Martin Luther King Jr. East Busway Extension Feasibility Study

May 2017

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Gannett Fleming

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Executive Summary

Goal of the Study

The goal of this feasibility study is to determine the viability of extending the East Busway from its current terminus at the Swissvale Station eastward to serve the communities of Braddock, East Pittsburgh, Turtle Creek, and Monroeville as well as points east of the study area.

Study Area

The study area for evaluation of the extension of the East Busway begins at the current eastern terminus at the Swissvale Station. The study area extends from the Swissvale Station to the Monroeville area with I-376/Parkway East as the northern boundary, the borough of Pitcairn as the eastern boundary and the Monongahela River as the southern boundary (Figure ES-1).

Evaluation Process

Alternatives were developed that are comprised of an alignment for the roadway and stop locations. (Note: All potential stations, park and ride stops and general bus stops reviewed are labeled "stops" in this report. The Port Authority defines a transit station as a transit stop that is located along a fixed guideway and features more infrastructure and amenities than a typical on-street transit stop. In this report, some stops could be stations, depending on the alignment of the alternatives and amenities considered.) The alternatives were based on the following:

Existing Conditions

- Environmental features that may be encountered by extending the East Busway were evaluated to determine if mitigation is possible or if avoidance is necessary.
- The existing roadway network was evaluated to determine the compatibility of extending the East Busway and providing access to facilities that use the busway.
- The existing transit network was evaluated to determine the compatibility of extending the East Busway and to determine the service adjustments that may be necessary to maximize the use of the busway.
- Population, land use, and employment were evaluated to provide an overall picture of the area that may be served by the extension of the busway and to determine the potential locations for stations.

Engineering

- Horizontal and vertical alignments were developed for each alternative.
- Bridges, walls, drainage, slopes and constructability were evaluated.
- Compatibility of alignments and stop locations were evaluated with consideration of connections to the existing roadway network and existing transit routes.

Ridership

- A number of alternative/options were evaluated incorporating new stop locations and new/expanded route changes.

- Daily boarding projections were developed based on the options modeled by the Southwestern Pennsylvania Commission (SPC) for the Year 2015 and 2035.

Stop Locations

- A number of potential stop locations were identified and evaluated with the proposed alternatives. Evaluation included construction feasibility, potential ridership, and walksheds. Transit Oriented Development (TOD) Typology was also identified for each location. Typology was defined using the Port Authority's Transit -Oriented Development Guidelines (April 2016).

Cost

- The capital costs were evaluated for a comparative evaluation of all alternatives.

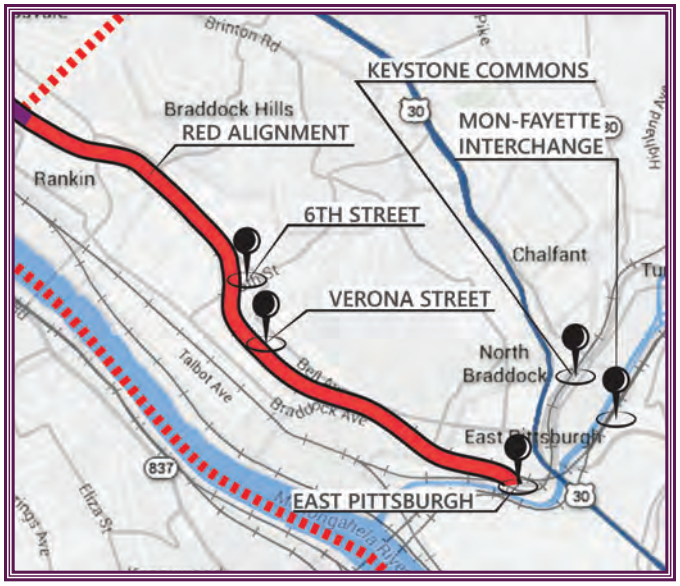
- Operating and maintenance costs were developed for the busway route changes for the alternatives modeled under the ridership projections.

Description of Alternatives

Red Alternative (Swissvale to Braddock Avenue)

The Red Alternative (2.9 miles) was developed to evaluate extending the East Busway from the existing Swissvale Station to Braddock Avenue near the Edgar Thomson Works.

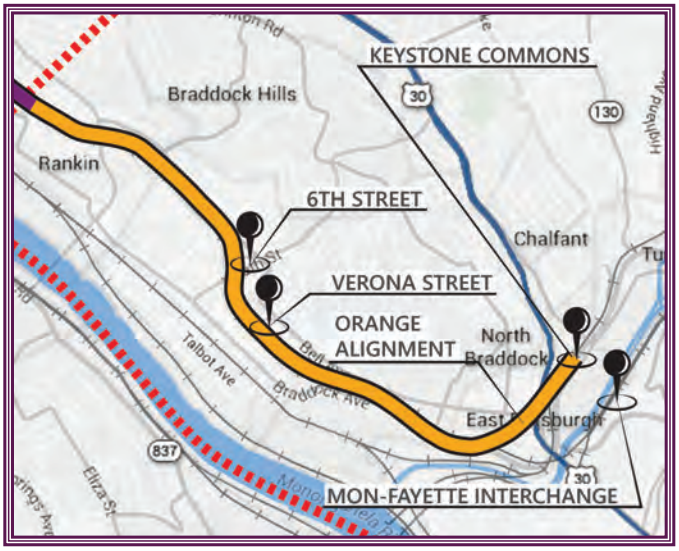
The Red Alternative consists of an alignment extending the East Busway from the existing Swissvale Station that follows the Norfolk Southern Railroad to Braddock Avenue just east of the Edgar Thomson Works. Stops are considered at 6th Street, Verona Street, Braddock Ave near East Pittsburgh, Keystone Commons, the proposed Mon Fayette Expressway Interchange, Pitcairn and the Monroeville Mall (exact locations require further study).



Orange Alternative (Swissvale to Keystone Commons)

The Orange Alternative (3.2 miles) was developed to evaluate extending the East Busway from the existing Swissvale Station to Keystone Commons.

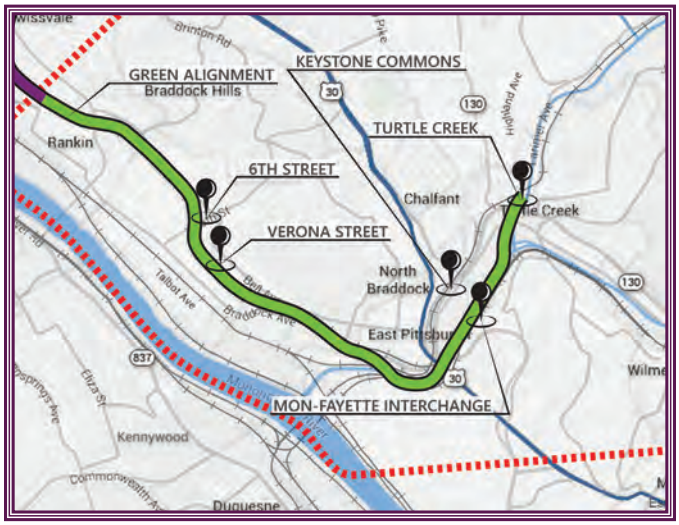
The Orange Alternative consists of an alignment extending the East Busway that follows the same alignment as the Red Alternative from the existing Swissvale Station along the Norfolk Southern Railroad to Braddock Avenue where it then takes a north-easterly path via a tunnel under East Pittsburgh to achieve a direct connection to Keystone Commons. The stops considered for the Orange Alternative include the same locations as the Red Alternative except for the Braddock Ave stop near East Pittsburgh.



Green Alternative (Swissvale to Turtle Creek)

The Green Alternative (4.3 miles) was developed to evaluate extending the East Busway from the existing Swissvale Station to the Borough of Turtle Creek.

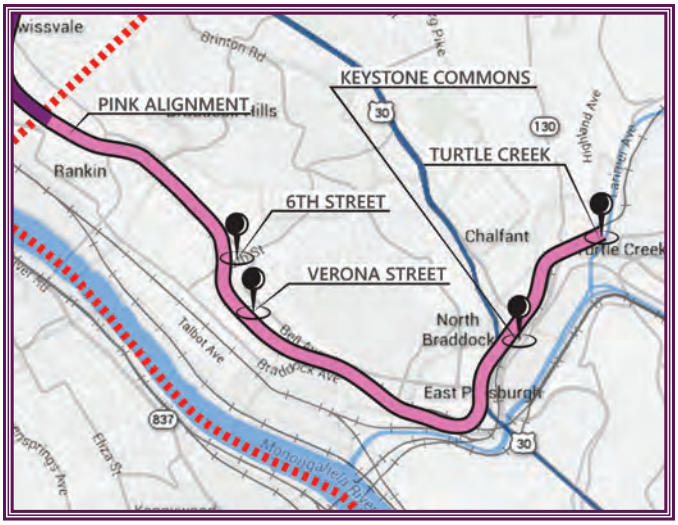
The Green Alternative consists of an alignment that follows the same alignment as the Red Alternative from the existing Swissvale Station along the Norfolk Southern Railroad to Braddock Avenue. From Braddock Avenue the alignment passes over the railroads and underneath the Westinghouse Bridge to reach the Borough of Turtle Creek. The stops considered for the Green Alternative included the 6th Street, Verona Street and Keystone Commons, Turtle Creek, Pitcairn and Monroeville Mall.



Pink Alternative (Swissvale to Turtle Creek)

The Pink Alternative (4.0 miles) was developed to evaluate extending the East Busway from the existing Swissvale Station to the Borough of Turtle Creek and to avoid the issues with the railroad associated with the Green Alternative at the Westinghouse Bridge.

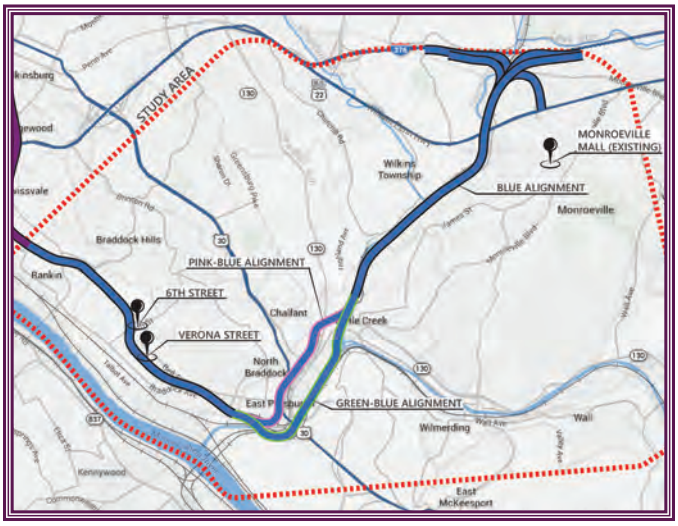
The Pink Alternative consists of an alignment that follows the same alignment as the Red Alternative from the existing Swissvale Station along the Norfolk Southern Railroad to Braddock Avenue where it then takes a north-easterly path via a tunnel under East Pittsburgh that emerges just west of the Union Railroad and continues to the Borough of Turtle Creek via an elevated structure. The stops considered for the Pink Alternative are the same as the Green Alternative.



Blue Alternative (Swissvale to Monroeville)

The Blue Alternative (10.0 – 10.3 miles) was developed to evaluate extending the East Busway from the existing Swissvale Station to Monroeville.

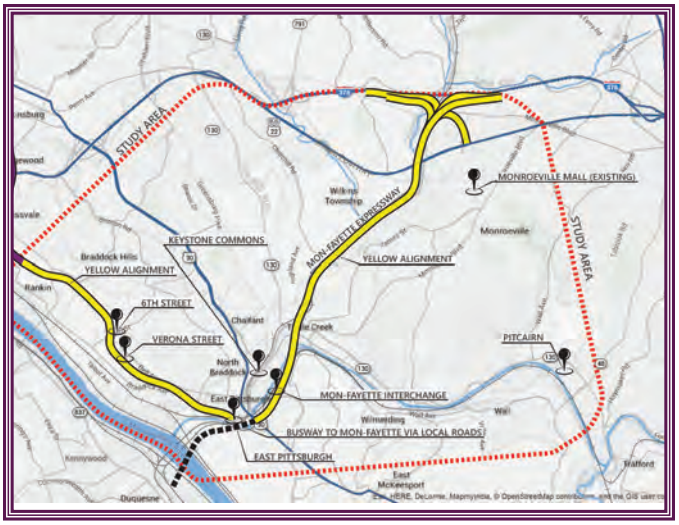
The Blue Alternative consists of an alignment that follows the Green or Pink Alternative from the existing Swissvale Station to the Borough of Turtle Creek. From Turtle Creek the alignment extends northward through the Thompson Run Valley to reach US Route 22 and the Monroeville Mall. The stops considered for the Blue Alternative include 6th Street and Verona Street in Braddock and the Monroeville Mall.



Yellow Alternative – Mon Fayette Expressway (Swissvale to Monroeville)

The Yellow Alternative (10.0 miles) was developed to evaluate utilizing the proposed Pennsylvania Turnpike Commission's (PTC) Mon Fayette Expressway as a means for busway service to reach to Monroeville from the Turtle Creek area without building a dedicated busway through the Thompson Run Valley.

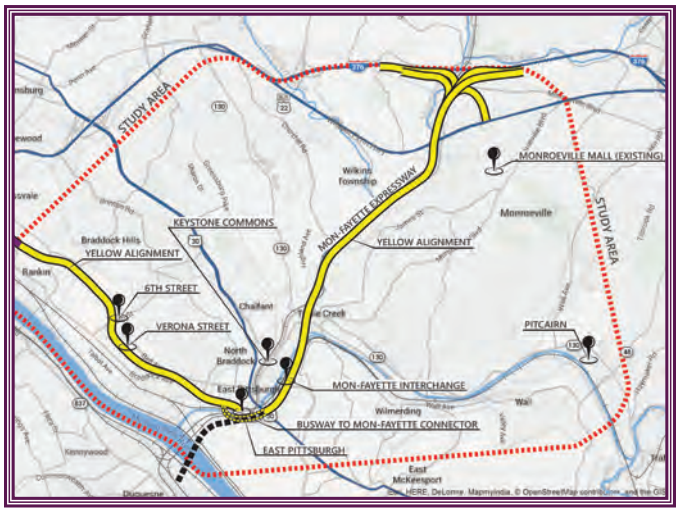
The Yellow Alternative consists of extending the East Busway that follows the same alignment as the Red Alternative from the existing Swissvale Station along the Norfolk Southern Railroad to Braddock Avenue. From Braddock Avenue busway service will access the Mon Fayette Expressway via the local roadway network and the proposed interchange of the Mon Fayette Expressway with East Pittsburgh/ McKeesport Boulevard. From the interchange, busway service extends to the Monroeville area via shared service on the Mon Fayette Expressway. The stops are the same as the Red Alternative.



Yellow Alternative with a Direct Connector to the Mon Fayette Expressway (Swissvale to Monroeville)

The Mon Fayette Direct Connector was developed to evaluate utilizing the PTC's proposed Mon Fayette Expressway without requiring bus service connection between the Busway Extension at Braddock Avenue and the Mon Fayette Expressway via the local roadway network.

The Mon Fayette Expressway Direct Connector Alternative consists of extending the East Busway that follows the same alignment as the Red Alternative from the existing Swissvale Station along the Norfolk Southern Railroad to Braddock Avenue. From Braddock Avenue busway service will reach the Mon Fayette Expressway via aerial ramp structures over the railroads and underneath the Westinghouse Bridge that tie directly to the Mon Fayette Expressway. The stops are the same as the Yellow Alternative.



