2045 Design Year). [4]

Using these details, monetized benefits and applicable construction costs were compiled to estimate an overall benefit-cost ratio (BCR) for each alternative (Volume 4). Summary results (Exhibit 16) reveal the following:

Safety: All three alternatives provide a safety benefit. However, Alternative 1 and the added protection of the divided roadway with barrier yields a total crash savings that is approximately 40% greater (based on number of crashes) to 60% greater (based on monetized benefits) than either of the five-lane options.

Travel Delay: All three alternatives provide a travel time benefit. Alternatives 1 and 2, however, yield approximately 20% more reduction in delay than Alternative 3.

Fuel and Stops: While all three alternatives provide an increase in stops, only Alternatives 1 and 2 reduce fuel usage. Alternative 3 reflects an increase in fuel usage, likely attributable to stops of longer duration (i.e. more idle time). Comparing Alternatives 1 and 2 only, Alternative 1 provides a substantial advantage of 73% fewer stops and more than double the fuel savings. Translated into vehicle operating costs, the four-lane alternative saves almost 2.5 times the benefit of the five-lane alternative.

Air Quality: Emissions reductions are achieved only in Alternatives 1 and 2, with substantially higher savings in Alternative 1. Alternative 3 reflects a negative impact on air quality, likely due to higher levels of congestion and, as with fuel usage, longer duration stops with more idle time.

BCR: Compiling the above details from an overall BCR perspective, the four-lane Alternative 1 provides the highest BCR at 0.74, despite being the most expensive alternative at almost $145M. Comparatively versus Alternative 2, Alternative 1 costs 11% more, but provides 18% more benefit. Comparatively versus Alternative 3, Alternative 1 costs 17% more, but provides 47% more benefit. In both cases, the monetized benefits of the four-lane alternative appear to clearly outweigh the marginal increase in cost.

Exhibit 16: Detailed Alternatives Analysis Summary (from Opening Year through 2045)

Benefit/Cost Item	**Alternative 1** Four-Lane Divided w/ Barrier	**Alternative 2** Five-Lane w/ Center Turn Lane	**Alternative 3** Five-Lane Variation
Measures of Effectiveness (Total Reduction from Opening Year to Design Year 2045)			
Safety Number of Crashes Reduced	1,044	753	773
Travel Delay Vehicle Hours of Delay Reduced	16.7M	16.4M	13.6M
Stops Reduction in Stops along Corridor	(28.0M)	(104.0M)	(101.6M)
Fuel Reduction in Fuel Usage (gal.)	10.0M	4.6M	(1.6M)
Emissions Reduction in CO, VOC, and NOx (kg)	1.0M	512k	(137k)
Monetized Benefits (Net Discounted Total in 2017 $)			
Safety Monetized Crash Reduction	$34.9M	$21.6M	$22.0M
Travel Delay Monetized Delay Reduction	$72.2M	$71.5M	$59.4M
Vehicle Operating Costs Monetized Savings (Stops + Fuel)	$8.0M	$3.3M	($1.8M)
Air Quality Monetized Emissions Reduction	$490k	$247k	($67.5k)
Benefit-Cost Summary [a]			
Total Benefits	$107.7M	$91.1M	$73.4M
Total Capital Costs	$144.9M	$130.6M	$124.0M
Benefit-Cost Ratio	**0.74**	**0.70**	**0.59**

[a] **Table Note:** Total monetized benefits account for MOE-based values plus additional assumptions related to future maintenance costs and residual infrastructure values per USDOT methodologies. Total costs account for assumptions related to expenses already required to update existing infrastructure; see Volume 4 for details.