Pitcairn

The location of a stop at Pitcairn is under consideration for the alternatives that may develop ridership along the existing service routes with connection to the busway extension. A dedicated busway to Pitcairn is not under consideration.

Conclusion

Alternatives Feasible for Further Consideration

Red Alternative

The Red Alternative may be considered as a phase of the busway extension that can provide service to Braddock, Turtle Creek and East Pittsburgh and allow for connection to additional phases of construction for the busway to reach Monroeville. Stop locations associated with the Red Alternative that are feasible for further consideration include a stop in Braddock, Keystone Commons, the proposed Mon Fayette Expressway Interchange, Monroeville Mall, and Pitcairn. The stop location at East Pittsburgh, near the Edgar Thomson Works is not feasible.

Yellow Alternative – Mon Fayette Expressway

The Yellow Alternative, utilizing the Mon Fayette Expressway to provide service to Monroeville is feasible for further consideration. Access to the Mon Fayette Expressway would be via the proposed interchange with East Pittsburgh/ McKeesport Boulevard. Bus service will connect to the Mon Fayette Expressway via the local roadway network at Braddock Ave. Bus service will also have access to Business Route 22 and the Monroeville Mall via connector ramps for the Mon Fayette Expressway. The stop locations for the Yellow Alternative are the same as the Red Alternative. The Mon Fayette Expressway does not require additional capital costs. The evaluation of dedicated bus lanes along the Mon Fayette Expressway may be considered and evaluated based upon potential time savings of bus service.

Yellow Alternative with a Direct Connector to the Mon Fayette Expressway

The Yellow Alternative, utilizing the Mon Fayette Expressway to provide service to Monroeville may also consider providing a direct connection between the busway extension at Braddock Avenue and the Mon Fayette Expressway via a set of direct connection ramps. The capital cost to construct the direct connection ramps is approximately $95 Million (2016) and requires an evaluation of potential time savings for bus service compared to utilizing the existing roadway network to provide access. The stop locations that are feasible are the same as the Yellow Alternative (Figure ES-1).

The most feasible alternative to extend the East Busway from the Swissvale Station to Monroeville is comprised of the Red Alternative from the Swissvale Station to Braddock Ave near East Pittsburgh and the Yellow Alternative (The Mon Fayette Expressway) from East Pittsburgh to Monroeville. A direct connection from the end of the Red Alternative at Braddock Ave to the Mon Fayette Expressway is a potential consideration. The most likely station locations are in Braddock, Keystone Commons (East Pittsburgh) and at the Monroeville Mall. The other feasible station locations that were evaluated may be considered in the future based upon further detailed study.

The following represents the estimated costs of the most likely feasible alternatives:

Table ES.1 - Overall Summary of Costs for Feasible Alternatives

Estimate Cost Summary	2016 Dollars	2026 Dollars*
Swissvale to East Pittsburgh (Red Alternative)		
Swissvale to East Pittsburgh Busway	$343 Million	$508 Million
Braddock Station	$10 Million	$14 Million
East Pittsburgh Station with Parking Facility	$18 Million	$27 Million
Total Red Alternative	**$371 Million**	**$549 Million**
East Pittsburgh to Monroeville (Yellow Alternative)**		
Mon Fayette Expressway Direct Connect	$95 Million	$141Million
Monroeville Mall Station	$10 Million	$14 Million
Total Yellow Alternative	**$105 Million**	**$155 Million**
Total Swissvale to Monroeville using Mon Fayette	**$476 Million**	**$704 Million**

*Assumes a 4% per year rate of inflation

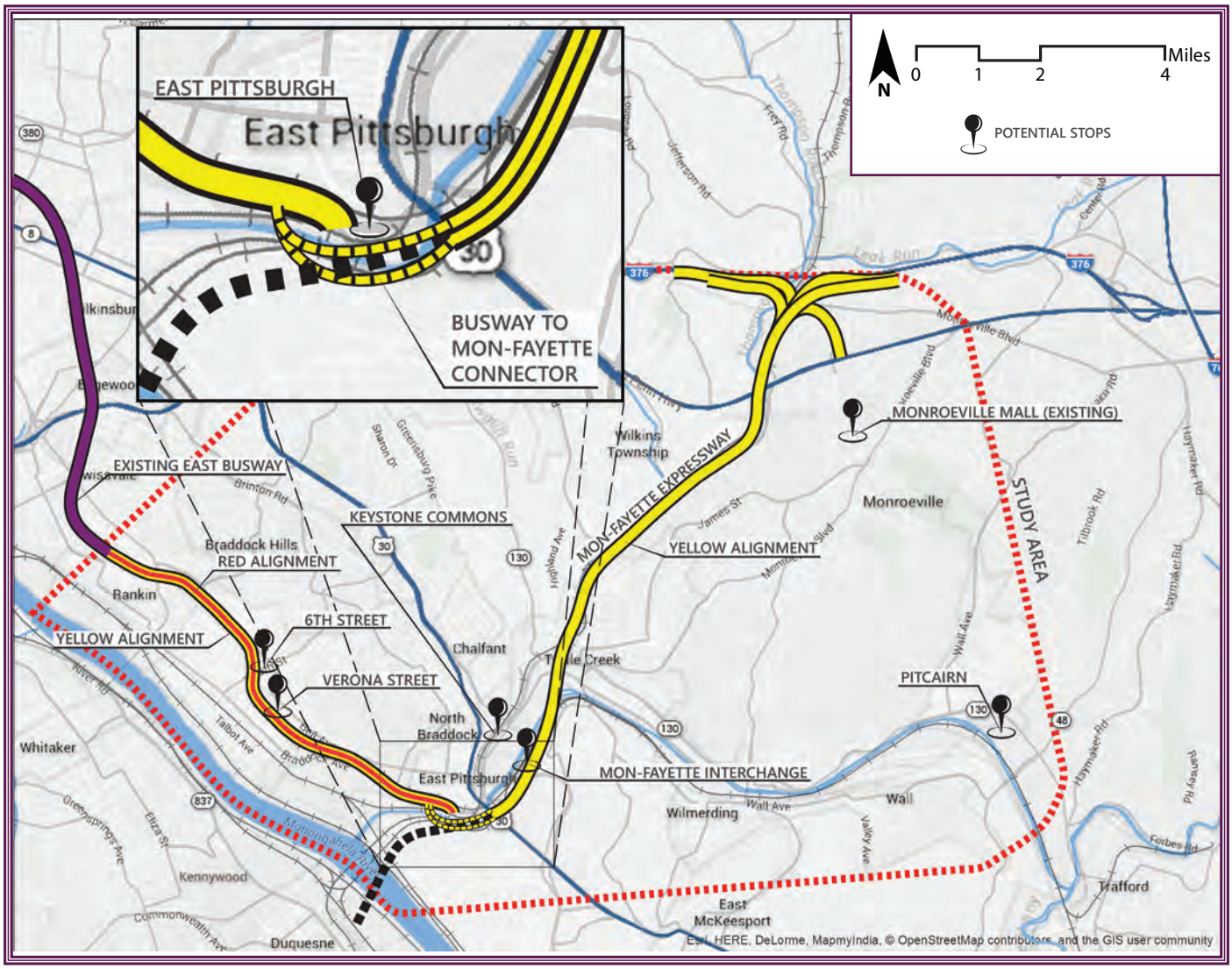
**Assumes the future Mon Fayette without any other additional improvements

A timeline for development of the extension of the East Busway is comprised of several major planning, engineering and construction activities as follows:

Table ES.2 - Estimated Timeline

Phase	Duration	Start	End
Programming of Project/ Design RFP	1 Year	2017	2018
Environmental Study	2 Years	2018	2020
Preliminary and Final Design	2 Years	2020	2022
ROW/Property Acquisition	2 Years	2021	2023
Construction	3 Years	2023	2026
Overall Schedule	9 Years	2017	2026

Figure ES.1 - Alternatives Feasible for Further Consideration



Alternatives Not Feasible for Further Consideration

Orange Alternative

The orange alternative is not considered feasible for further consideration due to capital cost and constructability issues associated with the tunnel that is needed to reach Keystone Commons.

Green Alternative

The Green Alternative is not considered feasible for further consideration due to the capital cost and constructability issues associated with the structures required to traverse the railroads at the Westinghouse Bridge, the potential alignment conflict with the proposed Mon Fayette Expressway and the lack of access to the roadway network in the Borough of Turtle Creek.

Pink Alternative

The Pink Alternative is not considered feasible for further consideration due to the capital cost and constructability issues associated with the tunnel that is needed to reach the Borough of Turtle Creek as well as the capital costs for the structure that will be required along the Union Railroad and the lack of access to the roadway network in the Borough of Turtle Creek.

Blue Alternative

The Blue Alternative is not considered feasible for further consideration due to the issues associated with the Green and Pink Alternatives as well as the capital cost of constructing the busway through the Thompson Run Valley and the associated connections that would be required at Monroeville. The Blue Alternative also occupies the same footprint as the proposed Mon Fayette Expressway through the Thompson Run Valley

Introduction

The Port Authority's East Busway has served the Eastern suburbs of Pittsburgh since first opening a 6.8 mile route from Pittsburgh to Wilkinsburg in 1983. In 2003, the East Busway was extended 2.3 miles to Swissvale and Rankin making the current length 9.1 miles. In recent years, significant development has occurred along the East Busway with new residential and commercial investments. Transit-oriented development has reshaped communities along the East Busway.

Goal of the Study

The goal of this feasibility study is to determine the viability of extending the East Busway from its current terminus at the Swissvale Station eastward to serve the communities of Braddock, East Pittsburgh, Turtle Creek, and Monroeville as well as points east of the study area.

Previous Studies

Several previous studies have been developed for transportation projects in this area.

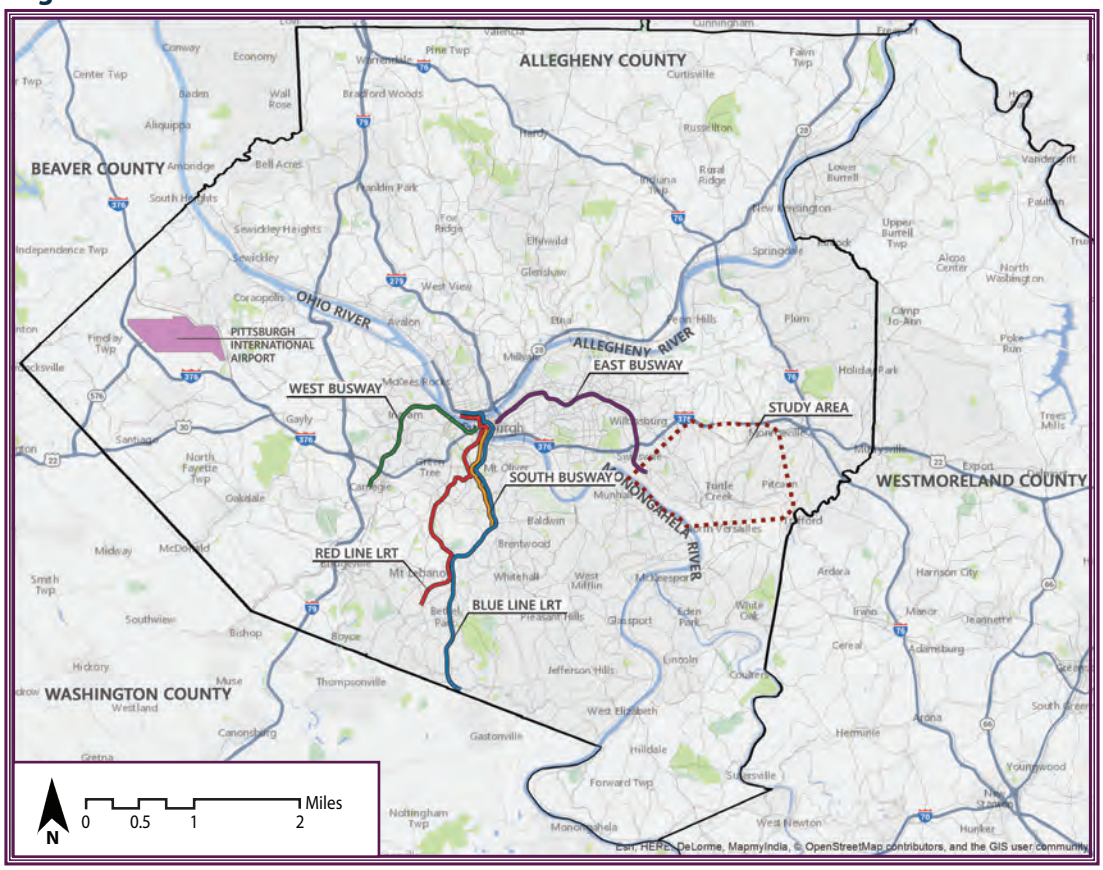
- 2002 Mon Fayette Expressway Environmental Impact Statement, PA Turnpike Commission (PTC)
- 2003 Eastern Corridor Transit Study, Southwestern Pennsylvania Commission (SPC), Port Authority of Allegheny County (PAAC) and Westmoreland County Transit Authority (WCTA)
- 2006 Eastern Corridor Transitional Analysis to Locally Preferred Alternatives, SPC, PAAC and WCTA
- 2007 Mon Fayette Expressway Design Field View Plans, PTC

These studies provide background, context and significant information that has been developed within this study area over the past 15 years.

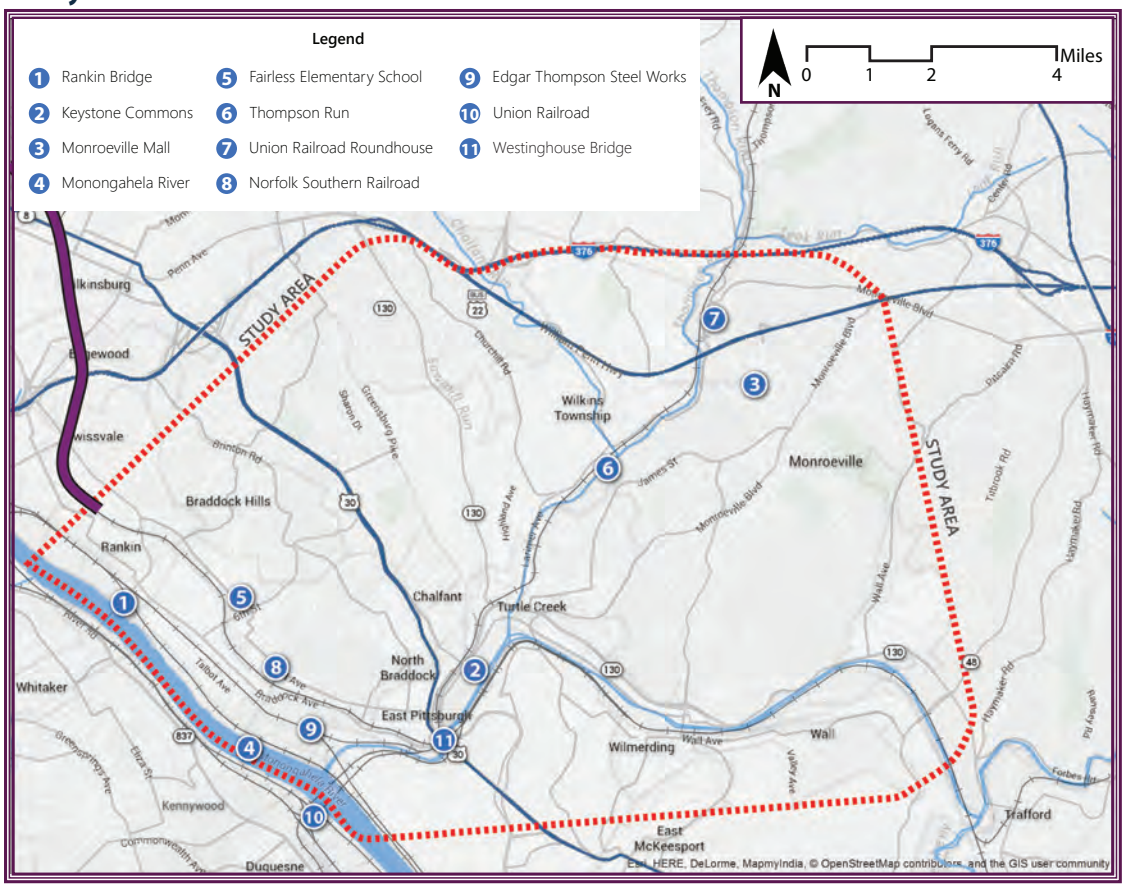
Study Area

The East Busway Extension Corridor encompasses the area from the Swissvale Station, the current eastern terminus, to Monroeville in the north and North Braddock/East Pittsburgh to the east with Pitcairn as a consideration for service improvements. The Monongahela River forms the southern boundary of the study area, while I-376/ Parkway East comprises the northern boundary. The length of the corridor is approximately 6.5 miles.