Based on the detailed analyses and considering the potential negative impact on fuel usage and emissions (and thus vehicle operating costs and air quality) Alternative 3 was dropped from consideration. The remaining four-lane (Alternative 1) and five-lane (Alternative 2) options were presented at a public meeting on October 5, 2017 (see Appendix C for meeting feedback summary). In conjunction with that meeting, the four-lane option was also set forth as the basis of the Department's Preliminary Proposed Alternative as it provides substantially greater benefits across all MOE categories – particularly with respect to crash reductions and safety – for only 11% additional cost and at a higher BCR compared to the five-lane option

Preliminary Proposed Alternative

Preliminary Proposed Alternative Development

Coupled with minor modifications to help reduce side-street impacts, enhance safety, and ensure adequate turnaround access throughout the corridor, the Preliminary Proposed Alternative was created by further refining the initial four-lane section and intersection improvement assumptions started in Detailed Alternative 1. Accounting for additional internal and external coordination between the Department, the interdisciplinary design team, and various agency/stakeholder/public interests, the Preliminary Proposed Alternative ultimately consists of the four-lane divided section with median barrier, proposed intersection-level improvements, and access control via jughandle turnarounds as detailed by Exhibit 17, Exhibit 18, and Exhibit 19.

Exhibit 17: Preliminary Proposed Alternative Intersection-Level Improvements

Intersection / Area:	Improvement:	Derived from Volume 2:
Irwin Area	new roadway connection between US 30 and Main Street	Option IA-2B
Billot Avenue	new turn-lanes on US 30, plus new signal	Option HS-2
Buttermilk Hollow Rd	new signal and westbound jughandle	Option HS-5
Robbins Station Rd	new grade-separated overpass and removal of existing signals	Option RS-2
Lincoln Way	at-grade intersection widening and turn-lane improvements	Option LW-1
Bethel/Hamilton Rd	intersection realignment, EB jughandle, and new signal	Option SK-3
Colonial Manor Rd	intersection realignment with EB/WB jughandles	Option CM-2
Carpenter Ln/Leger Rd	Leger Rd realignment (west) with EB/WB jughandles	Option CL-1B/2A
Old Jacks Run Rd	modified signal with EB/WB jughandles	Option AR-2
Ardara Rd	intersection realignment with WB jughandle and new signal	Option AR-2
Route 48	intersection widening and turn lane improvements	Option NV-4

Corridor-wide improvements incorporated as part of the Preliminary Proposed Alternative also include the following:

- The corridor will be fully reconstructed to modern design standards, including full-depth replacement of the existing pavement base layer that has been in place for over 80 years.
- Total reconstruction will yield improved pavement quality, but also provides the opportunity to replace and upgrade all pertinent supporting infrastructure, notably including drainage facilities throughout the corridor.
- The four-lane divided section with median barrier, coupled with jughandle turnarounds and/or signalized intersections that are strategically-located to provide access points approximately every 3,000 feet throughout the corridor, will implement a style of access management that greatly enhances corridor safety and traveler comfort levels, while balancing convenience and local access/circulation needs. Assuming a maximum inconvenience of 6,000 feet (3,000 each way), this improvement would result in a displacement of up to 1.5 minutes at 45 miles per hour.
- Upgrades will also include the implementation of a more efficient, state-of-the-art traffic signal system that will be more responsive to variable traffic demands throughout different times of the day, different days of the week, and under different scenarios (e.g. holiday shopping peaks, special events, weather events, crashes, or other emergency or non-recurring incidents).