Regional Context



Study Area



Existing Conditions

Infrastructure

This study area has numerous roads, railroads, streams, and industrial sites. Additionally the PTC recently (January 2016) re-started the final design of the Mon Fayette Expressway within the study area. An opportunity to develop a busway extension east of the Swissvale Station to North Braddock/ East Pittsburgh and then north toward Monroeville exists within this study area. The alternatives will be developed and evaluated to determine the most feasible and cost effective means for extending the busway and the right of way that may be required to extend the busway.

Roadway Functional Classification

Interstate and Other Limited Access Freeways

Provides limited access facilities.

Urban Principal Arterials

- Serves major centers of activity and carries high proportion of area travel even though it constitutes a relatively small percentage of the total roadway network.
- Integrated both internally and between major rural connections.
- Carries most trips entering and leaving the area and serves intra area travel.
- Provides continuity for rural arterials.
- Spacing related to trip-end density characteristics.

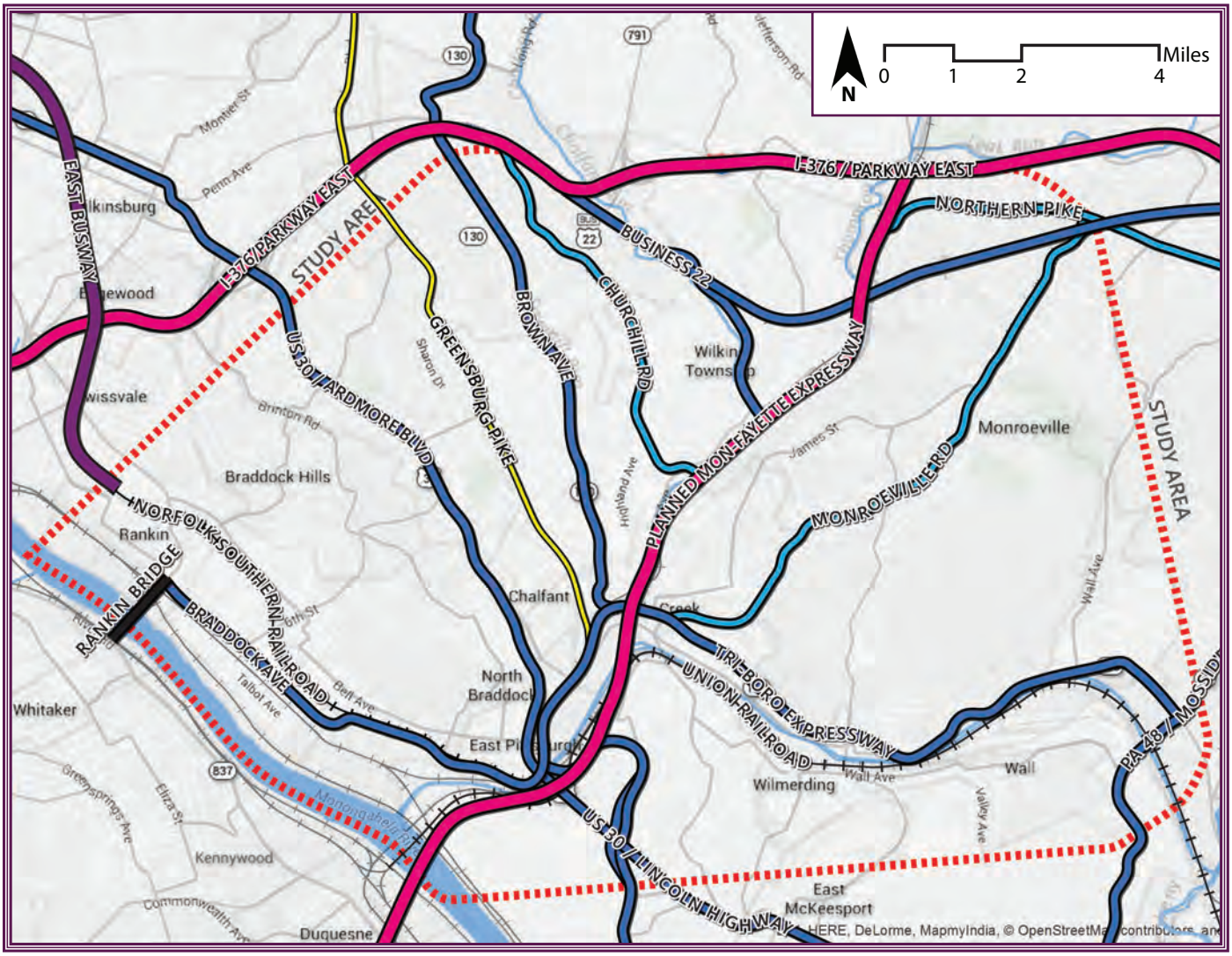
Urban Minor Arterials

- Interconnects with and augments principal arterials.
- Accommodates trips of moderate length.
- Distributes travel to areas smaller than identified with higher systems.
- Places emphasis on land access and offers lower traffic mobility.
- Spacing normally not more than 1 mile.

Urban Collectors

- Comprises all facilities not in one of the higher systems.
- Permits direct access to abutting lands and connects to higher systems.
- Discourages through-traffic movement

Existing Infrastructure



Legend

- Urban Interstate
- Urban Principal Arterial
- Urban Collector
- Urban Minor Arterial
- Railroad
- Bridge

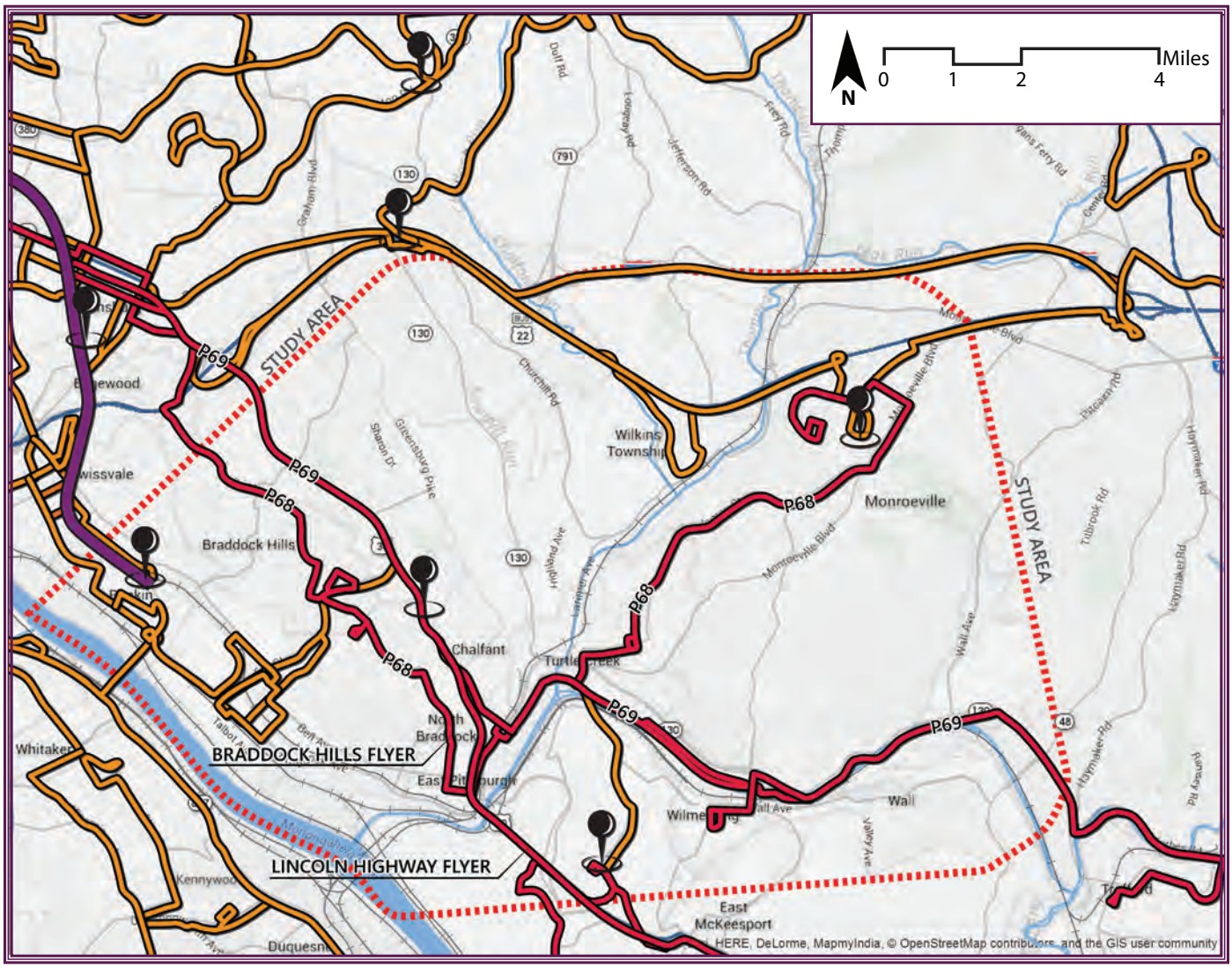
Transit Service

The PAAC transit service within the study area is comprised of bus routes that serve the eastern suburbs of Pittsburgh and the Monongahela Valley. Bus routes that reach Monroeville, Pitcairn, Turtle Creek, Glassport, Braddock and East Pittsburgh all utilize the roadway network within the study. The alternatives to extend the busway and the transit service throughout the study area will be evaluated to determine the overall effect on ridership and potential stop locations.

Heritage Community Initiatives operates transit service in the municipalities of Monroeville, Turtle Creek, East Pittsburgh, Pitcairn, East McKeesport, North Versailles, White Oak, and McKeesport. This transit service provides connections to the PAAC routes in the study area.

Westmoreland County Transit Authority (WCTA) Route 2F, Latrobe to Pittsburgh Flyer, that uses Route 22 may be a candidate to be rerouted onto Business Route 22 through Monroeville and onto the East Busway via the Mon Fayette Expressway.

Existing Transit Service



Legend

- Existing Busway - P1 and P3 service Swissvale Park and Ride
- Existing Port Authority Transit Routes
- Affected Existing Port Authority Transit Routes
- Existing Station/Park and Ride

Environmental Features

The alternatives are evaluated by considering a full range of environmental features developed through secondary source information, previous studies, and limited field reconnaissance.

Streams and Wetlands

Several watercourses lie within the study area including Chalfant Run, Leak Run, Thompson Run, and Turtle Creek. All of these streams are Warm Water Fisheries and would not likely require in-stream construction restrictions. Coordination with the Pennsylvania Department of Environmental Protection (PA DEP) and the United States Army Corps of Engineers (USACOE) will be required prior to construction to determine any mitigation measures.

Wetlands in the study area are associated with Turtle Creek and Thompson Run. Impact to these resources will require permits and potentially mitigation. It is likely that impacts to these resources will occur due to the proposed Mon Fayette Expressway. It is less likely that impacts to streams and wetlands will occur along the Busway Extension from Swissvale to Braddock Ave. as the alignment is along the uphill side of the railroad. There may be localized areas of this alignment that impact streams or wetlands and this will need to be investigated in detail during the development of preliminary engineering and the environmental document.

Floodplains

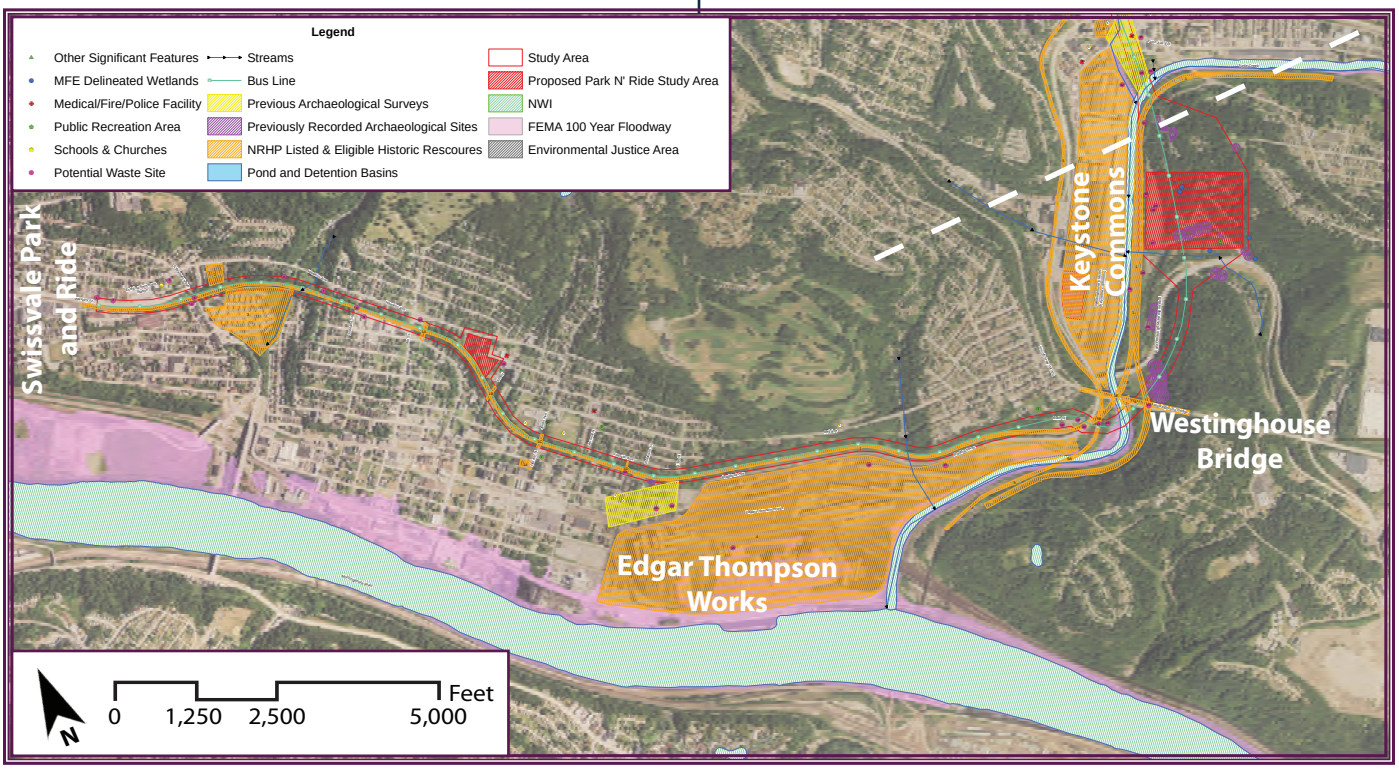
There are defined 100 year floodplains associated with the streams in the study area that will require evaluation during the development of preliminary design and the environmental document.

Threatened and Endangered Plants and Animals

The Peregrine Falcon, Warmouth (freshwater fish), and the Lilliput (freshwater mussel) are identified in the study area and will require evaluation during development of the preliminary engineering and the environmental document.

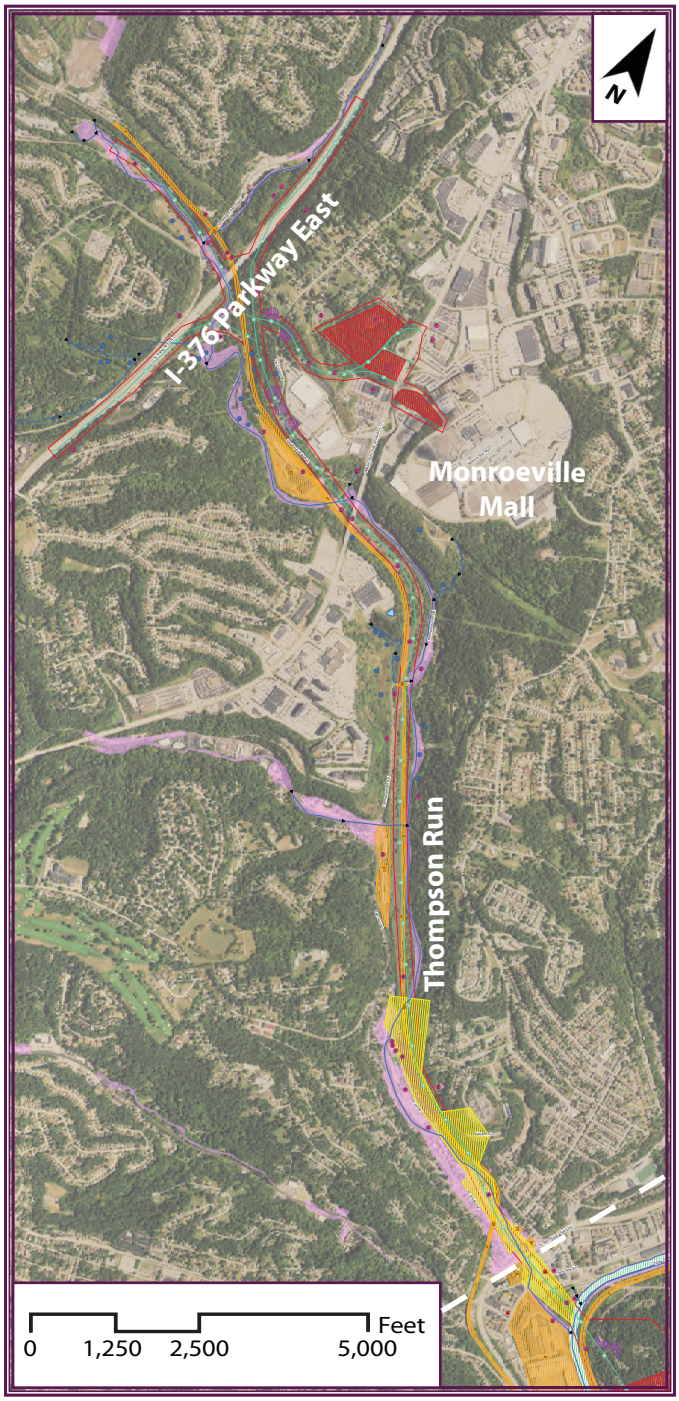
Coordination with state and federal environmental resource agencies will be required to identify threatened and endangered species and their habitats. Appropriate mitigation measures will need to be considered based on potential impacts.

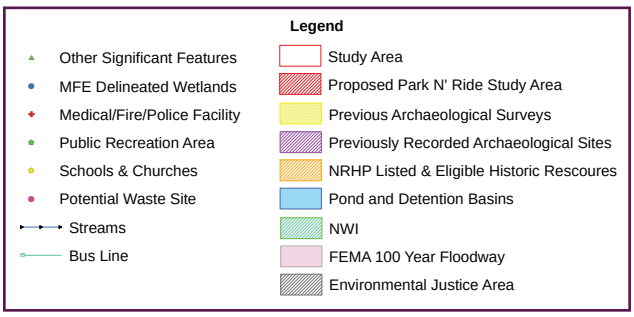
Environmental Features A



The detailed plan maps are included in Appendix B.

Environmental Features B





The detailed plan maps are included in Appendix B.

Historic Resources

Historic Resources are present throughout the study area. Field reconnaissance verified that the Busway Extension is almost entirely located in communities over 45 years old, much of which has never been evaluated for eligibility on the National Register of Historic Places. The railroads in the area are also eligible as historic districts and will require evaluation, including contributing elements such as bridges and underpasses. Coordination with the Pennsylvania State Historic Preservation Office (SHPO) will be required to identify individual sites, historic districts and potential effects and mitigation.

Archaeological Resources

Pennsylvania Archaeological Site Survey (PASS) forms and the Mon Fayette Expressway archaeological surveys have recorded a large number of historic archaeological sites. These sites, if impacted by the Busway Extension will require further evaluation during preliminary engineering and development of the environmental document.

If floodplains associated with Turtle Creek and Thompson Run are impacted additional geomorphological testing may be required. Even though there may be Historic Archaeological and Archaeological sites in the study area, these issues are not anticipated to be "show stoppers" for developing the Busway Extension.

Coordination with the SHPO will also be required for Archaeological Resources to determine potential effects and mitigation.

Hazardous and Residual Wastes – Potentially Contaminated Areas

Due to the highly industrialized development of the study area there is a high potential for encountering areas of potential contamination. Review of existing data and the field reconnaissance identified areas of concern associated with automotive dealerships and service stations, businesses, industrial sites, abandoned and active gas wells, railroad corridors and areas of miscellaneous fill. These areas will require thorough investigation during the development of preliminary engineering and the environmental document.

Environmental Justice

Significant portions of the study area lie within an Environmental Justice Area. The boroughs of Braddock, North Braddock, East Pittsburgh, and North Versailles will require an Environmental Justice Analysis to determine if there are disproportionate and adverse effects on minority and/or low income groups.

Parks and Recreational Areas

Several park and recreational areas are located in the study area. Any temporary or permanent impact to these facilities will require coordination and mitigation that will need to be evaluated during the development of the preliminary engineering and the environmental document.

Public Facilities

Numerous public facilities such as churches, emergency service providers, fire departments, hospitals and schools are located in the study area. Coordination will need to be conducted if the project affects these resources. As this project is considered in further detail, a complete environmental investigation consisting of an Environmental Assessment or an Environmental Impact Statement will need to be developed.

Population

The alignments and stop locations for the alternatives are evaluated based upon the population and population density that can be served by an alternative. Walking distances as well as the potential for park and ride lots are taken into account. The total population of the study area for Year 2015 is estimated at 87,266 by the Southwestern Pennsylvania Commission (SPC). In particular, Monroeville has a third of the study area population at 28,869. Other municipalities with significant populations include North Versailles (10,356), Swissvale (9,364) and Forest Hills (6,580). Municipalities with lower population estimates include Chalfant (881), East Pittsburgh (1,565), Rankin (2,089), Wilmerding (2,029) and Braddock (2,193). SPC population projections for the study area indicate a modest growth to 91,619 (5% growth from 2015) in 2045. This represents an increase from 2015 to 2035 of 4,382 persons.

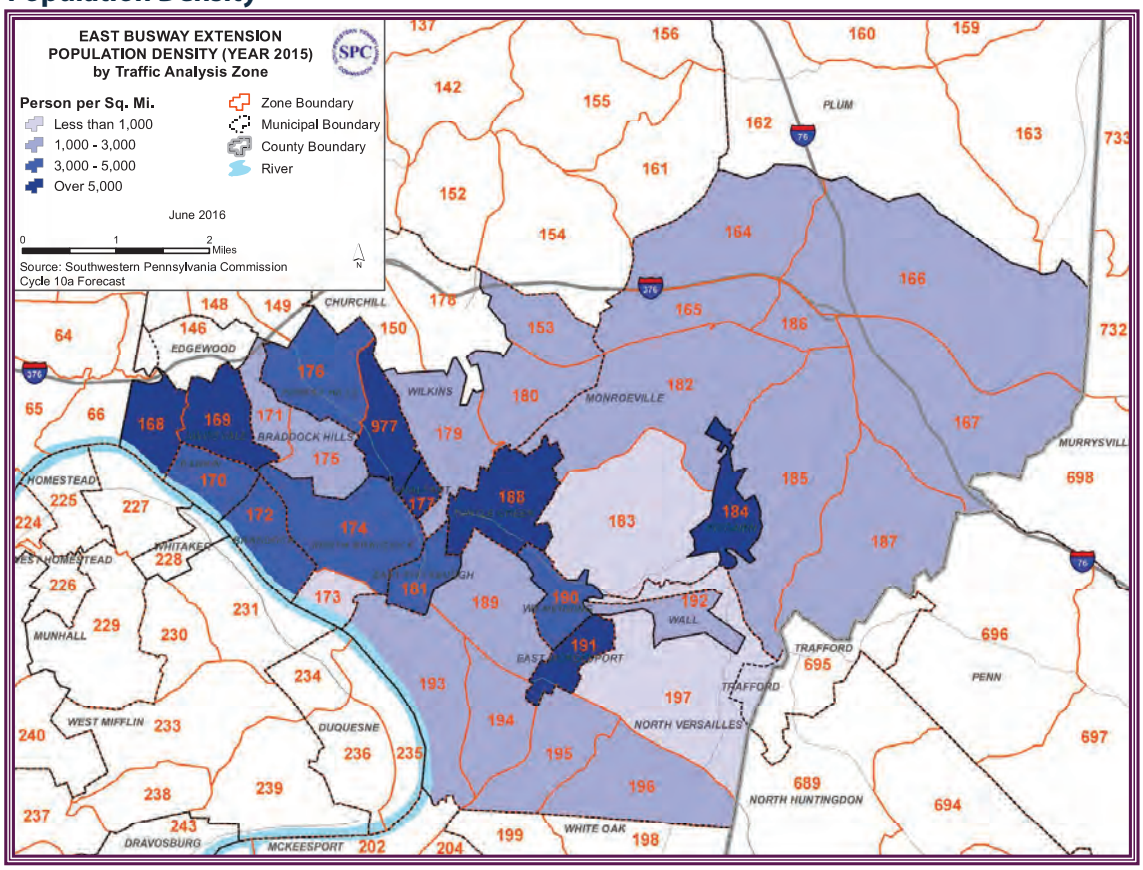
Population density indicates different municipalities in the higher and lower ranges compared to the straight population estimates discussed above. In the accompanying figure, SPC indicates the population density for Year 2015 for analysis zones in the study area. The average population density for the study area is 4065 person / square mile. The higher population densities occur in Swissvale (7,705), Pitcairn (6,411), East McKeesport (5,980) and Chalfant (5,593). Lower population densities occur in North Versailles (1,267), Monroeville (1,460) and Braddock Hills (1,992).

Employment

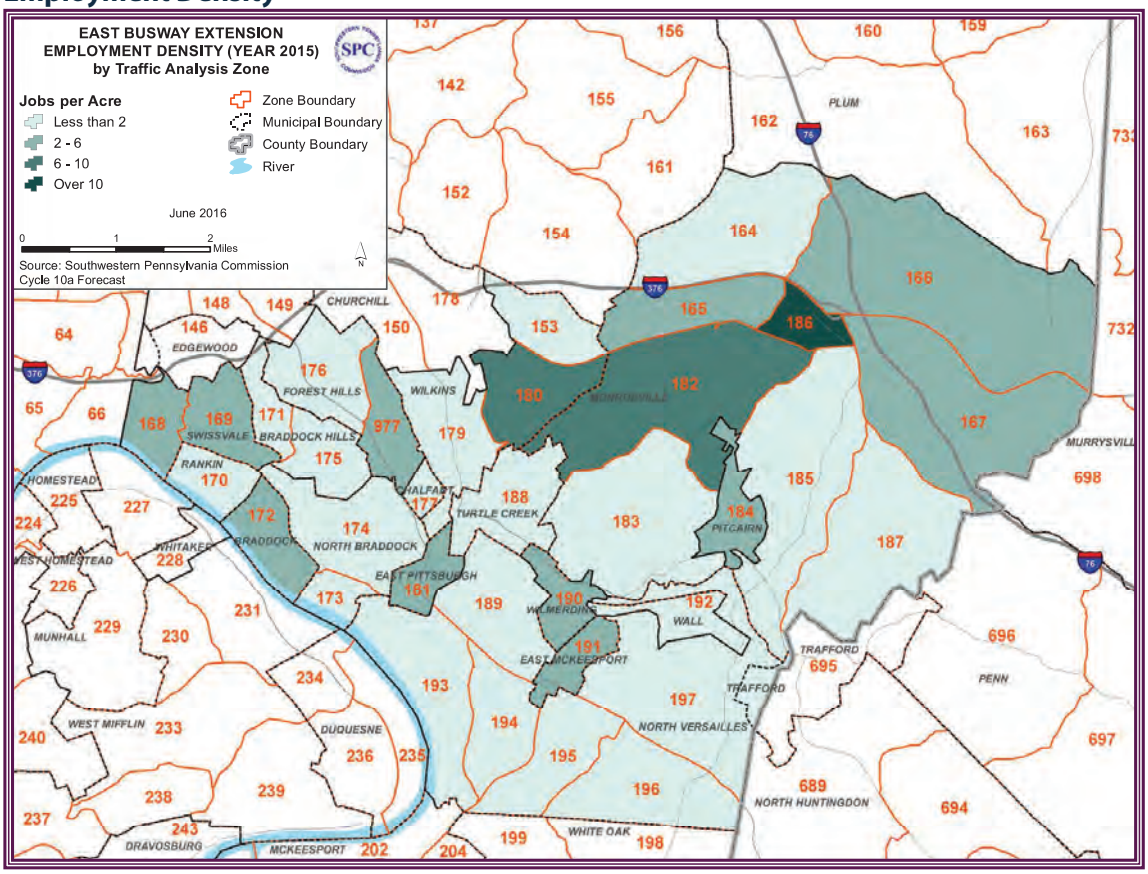
The employment and employment density is also considered when evaluating the alignments and stop locations for the alternatives. The total employment of the study area for Year 2015 is estimated at 57,461 by SPC. As with population, Monroeville has the largest employment base of 32,721 employees (approximately 57% of the study area employees). Other municipalities with significant employment include North Versailles (4,902), Wilkins (4,797) and Swissvale (2,784). Municipalities with lower employment estimates include Chalfant (117), Rankin (427), Braddock Hills (611) and Braddock (612). One note with Braddock, although many people think the U.S. Steel Edgar Thomson Works is located in Braddock, it is actually located in North Braddock. SPC employment projections for the study area indicate a modest growth to 64,999 (13% growth from 2015) in 2045. This represents an increase from 2015 of 7,538 employees.