Exhibit 18: Preliminary Proposed Alternative Concept Map

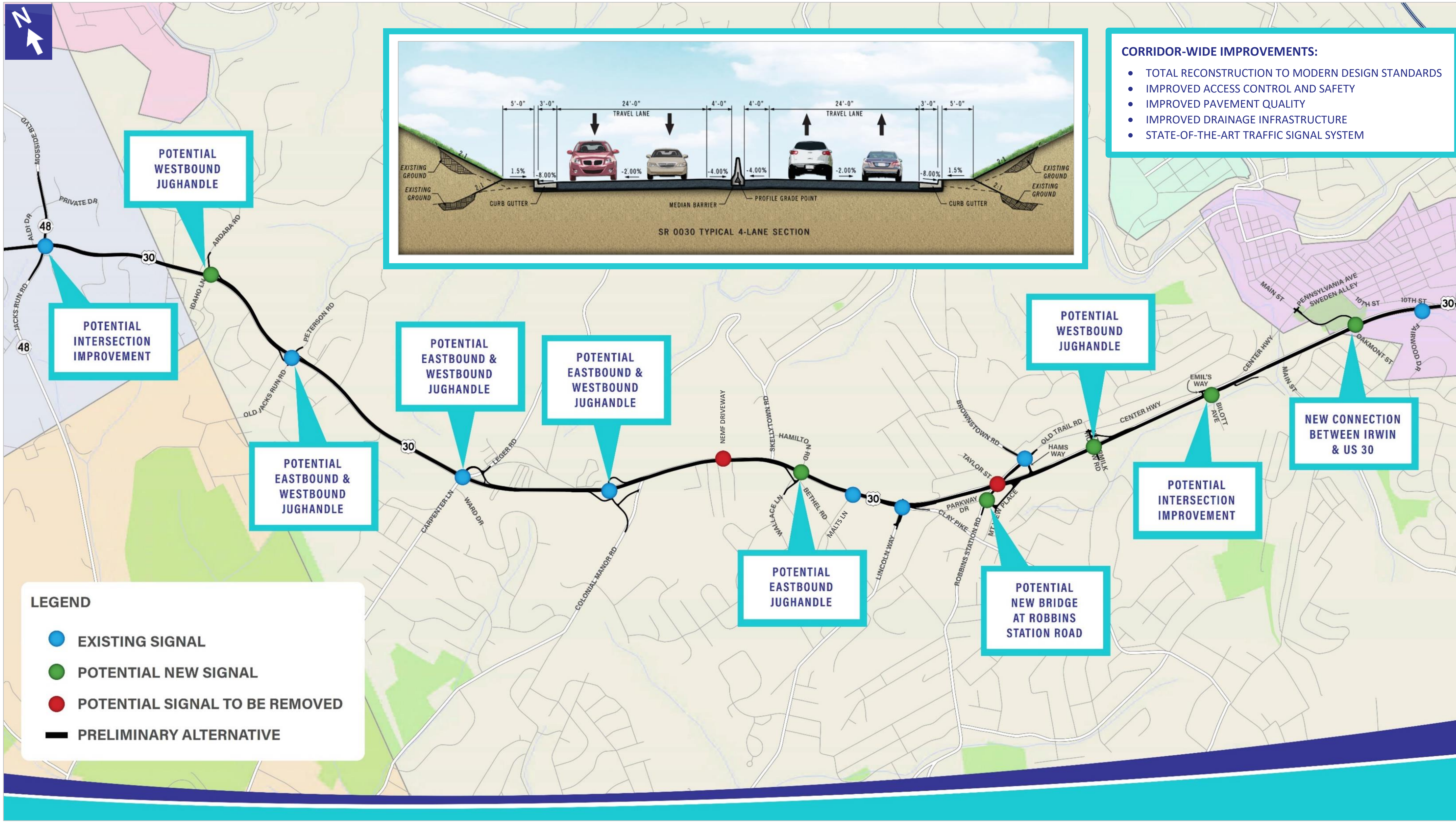
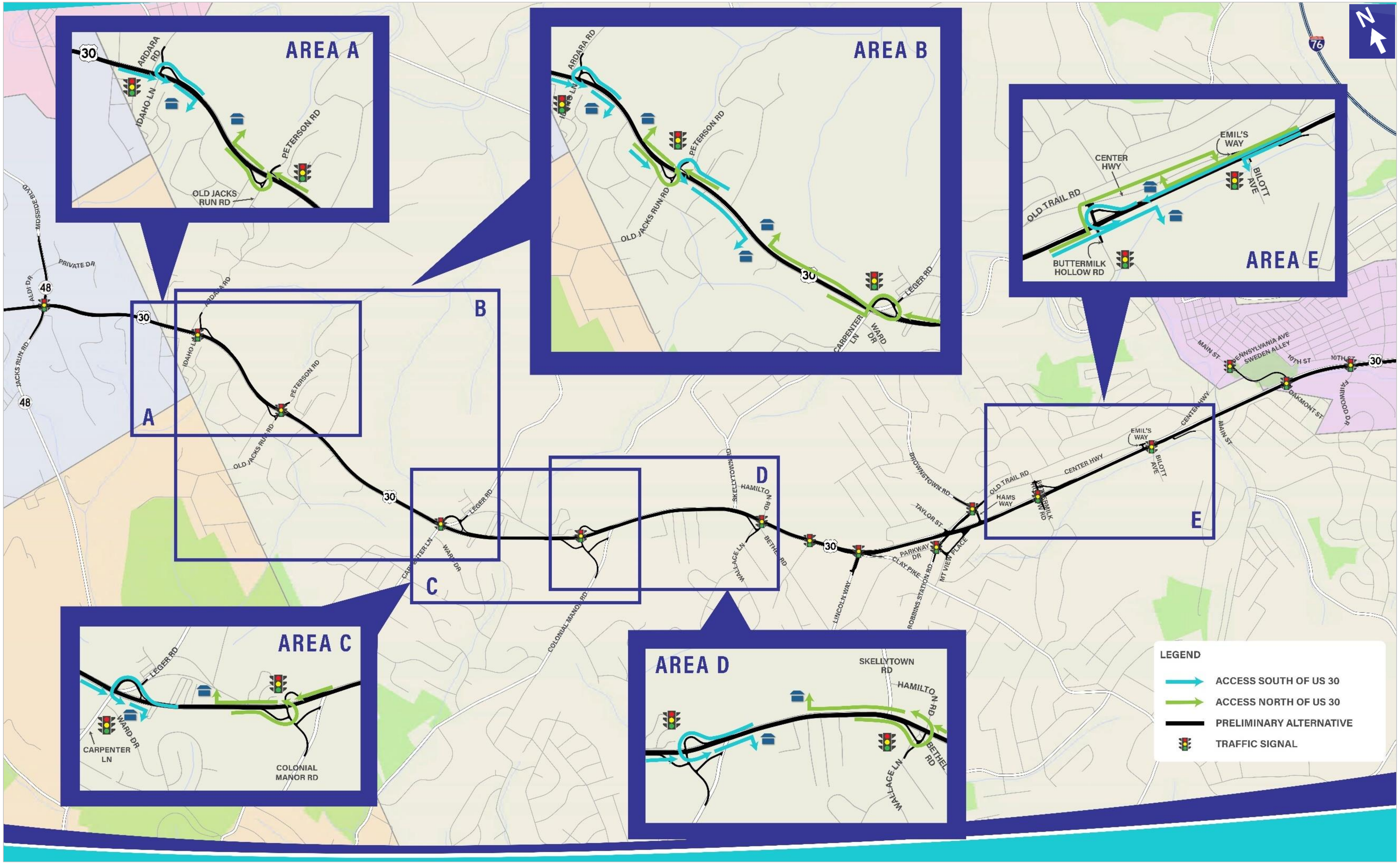