As with population density, employment density indicates different municipalities in the higher and lower ranges compared to the straight population estimates discussed above. In the accompanying figure, SPC indicates the employment density for Year 2015 for analysis zones in the study area. The average employment density for the study area is 2.7 jobs / square mile. The higher employment densities occur in Wilmerding (6.0), East McKeesport (4.4) and Pitcairn (4.0). As a whole, Monroeville has an employment density of 2.6 jobs/acre, however, there are subareas in the municipality that have much higher densities. Lower employment densities occur in North Versailles (0.9), Braddock Hills (1.0), Chalfant (1.2) and Rankin (1.3).

Population Density



Employment Density

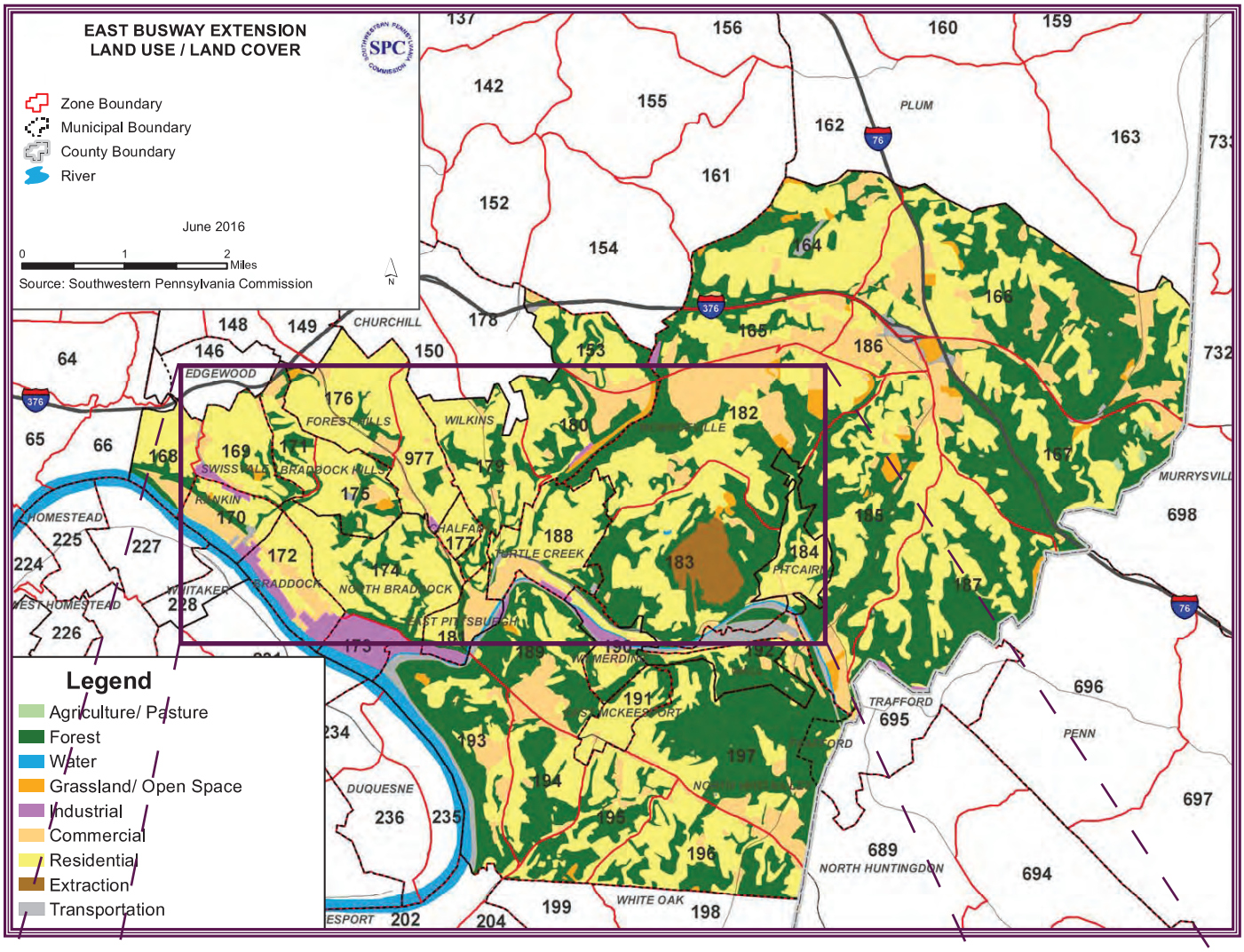


Land Use

The land use is a determining factor for the viability of the alignments and stop locations for the alternatives. The study area as a whole is a mix of urban and suburban areas. The southern portion of the study area is comprised of several waterways and railways which serve existing and extant commercial and industrial facilities that have dominated the landscape of the area since the late 1800s. The highway network diverges from the city through the landscape establishing the northern and eastern boundaries of the study. The western boundary of the project is the current terminus of the East Busway at the Swissvale Station which serves the surrounding residential area and as a park and ride lot. Residential, commercial and industrial sites are commingled throughout the study area in a well-established land use pattern.

The total land area in the study area, as shown in the accompanying figure, is approximately 25,900 acres. Of that, approximately 38% is forested. Other major categories include 42% residential, 12% commercial and 2% industrial.

Land Use


EAST BUSWAY EXTENSION
LAND USE / LAND COVER
SPC
Zone Boundary
Municipal Boundary
County Boundary
River
June 2016
0 1 2 Miles
Source: Southwestern Pennsylvania Commission
Legend
Agriculture/ Pasture
Forest
Water
Grassland/ Open Space
Industrial
Commercial
Residential
Extraction
Transportation
EDGEWOOD
FOREST HILLS
WILKINS
SWISSVALE
BRADDOCK HILLS
RANKIN
HOMESTEAD
WEST HOMESTEAD
WHITAKER
BRADDOCK
NORTH BRADDOCK
CHALFANT
TURTLE CREEK
PITCAIRN
EAST PITTSBURGH
WILMERDING
DUQUESNE
CHURCHILL
PLUM
MURRYSVILLE
TRAFFORD
PENN
NORTH HUNTINGDON
WHITE OAK

Alternatives

Corridors

The study area provides two general "corridors" for the development of alternatives to extend the East Busway. These corridors are complimentary to each other and are not exclusive. The existing East Busway follows the Norfolk Southern Railway corridor to its current end point at the Swissvale Station. An easterly route through the study area from the existing Swissvale Station toward Monroeville, exists along the Norfolk Southern Railway to the Westinghouse Bridge. A northerly route from the Westinghouse Bridge toward Monroeville exists through the Thompson Run valley.

Study Corridor 1

Study Corridor 1 lies in a West to East direction and is bounded by the Swissvale Station at the end of the existing East Busway to Braddock Avenue just east of the Edgar Thomson Works.

The alternatives considered to develop within Study Corridor 1 extend the East Busway along the Norfolk Southern Railway to East Pittsburgh at Braddock Avenue. The extension of the busway in this corridor focuses on an alignment parallel to the Norfolk Southern Railway that provides crossings of the side roads, valleys and drainage paths to the Monongahela River, widening of the railway shelf along the hillside addressing retaining wall and geotechnical issues associated with the hillside, right of way, and utilities through Braddock, North Braddock to East Pittsburgh.

The eastern terminus of Study Corridor 1 considers access to Keystone Commons, the Borough of Turtle Creek and the proposed Mon Fayette Expressway.

Study Corridor 2

Study Corridor 2 lies in a South to North direction and is bounded by the Westinghouse Bridge at the south end and the I-376/Parkway East at the north end.

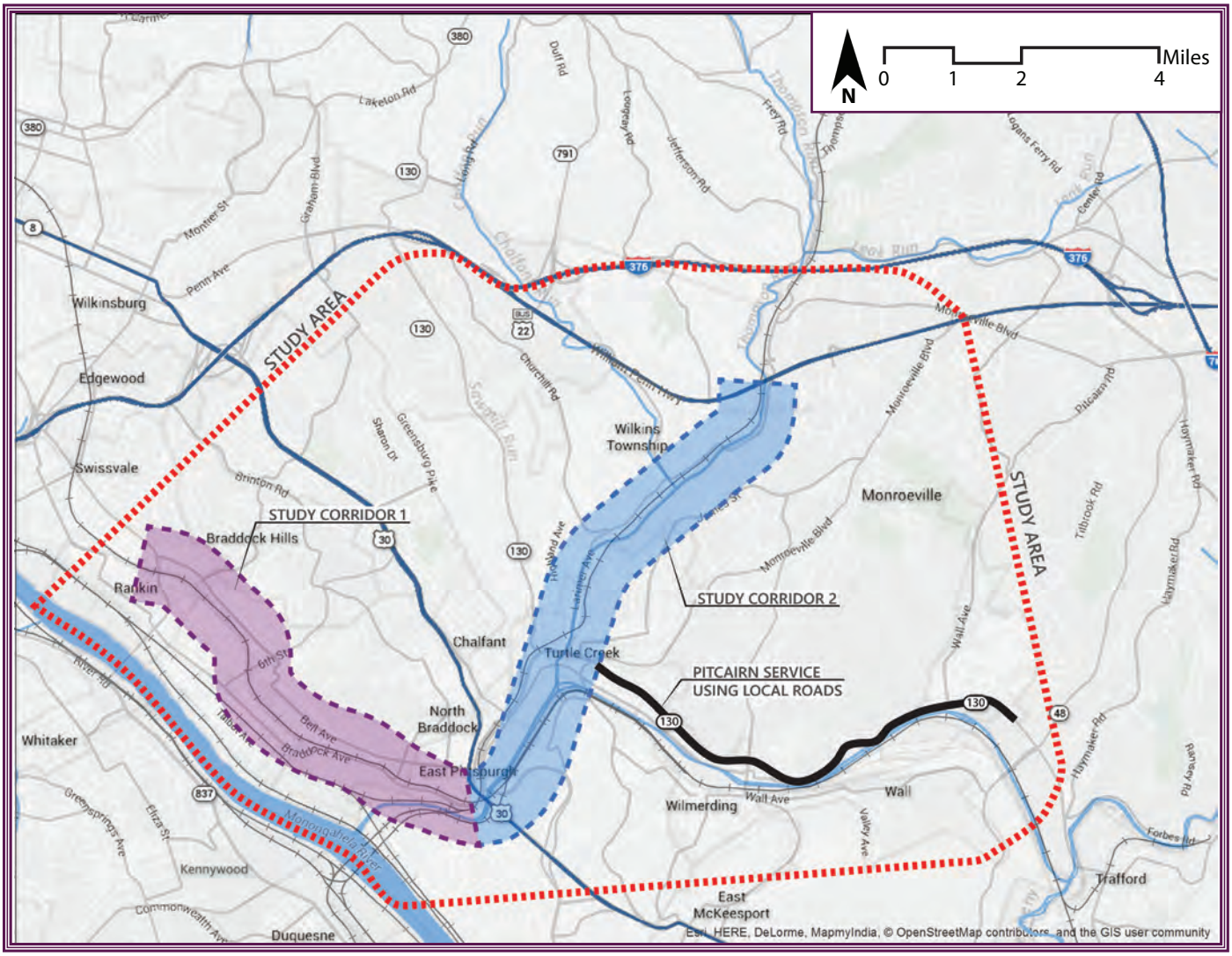
The alternatives to develop within Corridor Study 2 extend the Busway from the Westinghouse Bridge through the Borough of Turtle Creek along the Thompson Run Valley to Monroeville.

The major consideration within Study Corridor 2 is the proposed Mon Fayette Expressway. The development of alternatives within Study Corridor 2 consider the possibility of the Mon Fayette Expressway serving as a link for the Busway from the Turtle Creek area to Monroeville.

Westinghouse Bridge over Turtle Creek

The east end of Study Corridor 1 and the south end of Study Corridor 2 at the Westinghouse Bridge is the critical point in this evaluation of the feasibility of the alternatives to extend the East Busway. Regardless of the alternative under consideration, it eventually has to pass through or bypass the Westinghouse Bridge area. The existing infrastructure at the Westinghouse Bridge area is dense with multiple levels of structures carrying both roads and railroads, as well as Turtle Creek and the proposed Mon Fayette Expressway. This area is critical in shaping the evaluation and feasibility of the alternatives.

Study Corridors



Other Considerations

Pitcairn Service using Local Roads

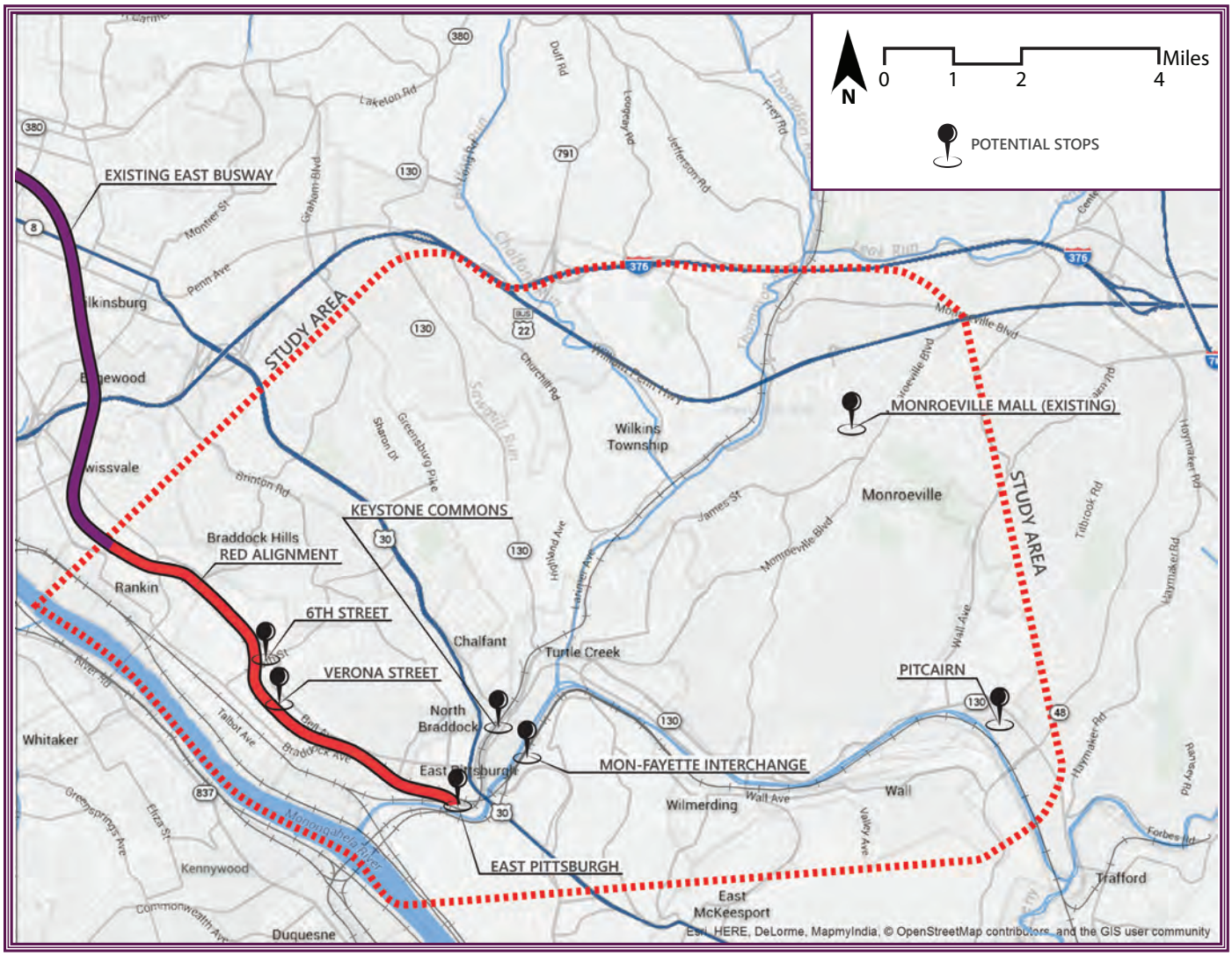
A third element under consideration within the study area, is the transit service between the Study Corridors and Pitcairn. Pitcairn is readily accessible from communities east of the study area. Improvements to stops at Pitcairn may provide an opportunity to improve ridership with transit service to Turtle Creek along the existing roadway network and then with access to the East Busway. While construction of a dedicated extension of the East Busway to Pitcairn is not the focus of this feasibility study, transit service to and from Pitcairn with the evaluation of a stop location near Pitcairn may reveal an additional benefit to the overall transit service in this area.

Alternatives

The alternatives that were considered lie within Study Corridors 1 and 2 and are comprised of alignments and stop locations. The alignments provide connection to the local infrastructure and transit service with consideration of the existing environmental features.

All potential stations, park and ride stops and general bus stops reviewed are labeled "stops" in this report. The Port Authority defines a transit station as a transit stop that is located along a fixed guideway and features more infrastructure and amenities than a typical on-street transit stop. In this report, some stops could be stations, depending on the alignment of the alternatives and amenities considered.

Red Alignment



The stop locations provide opportunity to develop ridership along the proposed alignment with respect to the local infrastructure as well as the walkability, population and employment densities, as well as land use.

Note: Not all feasible stop locations were evaluated. A full planning study of all feasible stop locations should be considered if the extension of the busway is pursued. The locations shown are not based on analysis, but are provided as examples.

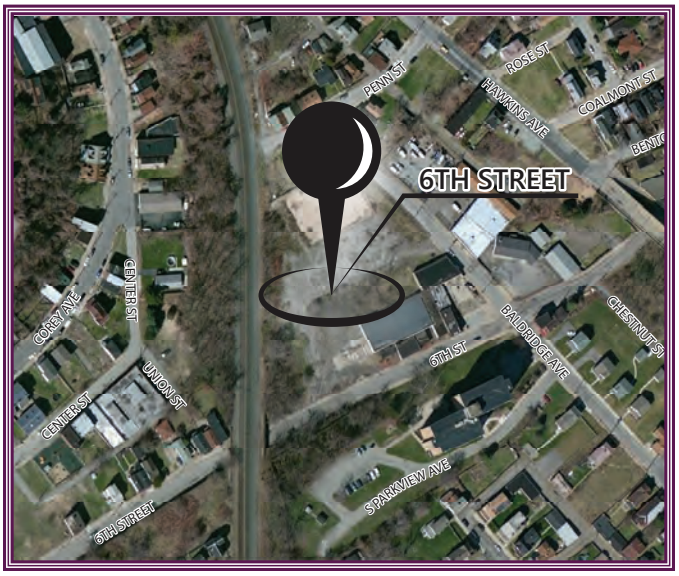
Alternatives Considered

Red Alternative – (Swissvale to Braddock)

Alignment

The alignment for the Red Alternative (2.9 miles) involves extending the East Busway to provide access to the local roadway network near East Pittsburgh and potential connection to the Mon Fayette Expressway. The alignment begins at the Swissvale Station and follows the Norfolk Southern Railway to Braddock Avenue just east of the Edgar Thomson Works. The busway alignment is located along the uphill (northern) side of the railway in a bifurcated manner requiring a retaining wall for the Busway as it is elevated above the railway. This configuration is similar to the alignment of the existing East Busway as it approaches its end point at the Swissvale Station.

6th Street



Verona Street

There are approximately 45 residential properties required for right of way and nine new bridges required to cross local side roads.

At the eastern end of the Red Alternative, the alignment requires a structure to cross over the Norfolk Southern Railway and a portion of the Braddock Avenue-Tri-Boro Expressway Bridge will need to be reconstructed to provide a connection to the alignment.

The connection of the alignment to Braddock Ave provides access for local bus service to Keystone Commons, Pitcairn and the proposed Mon Fayette Expressway with access to Monroeville.

Stop Locations

6th Street and Verona Street in Braddock

Note: Not all feasible stop locations in Braddock were evaluated. A full planning study of all feasible stop locations in the Braddock area should be considered if the extension of the busway is pursued. The locations shown are not based on analysis, but are provided as examples.

Potential stop locations are considered at the crossing of the alignment with 6th Street and Verona Street in Braddock. These locations provide access to the local roadway network in Braddock and are spaced near the mid-point of the alignment for the Red Alternative between the existing Swissvale Station and the end of the alignment at Braddock Avenue. The distance between the 6th Street stop and the Verona Street stop is approximately 1,700 feet.

The topography at the 6th Street stop site allows for at grade access to the local roadway network and requires minimal acquisition of right of way.

The Verona Street stop site has topography that allows for access to the local network that requires a significant number of occupied residences for acquisition of right of way.

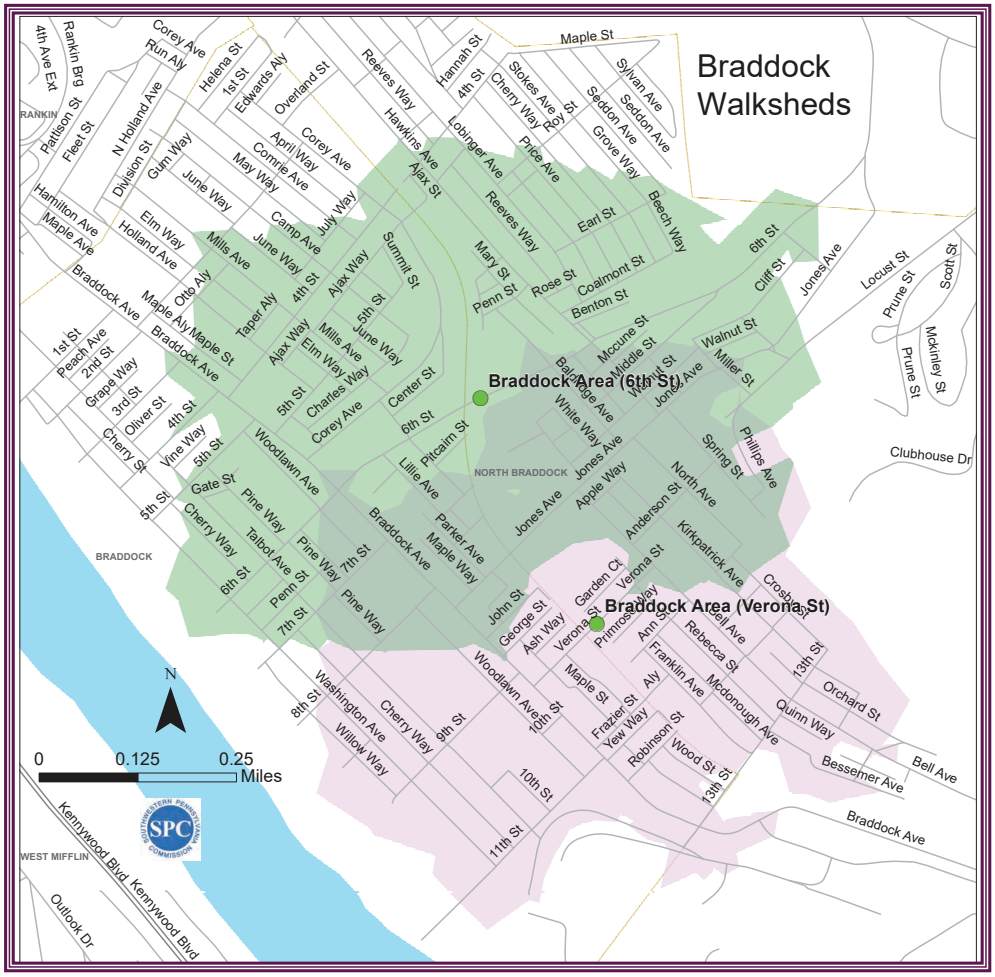
Walkability

Walkshed maps that estimate the area accessible to each stop within a ½ mile distance walking were generated by the SPC. This area for both the 6th Avenue and Verona Street locations are shown in the figure below.

From these walksheds, several walkability parameters were identified and calculated.

The 6th Street location has the following attributes:

- Walkshed Size: 0.408 sq. miles
- Walkshed Ratio: 52% (walkshed size/perfect walkshed size of 0.79 sq. mi)
- Number of Intersections: 175
- Presence of Sidewalks: High presence



Additionally, a walkability index score of 62 was obtained by from Walkscore.com. Walkscore.com is a private firm that generates a 0 to 100 score for a particular address based up its proximity to amenities.

The Verona Street location has the following attributes:

- Walkshed Size: 0.358 sq. miles
- Walkshed Ratio: 45%
- Number of Intersections: 127
- Presence of Sidewalks at Stop Location: High presence

Additionally, the Verona Street walkability index score is 61.

Population/Employment Density, TOD Typology

Based upon the walkshed area, population and employment density information was obtained from SPC for the year 2015 in the Traffic Analysis Zones covered by the walkshed. Density (Jobs + Resident per square mile) and a Jobs: Residents Ratio was calculated. These parameters were used to determine a Transit Oriented Development (TOD) Typology. To understand TOD opportunities and user relationships at each station in the Port Authority system, a typology was created in the Authority's publication, Transit-Oriented Development Guidelines (April 2016). The Jobs + Resident Density and Jobs: Residents Ratio was used to determine the TOD Typology for each stop location.

The 6th Street and Verona locations has the following attributes:

- Density (Jobs + Residents per sq. mi.): 7,589
- Jobs: Residents Ratio: 0.46
- TOD Typology: Transit Neighborhood

East Pittsburgh

"East Pittsburgh" – Intersection of Braddock Avenue with "Old" Braddock Ave and Main Street

A stop location at the East Pittsburgh end of the alignment near the intersections of Braddock Avenue with "Old" Braddock Ave and Main Street could provide access to the busway extension. The site topography has significant elevation differences from the Busway above the railroad to the south side of Braddock Avenue that requires long elevated ramps. Right of way acquisition is required in the area south of Braddock Avenue that is within the Edgar Thomson rail yard and is also an active industrial facility.

Walkability

From the walkshed shown as follows, the following parameters were identified and calculated.

- Walkshed Size: 0.16 sq. miles
- Walkshed Ratio: 20% (walkshed size/perfect walkshed size of 0.79 sq. mi)
- Number of Intersections : 54
- Presence of Sidewalks at Stop Location: Not present at stop location

Additionally, the East Pittsburgh location has a walkability index score is 34.

Keystone Commons

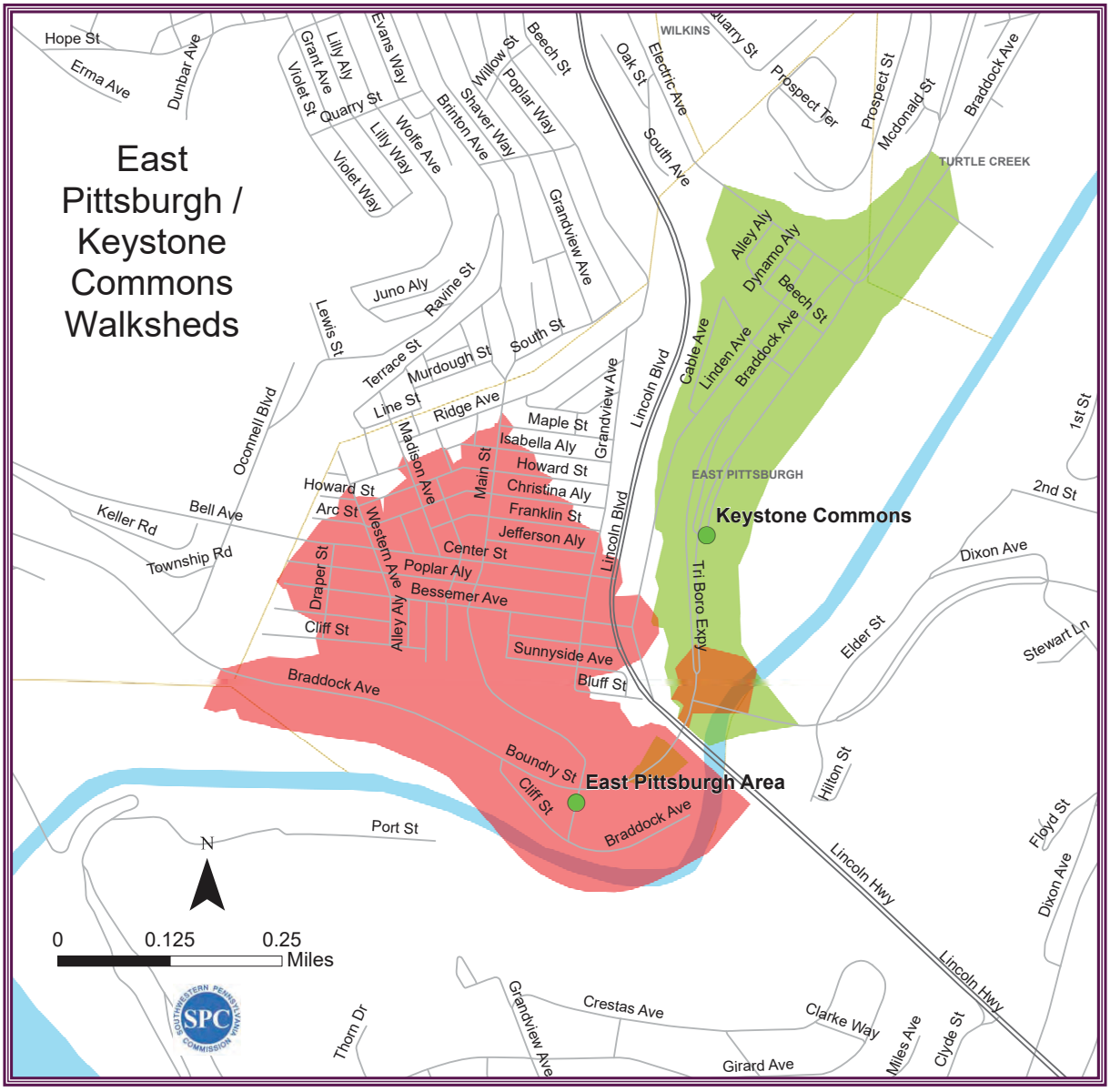
Population/Employment Density, TOD Typology

The East Pittsburgh stop location has the following attributes:

- Density (Jobs + Residents per sq. mi.): 6,618
- Jobs: Residents Ratio: 0.69
- TOD Typology: Suburban Neighborhood

Keystone Commons

A stop at Keystone Commons is a possible site that is not directly connected to the alignment but may be connected to the busway extension with service via the local roadway network. The Keystone Commons site represents the potential of a stop within the existing parking area for the facility which is a significant employment center with existing access to the local roadway network and transit service.