Exhibit 19: Preliminary Proposed Alternative Access/Jughandle Map



Preliminary Proposed Alternative Analysis

Building onto the spreadsheet tools, traffic models, and design details put into place throughout previous stages of the alternatives analysis, the final set of proposed intersection assumptions for the Preliminary Proposed Alternative were configured into the applicable analysis tools and re-assessed to establish updated MOEs for the corridor. Because the Preliminary Proposed Alternative for US 30 at SR 48 has yet to be determined, the benefits and costs for this intersection were not included in the Preliminary Proposed Alternative analysis.

Based on these analyses, acceptable intersection operations of LOS C or better (overall) were found to occur through Design Year 2045 during all peak periods (AM, PM, and Saturday) at all locations along Route 30 (see Volume 2). From a systems perspective, improvements also occur across all MOE categories per Exhibit 20 and as follows:

- Enhances safety with a crash reduction potential of 1,175 fewer crashes through Design Year 2045, or the equivalent of approximately 5 fewer crashes per month throughout the 20-year design period.
- Reduces travel times during all peak periods compared to No-Build conditions, including a 25-50% reduction during the weekday PM peak, or a travel savings of approximately 3 to 9 minutes per vehicle per direction. Compiled savings exceed 14 million vehicle-hours of delay ($61M) over the 20-year design period.
- Substantial reductions in delay throughout the corridor translate into less vehicular wear & tear, less fuel usage, and emissions reductions that benefit air [2]quality. Savings include a reduction of approximately 15 million gallons of fuel and $13M in vehicle operating costs over the 20-year design period.