Walkability

From the walkshed shown above, the following parameters were identified and calculated.

- Walkshed Size: 0.096 sq. miles
- Walkshed Ratio: 12% (walkshed size/perfect walkshed size of 0.79 sq. mi)
- Number of Intersections : 24
- Presence of Sidewalks at Stop Location: Present

Additionally, the Keystone Commons stop location has a walkability index score is 29.

Population/Employment Density, TOD Typology

The Keystone Commons has the following attributes:

- Density (Jobs + Residents per sq. mi.): 6,618
- Jobs: Residents Ratio: 0.69
- TOD Typology: Suburban Neighborhood

Mon-Fayette Interchange

Mon Fayette Expressway Interchange with East Pittsburgh/McKeesport Boulevard

The proposed Mon Fayette Interchange with East Pittsburgh/ McKeesport Boulevard provides an opportunity to develop a site that is not directly connected to the alignment but may be connected to the busway extension with service via the local roadway network. This site represents the opportunity to develop transit ridership along the Mon Fayette Expressway with access to the local transit service and service to the extension of the East Busway at Braddock Avenue.

Walkability

The Mon-Fayette Interchange location has the following attributes:

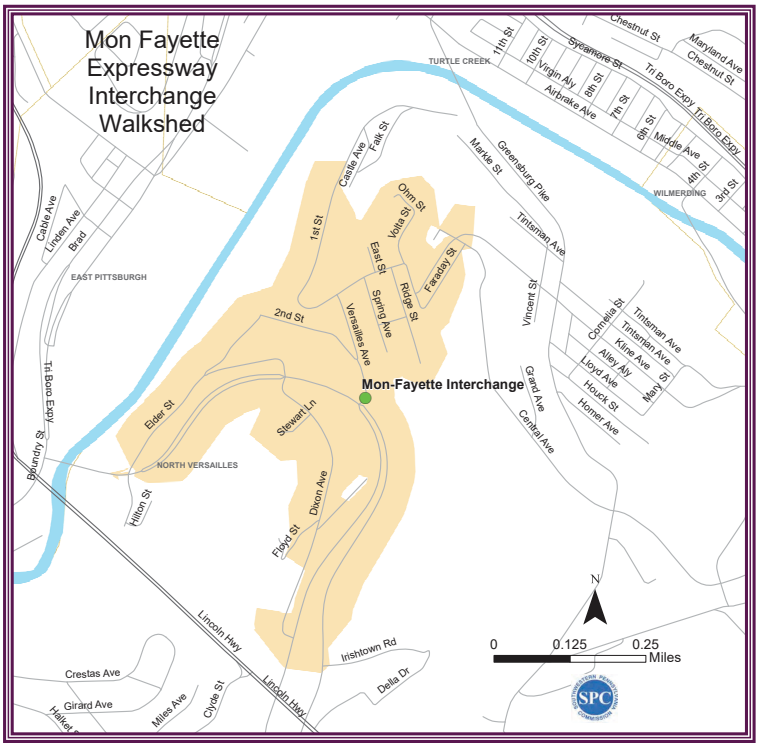
- Walkshed Size: 0.21 sq. miles
- Walkshed Ratio: 27% (walkshed size/perfect walkshed size of 0.79 sq. mi)
- Number of Intersections : 8
- Presence of Sidewalks at Stop Location: Not present

Additionally, the Mon-Fayette Interchange stop location has a walkability index score of 18.

Population/Employment Density, TOD Typology

The Mon-Fayette Interchange location has the following attributes:

- Density (Jobs + Residents per sq. mi.): 2,373
- Jobs: Residents Ratio: 0.62
- TOD Typology: Suburban Neighborhood



Pitcairn

Pitcairn

Pitcairn is a possible site that is not directly connected to the alignment but may provide an opportunity to develop ridership via the local roadway network with transit service to Turtle Creek and Keystone Commons and then with access to the East Busway extension.

Walkability

The Pitcairn location has the following attributes:

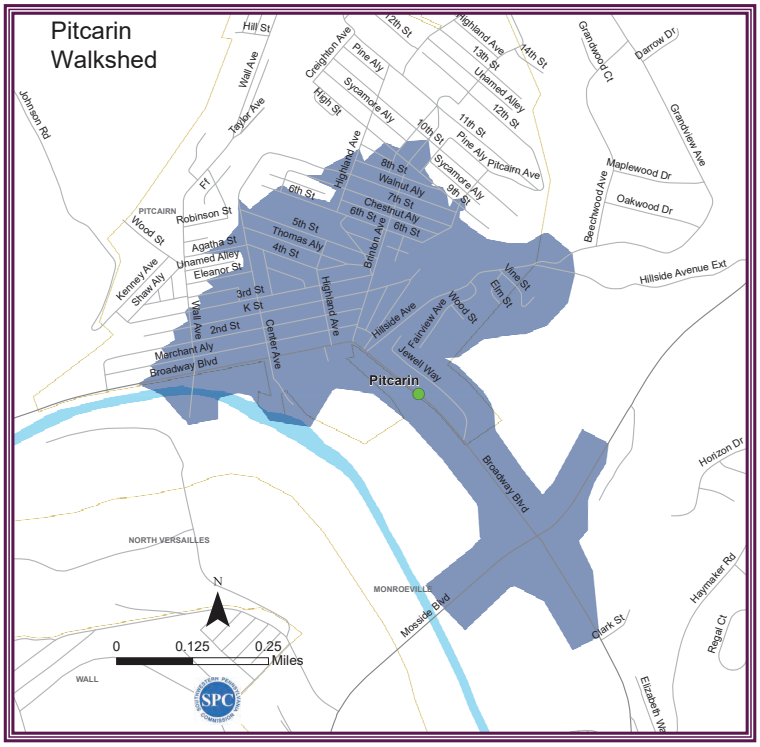
- Walkshed Size: 0.262 sq. miles
- Walkshed Ratio: 33% (walkshed size/perfect walkshed size of 0.79 sq. mi)
- Number of Intersections : 60
- Presence of Sidewalks at Stop Location: Not present

Additionally, the Pitcairn walkability index score is 47.

Population/Employment Density, TOD Typology

The Mon-Fayette Interchange location has the following attributes:

- Density (Jobs + Residents per sq.. mi.): 2329
- Jobs: Residents Ratio: 0.34
- TOD Typology: Suburban Neighborhood



Monroeville Mall

Monroeville Mall

The existing park and ride lot at the Monroeville Mall is potential site for consideration with the Red Alternative. This site is not directly connected to the alignment but may provide the opportunity to develop ridership via the local roadway network with transit service to the East Busway extension.

Walkability

From the walkshed shown as follows, the following parameters were identified and calculated.

- Walkshed Size: 0.16 sq. miles
- Walkshed Ratio: 20% (walkshed size/perfect walkshed size of 0.79 sq. mi)
- Number of Intersections: 27
- Presence of Sidewalks at Stop Location: Not present

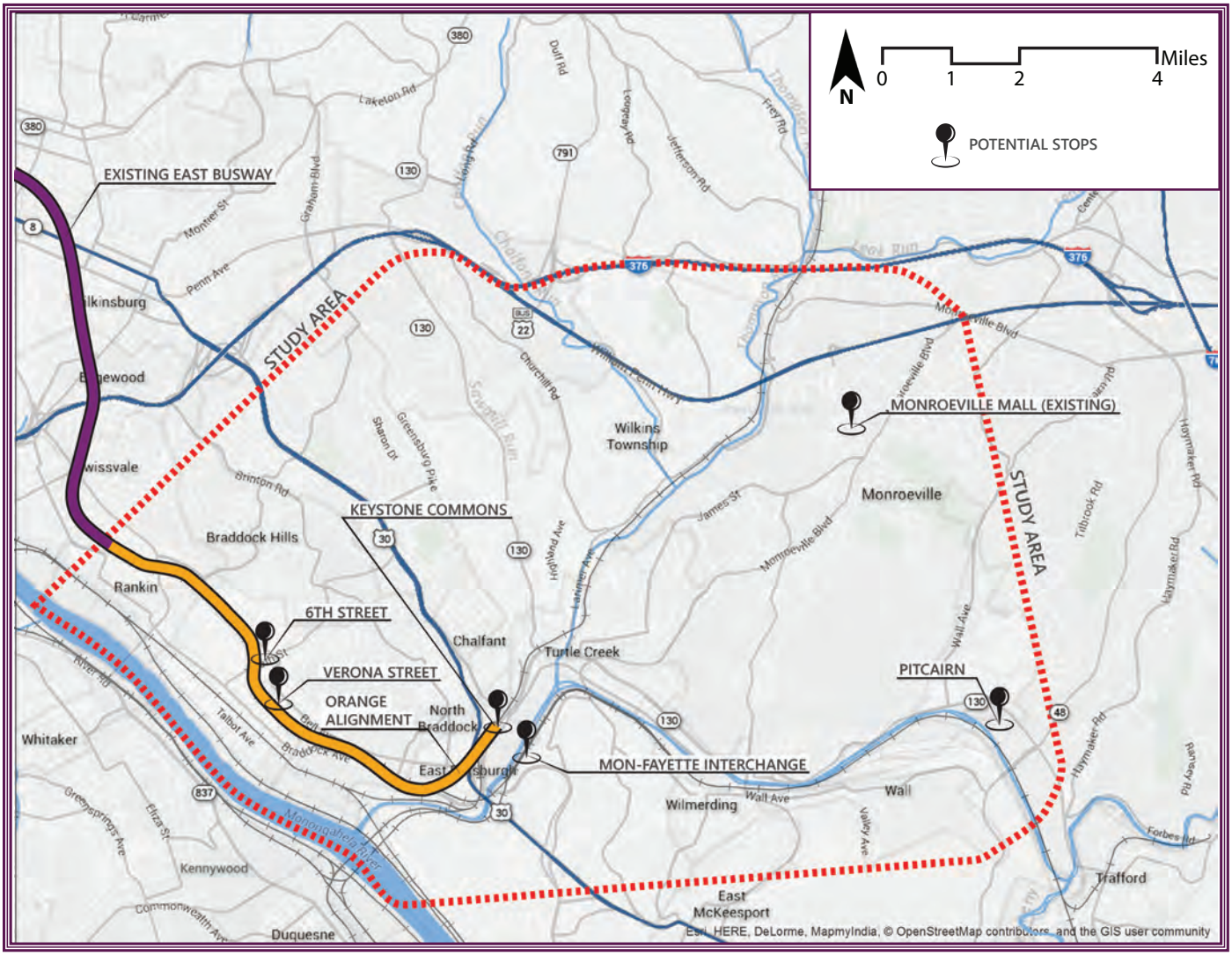
Additionally, the Monroeville Mall location walkability index score is 40.

Population/Employment Density, TOD Typology

The Monroeville Mall location has the following attributes:

- Density (Jobs + Residents per sq. mi.): 6084
- Jobs: Residents Ratio: 2.22
- TOD Typology: Suburban Employment

Orange Alignment



Orange Alternative – (Swissvale to Keystone Commons)

Alignment

The alignment for the Orange Alternative (3.2 miles) involves providing direct access of the East Busway extension from the existing Swissvale Station to Keystone Commons.

The Orange Alternative follows the same alignment as developed for the Red Alternative from Swissvale to East Pittsburgh where it diverges and takes a northerly path to provide direct access to Keystone Commons.

A tunnel under East Pittsburgh is required to achieve this direct access to Keystone Commons. The tunnel underneath East Pittsburgh is necessary for the alignment to reach the Keystone Commons while maintaining a reasonable profile grade for the alignment.

While achieving a direct access to Keystone Commons, the alignment does not provide a connection to Braddock Avenue as did the alignment for the Red Alternative. Therefore, access to the local roadway network, the Mon Fayette Expressway and the local transit service would be from the busway connection to Keystone Commons.

Stop Locations

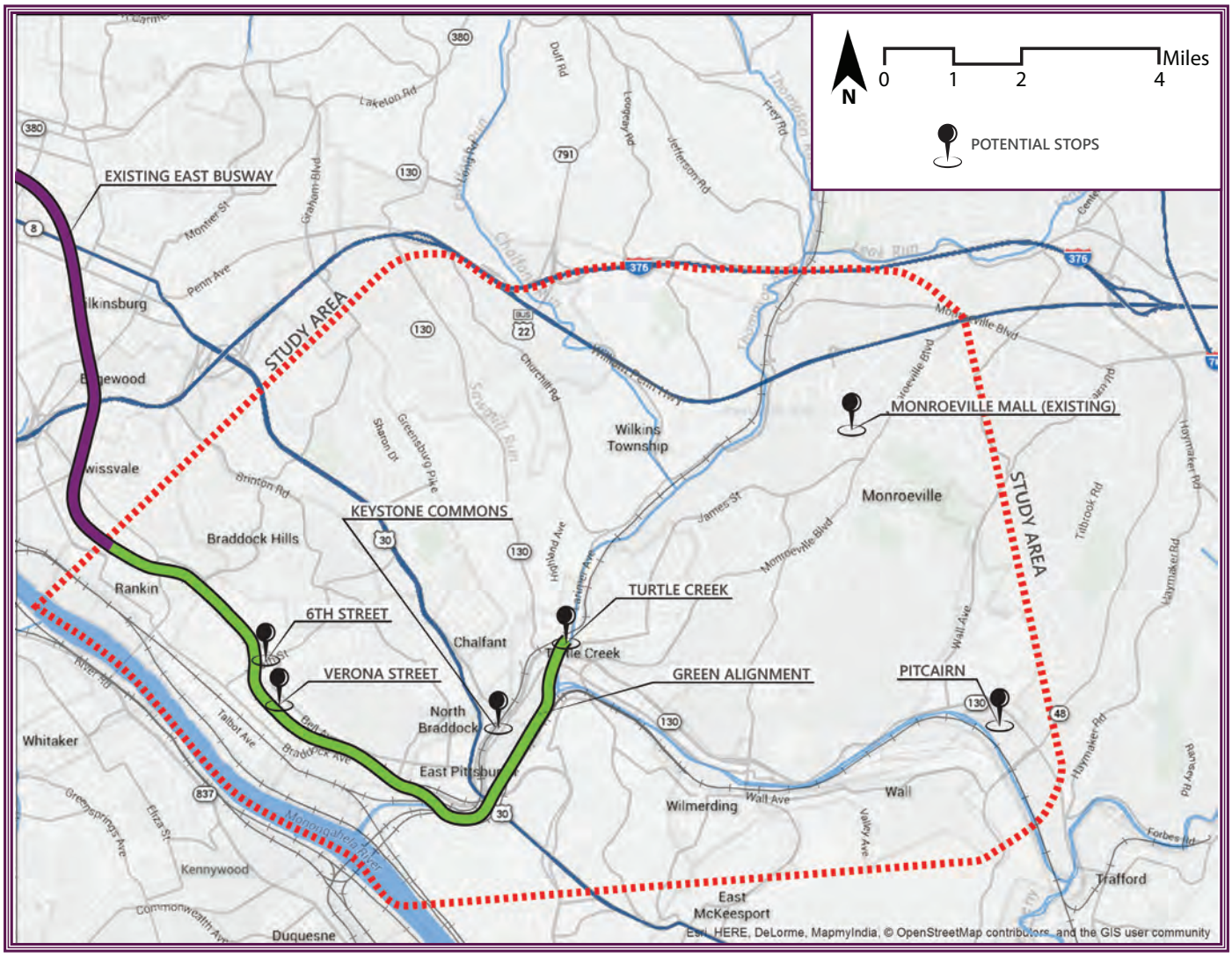
Potential stop locations are the same for the Orange Alternative as for the Red Alternative at 6th Street and Verona Street in Braddock, Pitcairn and Monroeville Mall.