Exhibit 20: Preliminary Proposed Alternative Analysis Summary (from Opening Year through 2045)

Benefit/Cost Item	**Preliminary Proposed Alternative** Four-Lane Divided w/ Barrier
Measures of Effectiveness (Total Reduction from Opening Year to Design Year 2045)	
Safety Number of Crashes Reduced	1,175
Travel Delay Vehicle Hours of Delay Reduced	14.6M
Stops Reduction in Stops along Corridor	(170.4M)
Fuel Reduction in Fuel Usage (gal.)	15.0M
Emissions Reduction in CO, VOC, and NOx (kg)	1.5M
Monetized Benefits (Net Discounted Total in 2017 $)	
Safety Monetized Crash Reduction	$38.3M
Travel Delay Monetized Delay Reduction	$60.6M
Vehicle Operating Costs Monetized Savings (Stops + Fuel)	$12.6M
Air Quality Monetized Emissions Reduction	$727k
Benefit-Cost Summary [a]	
Total Benefits	$106.1M
Total Capital Costs	$100.4M
Benefit-Cost Ratio (BCR)	**1.06**

[a] **Table Note:** Total monetized benefits account for MOE-based values plus additional assumptions related to future maintenance costs and residual infrastructure values per USDOT methodologies. Total costs account for assumptions related to expenses already required to update existing infrastructure; see Volume 4 for details.

Total monetized benefits for the corridor based on the MOEs that were evaluated amount to approximately $106.1M (discounted per USDOT methodologies). Comparing these benefits to a conceptual cost estimate of approximately $100.4M to construct the project, the Preliminary Proposed Alternative yields a final BCR of 1.06.

Preliminary Proposed Alternative Refinement

Emergency Vehicle Access Perspectives

In response to public and stakeholder feedback (from the Public Meeting) on the Preliminary Proposed Alternative, a detailed evaluation of emergency vehicle access concerns was conducted based on potential fire response times throughout the project corridor (see Volume 2). Key findings from this evaluation indicate that:

- Fire response times either improve or experience no change for 79% of the Traffic Analysis Zones (TAZ) analyzed along the corridor, with the average TAZ experiencing a 19-second improvement.
- For those TAZ's that would experience a longer fire response time compared to the No-Build, the average increase is 17 seconds.
- Only 6 out of 136 TAZ's experience an increase in response time greater than 30 seconds.

Based on the above analyses, it is anticipated that emergency vehicle response times throughout the corridor will generally improve under the Preliminary Proposed Alternative based on (1) an overarching reduction in delays, queuing, and congestion, and (2) the strategic planning and placement of jughandle turnarounds and/or intersection access points as part of the overall corridor design, which may continue to be refined as the *Route 30 Projects* program evolves through subsequent stages of preliminary engineering and design.

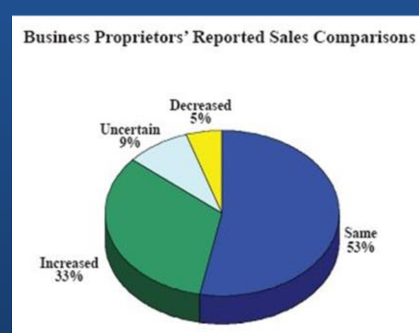
Business Access Perspectives

A detailed evaluation of business access concerns was also conducted to review commercial travel time accessibility throughout the project corridor using methods similar to the evaluation of fire response times (see Volume 2). Key findings from this evaluation indicate that:

- For commercial access to and from North Versailles, 91% of TAZ's experience faster travel time or no change. Travel time to and from the western end of the corridor improves on average by about 2.5 minutes. For TAZ's that increase in travel time to and from the west, the average rise is only by about 23 seconds. Only 6 TAZ's see a travel time increase greater than 30 seconds.
- For commercial access to and from Clay Pike located south of US 30, 84% of TAZ's either improve or experience no change in travel time. Travel time to and from Clay Pike improves on average by almost 2 minutes. TAZ's that increase in travel time take an average 12 seconds longer to travel to or from Clay Pike, with only 4 TAZ's experiencing an increase of more than 30 seconds.

Access Management Perspective:

Construction aside, access changes are unlikely, on their own merits, to negatively impact a business. One of the goals of roadway corridor improvement projects is to clean up the sometimes cluttered distribution and alignments of sidestreet and driveway access points such that property access "order" is developed where chaos existed, and concurrently, throughput traffic delay is reduced and safety is improved. The entire corridor benefits such that customers will be enticed to use it. Improvements through access management practices can be "win-win" for both the properties, and the through traffic in a corridor.



Text/Graphic Source: *Safe Access is Good for Business* [5]

- For commercial access to and from the eastern end of the corridor, 79% of TAZ's see improvement or no change. On average, travel time improves by about 1.5 minutes. Only 6 of 136 TAZ's see an increased travel time difference larger than 30 seconds when compared to the No-Build.

Anecdotally, and considering the relationships between transportation infrastructure and business access, it is also important to note that substantial research has been conducted over the years to investigate before/after conditions and the influence of access management strategies on business activity. One exceptionally relevant example considering the types of improvements proposed for the *Route 30 Projects* corridor is the access management primer *Safe Access is Good for Business.* [5] The primer compiles research based on studies of businesses in several states including Florida, Iowa, Minnesota, Texas, and Kansas. That research demonstrated that once implemented, access management consistently, and in some cases overwhelmingly, had a positive influence on business activity, property values, and customer/delivery experiences, including details as follows:

Key Benefits of Access Management:

- Reduces crashes and congestion, which is more attractive to potential customers
- Results in well-managed arterials that are 40-50% safer
- Increases customer convenience and exposure to businesses with road speeds 15-20 mph faster (i.e. less congestion)
- Reports that replacing a two-way left turn lane with a median can reduce crash rates by 37% and injuries by 50%

Effects on business activity:

- Access to businesses becomes safer, easier, and quicker, especially along congested roadways
- Land value tends to increase or remain the same
- Customers and truck drivers surveyed before/after reported improved safety, traffic flow, and convenience
- After project completion, businesses tend to report better sales than those in surrounding areas (see pie chart in call-out box above, which shows that one-third of businesses reported increased sales, half reported no change, and only 5% reported a decrease).

While the above information is based on national research, local perspectives typically corroborate similar findings. Anecdotal discussions, for example, with personnel involved in access management strategies implemented along US Route 22 in nearby Murrysville have directly attributed some of the growth and redevelopment success of recent years to past transportation improvements that were implemented. Properly planned, designed, and implemented, it is anticipated that a well-managed set of corridor improvements along US Route 30 will likewise enhance future growth and development opportunities for the area.

Summary and Next Steps

Future Design Implications

Design Criteria

As the *Route 30 Projects* program advances through the overall project development process, ongoing minor refinements to the Preliminary Proposed Alternative concepts are likely to continue as the level of survey, engineering, and design accuracy increases nearer to construction. Design-level details, however, are expected to build upon the overall concept of the Preliminary Proposed Alternative's four-lane divided section and comply with modern design criteria (including, for example, previous Exhibit 4).

PennDOT Connects

The design evolution will also continue to foster project coordination and topical considerations as detailed by the *PennDOT Connects* policy. These policies reflect an approach to project planning and development that expands the department's requirements for engaging local and planning partners, collaborating with stakeholders, and considering projects in a holistic way for opportunities to improve safety, mobility, access, and environmental outcomes for all modes and local contexts. Relative to the *Route 30 Projects* program specifically, potential considerations related to *PennDOT Connects* may include the following examples:

- **Pedestrians and Bicyclists**: design development may explore site-specific sidewalk connections in coordination with municipal needs/interests and will account for design elements such as pedestrian signalization, crosswalks, and/or curb ramps at intersections.
- **Public Transit**: Ongoing stakeholder coordination, including discussions with Westmoreland Transit, may reveal additional opportunities to enhance access to/from public transit or park-and-ride facilities within the project corridor.
- **TSMO and ITS Enhancements**: State-of-the-art adaptive traffic signal systems will support technological improvements that benefit the corridor, while ongoing agency/stakeholder coordination may continue to consider specific TSMO or ITS interests.
- **Freight, Economic Activity, and Manufacturing**: Access management strategies, intersection design criteria, jughandle planning/design, and general congestion mitigation will continue to balance safety and operations improvements alongside travel and access needs for trucks, businesses, deliveries, equipment, and patrons/customers that contribute to the local and regional economy of the area.
- **Stormwater and Green Infrastructure**: Drainage system replacement and upgrades will continue to be a major focus of the *Route 30 Projects* program as design progresses.
- **Utilities, Health, and Community/Cultural Events**: Agency, stakeholder, and public coordination efforts will continue to monitor key issues such as utility impacts or relocations as a result of corridor widening, roadway connections that affect community resources (e.g., parks, schools, residential areas), or future construction/work-zone related issues or impacts.
- **Public Controversy**: Future public meetings will be held to review segment-specific design and construction topics, while ongoing design team collaboration will continue to maintain an objective and open-minded approach to exploring feedback and concerns such as those detailed above for emergency vehicle and business access perspectives.

Corridor Segmentation and Schedule

Current project guidance anticipates that future stages of the *Route 30 Projects* program will be divided into at least two separate corridor/project segments that break approximately at the intersection of US 30 and Malts Lane in North Huntingdon Township, Westmoreland County (Exhibit 21). Segment 1 extends west from Malts Lane toward Route 48 in North Versailles Township, Allegheny County; while Segment 2 extends east from Malts Lane toward 10th Street in Irwin Borough. Current schedules anticipate that the western segment will be the priority with design through 2020 and construction through 2022, while the eastern segment will follow with design through 2022 and construction through 2024 (Exhibit 22). All corridor/project segmentation and scheduling are subject to change based on future funding levels and availability.

Exhibit 21: Preliminary Corridor/Project Segments

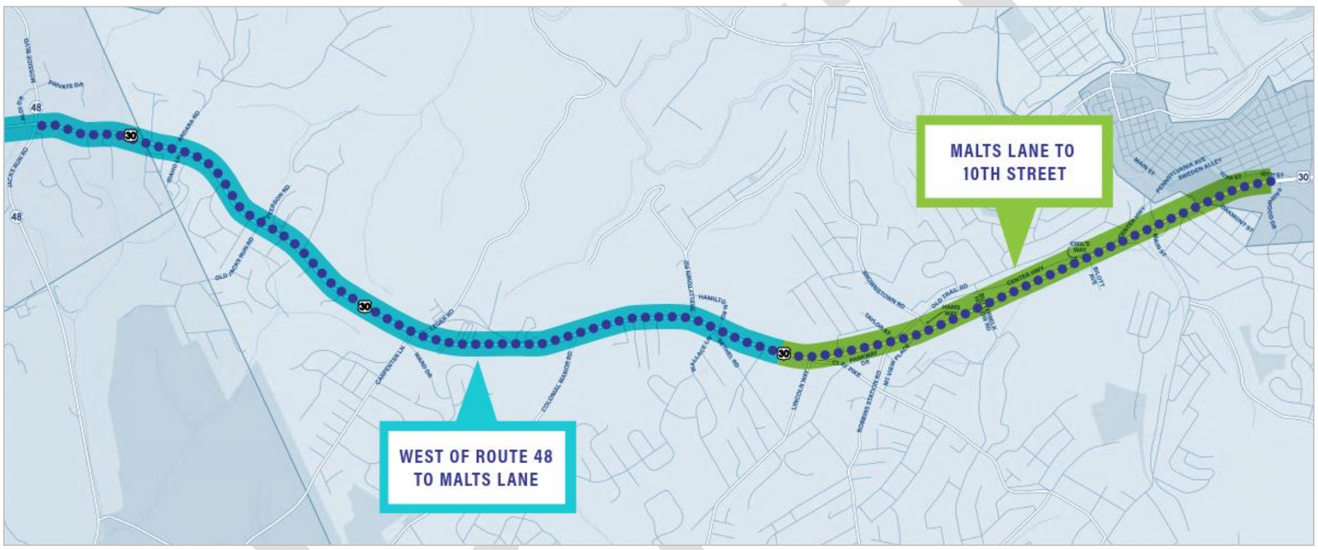
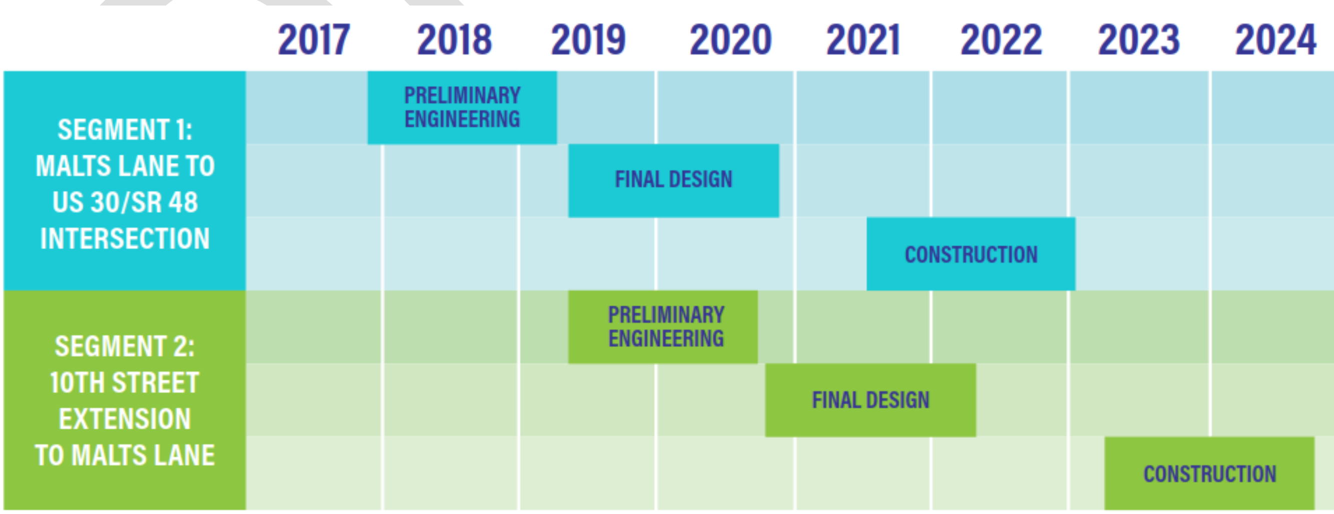


Exhibit 22: Preliminary Project Schedule



** Schedule subject to change due to funding availability*

Preliminary Engineering

Immediate next steps for the project include beginning preliminary engineering for the western corridor/project segment. During this process the project team will continue to refine the Preliminary Proposed Alternative. Refinements will add detail to the conceptual alignments discussed in this Master Planning Summary while seeking to minimize property, environmental, and utility impacts.

The preliminary engineering phase of the project will include ongoing involvement of the Project Advisory Committee members and stakeholders and will also include an additional public meeting.

Future project changes and meetings regarding the project will continue to be distributed to individuals that signed up for the project contact list. Updates will also be advertised on the project website at Route30projects.com.

References

[1] Pennsylvania Department of Transportation, *Publication 319 (Needs Study Handbook)*, December 2010.

[2] Pennsylvania Department of Transportation, *Publication 242 (Pavement Policy Manual)*, May 2015 ed., February 28, 2018.

[3] Pennsylvania Department of Transportation, "PennDOT Connects Policy," 19 December 2016. [Online]. Available: https://paconnects.org/index.php?/Knowledgebase/Article/View/37/8/penndot-connects-policy. [Accessed 9 May 2018].

[4] U.S. Department of Transportation, "Benefit-Cost Analysis Guidance for TIGER and INFRA Applications," July 2017. [Online]. Available: https://cms.dot.gov/sites/dot.gov/files/docs/mission/office-policy/transportation-policy/284031/benefit-cost-analysis-guidance-2017_1.pdf. [Accessed 9 May 2018].

[5] D. Ismart, W. Frawley, D. Plazak, K. Williams, D. Matherly, M. Fendrick and N. Spiller, "Safe Access is Good for Business," Science Applications International Corporation, U.S. Department of Transportation, August 2006. [Online]. Available: https://ops.fhwa.dot.gov/publications/amprimer/access_mgmt_primer.htm. [Accessed 9 May 2018].

[6] Transportation Research Board, *Highway Capacity Manual*, Washington, DC, 2010.

[7] Pennsylvania Department of Transportation, *Publication 46 (Traffic Engineering Manual)*, March 3, 2014.