The Keystone Commons site may be directly connected to the eastern end of this alignment. Access to the local roadway network, the Mon Fayette Expressway and local transit service is available from this site.

The proposed Mon Fayette Interchange with East Pittsburgh/ McKeesport Boulevard provides the same potential as for the Red Alternative but with connection to the alignment at the Keystone Commons site.

The alignment for the Orange Alternative does not connect to Braddock Ave, therefore a stop at East Pittsburgh is not included.

Green Alignment



Green Alternative – (Swissvale to Turtle Creek)

Alignment

The alignment for the Green Alternative (4.3 miles) involves extending the busway from the existing Swissvale Station to the Borough of Turtle Creek. The alignment follows the same alignment as for the Red Alternative from Swissvale to East Pittsburgh at Braddock Avenue. The alignment does not connect to Braddock Avenue but crosses over the roadway and the railways and then passes underneath the Westinghouse Bridge. Achieving this alignment requires a significant aerial structure(s) that is both horizontally and vertically curved, significant railroad relocations, and conflicts with the proposed Mon Fayette Expressway.

During the development of the Environmental Impact Statement (EIS) for the Mon Fayette Expressway, the Borough of Turtle Creek negotiated mitigation commitments for the location of the Mon Fayette Expressway that require it to be on a viaducts (approximately 90 feet high) as it passes through the Borough of Turtle Creek to minimize impacts to the borough. The development of the East Busway extension to, or through, Turtle Creek would be subject to similar mitigation strategies in the Borough of Turtle Creek requiring elevated viaducts. The need to provide elevated viaducts in the Borough of Turtle Creek significantly limits the opportunity for a transit stop in the Borough of Turtle Creek or for the opportunity of access to the alignment from the local roadway network without significant ramp structures. A potential stop and ramp structures would require significant coordination with the

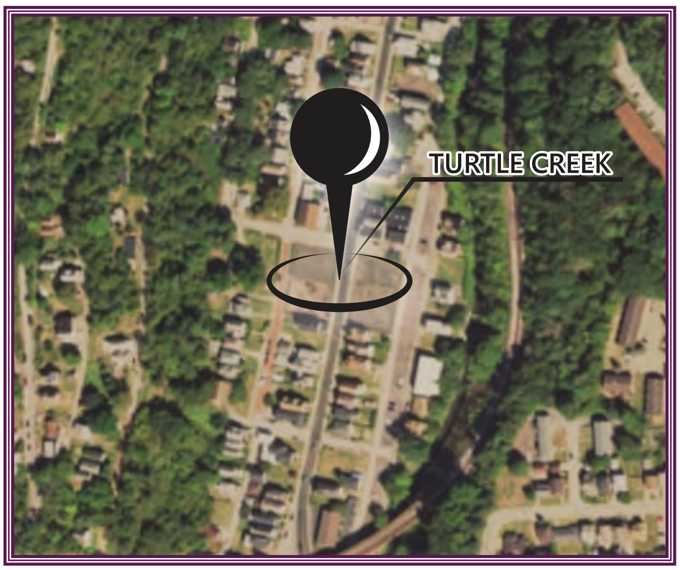
Borough of Turtle Creek and the PTC with respect to the proposed Mon Fayette Expressway alignment.

Stop Locations

Potential stop locations are the same for the Green Alternative as for the Red Alternative at 6th Street and Verona Street in Braddock, Keystone Commons, Pitcairn and Monroeville Mall.

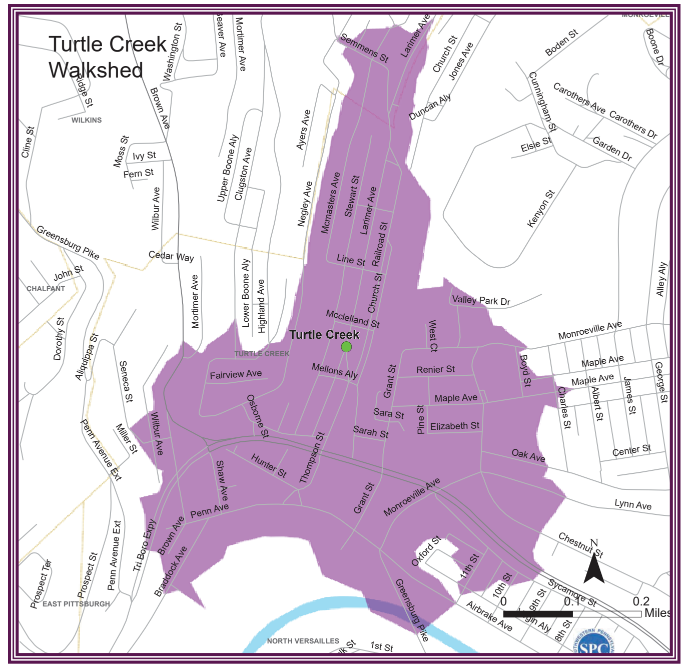
A stop at East Pittsburgh is not considered as the alignment for the Green Alternative does not provide a connection at Braddock Avenue. A stop is not considered at the Mon Fayette Expressway Interchange since the alignment for the Green Alternative occupies the same foot print as the expressway.

Turtle Creek



Borough of Turtle Creek

A stop at Turtle Creek requires significant site development and right of way acquisition as well as significant approach structures to provide connection to the elevated busway.



Walkability

From the walkshed shown above, the following parameters were identified and calculated.

- Walkshed Size: 0.267 sq. miles
- Walkshed Ratio: 34% (walkshed size/perfect walkshed size of 0.79 sq. mi)
- Number of Intersections: 79
- Presence of Sidewalks at Stop Location: Present

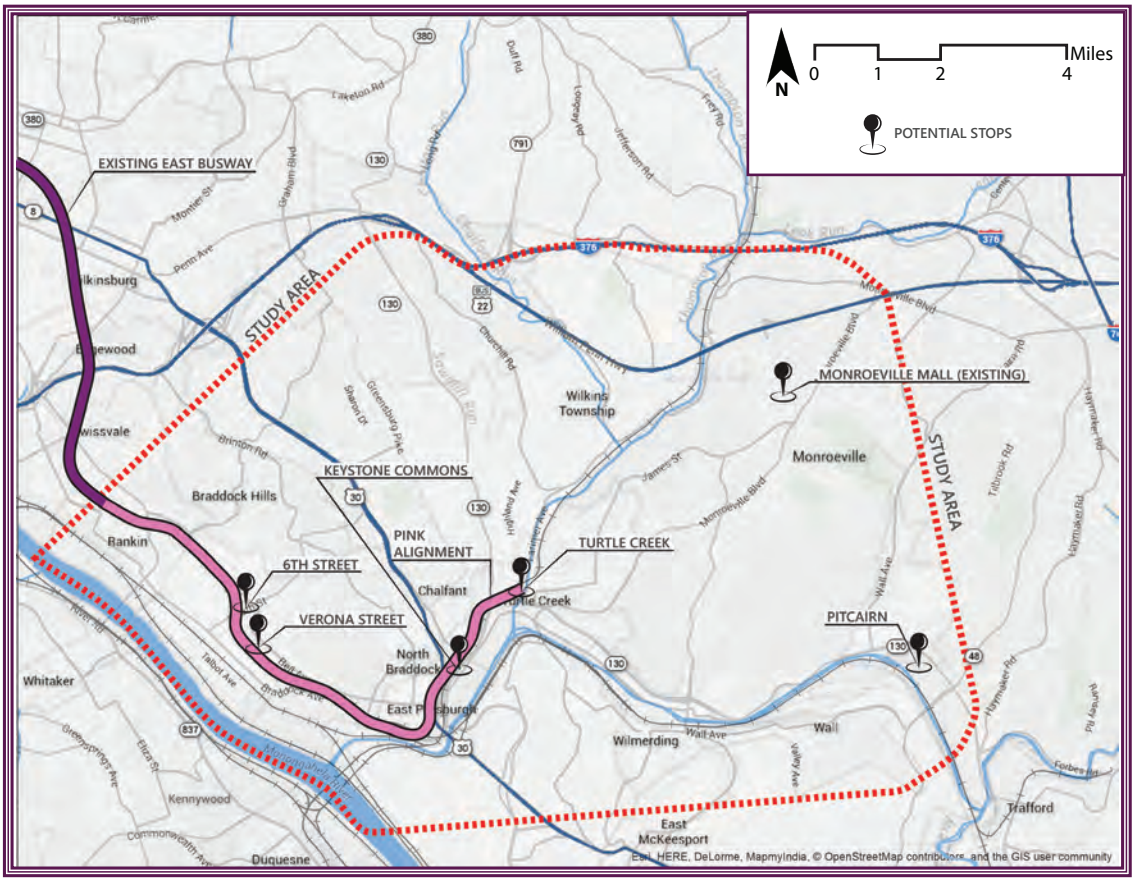
Additionally, the Turtle Creek location walkability index score is 37.

Population/Employment Density, TOD Typology

The Monroeville Mall location has the following attributes:

- Density (Jobs + Residents per sq. mi.): 6,352
- Jobs: Residents Ratio: 0.23
- TOD Typology: Suburban Neighborhood

Pink Alignment



Pink Alternative – (Swissvale to Turtle Creek)

Alignment

The alignment for the Pink Alternative (4.0 miles) involves extending the busway from the Swissvale Station to the Borough of Turtle Creek as an alternate to the alignment of the Green Alternative. The alignment for the Pink Alternative seeks to avoid the railroad and infrastructure at the Westinghouse Bridge. This alignment also avoids the alignment of the proposed Mon Fayette Expressway.

The alignment for Pink Alternative follows the same alignment as the Red Alternative from the existing Swissvale Station to East Pittsburgh but diverges at East Pittsburgh and takes a northerly path by way of a tunnel under East Pittsburgh that emerges just west of the Union Railroad and then follows the Union Railroad to Turtle Creek. The alignment requires an elevated structure along the Union Railroad to reach Turtle Creek.

As compared to the alignment for the Orange Alternative, this alignment does not provide a direct connection to Keystone Commons. This alignment passes to the north-west of the Borough of Turtle Creek and has limited options for making connections to the local roadway network near the Borough of Turtle Creek.

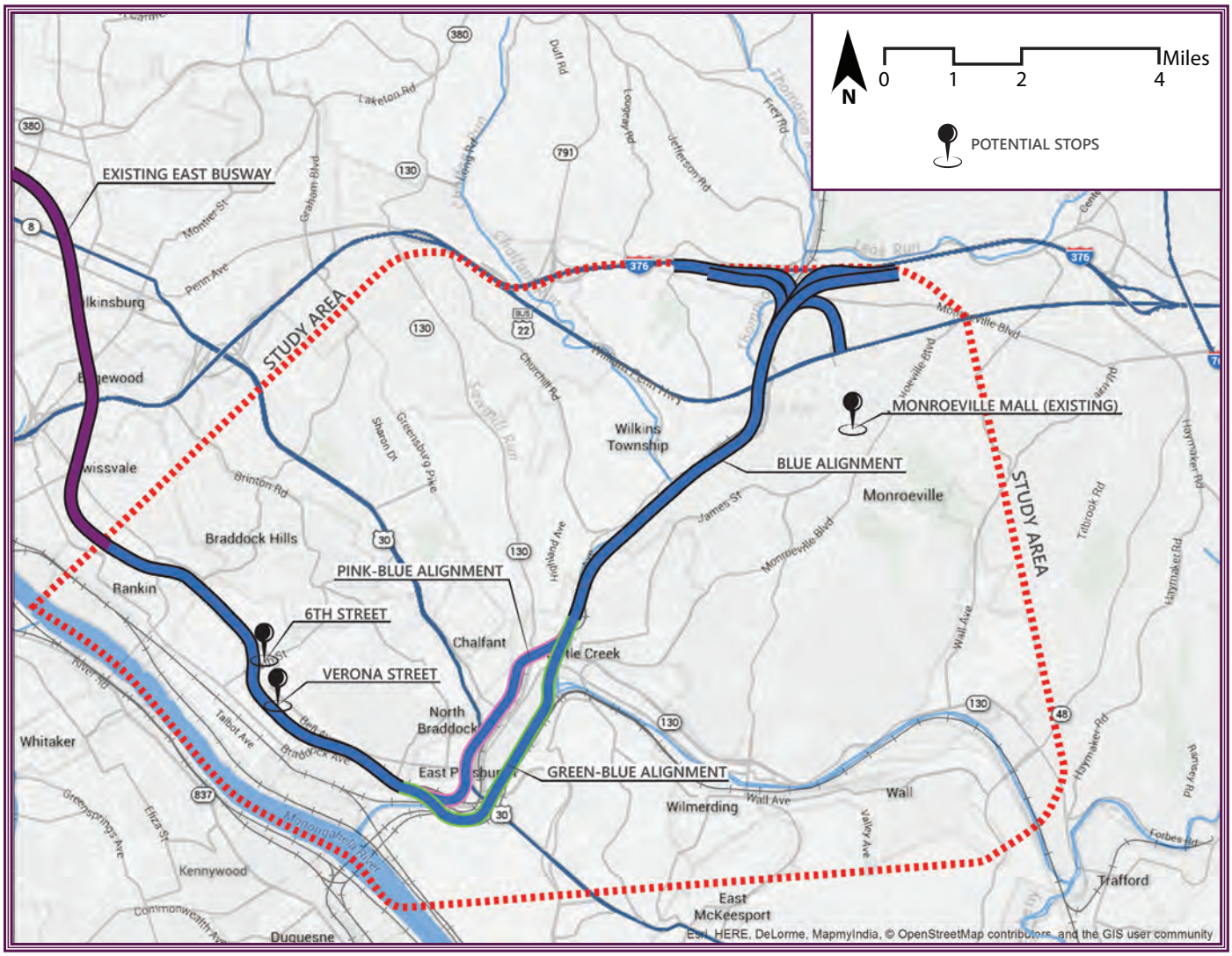
Stop Locations

Potential stop locations are the same for the Pink Alternative as for the Red Alternative at 6th Street and Verona Street in Braddock, Keystone Commons, Pitcairn and Monroeville Mall.

A stop at Turtle Creek requires significant site development and right of way acquisition as well as significant approach structures to provide connection to the elevated busway similar to the Green Alternative.

A stop at East Pittsburgh is not included as alignment for the Pink Alternative does not provide a connection to Braddock Avenue. A stop at the Mon Fayette Interchange is not included as the alignment for the Pink Alternative because it does not provide connection to the Expressway.

Blue Alignment



Blue Alternative – (Swissvale to Monroeville)

Alignment

The alignment for the Blue Alternative (10.0 – 10.3 miles) involves extending the busway from the Swissvale Station to Monroeville. The alignment for the Blue Alternative follows that of either the Green or Pink Alternatives and connects to those alignments at the Borough of Turtle Creek. From Turtle Creek the alignment extends north through the Thompson Run Valley to Business Route 22 and I376/Parkway East with connections to the local roadway network.

Evaluation of the alignment through the Thompson Run Valley results in a similar line and grade taken by the proposed Mon Fayette Expressway. The grade difference from the floor of the valley to the Monroeville Mall is approximately 250 feet. At Monroeville, there are significant infrastructure obstacles associated with I-376/Parkway East, Business Route 22 and the Union Railroad.

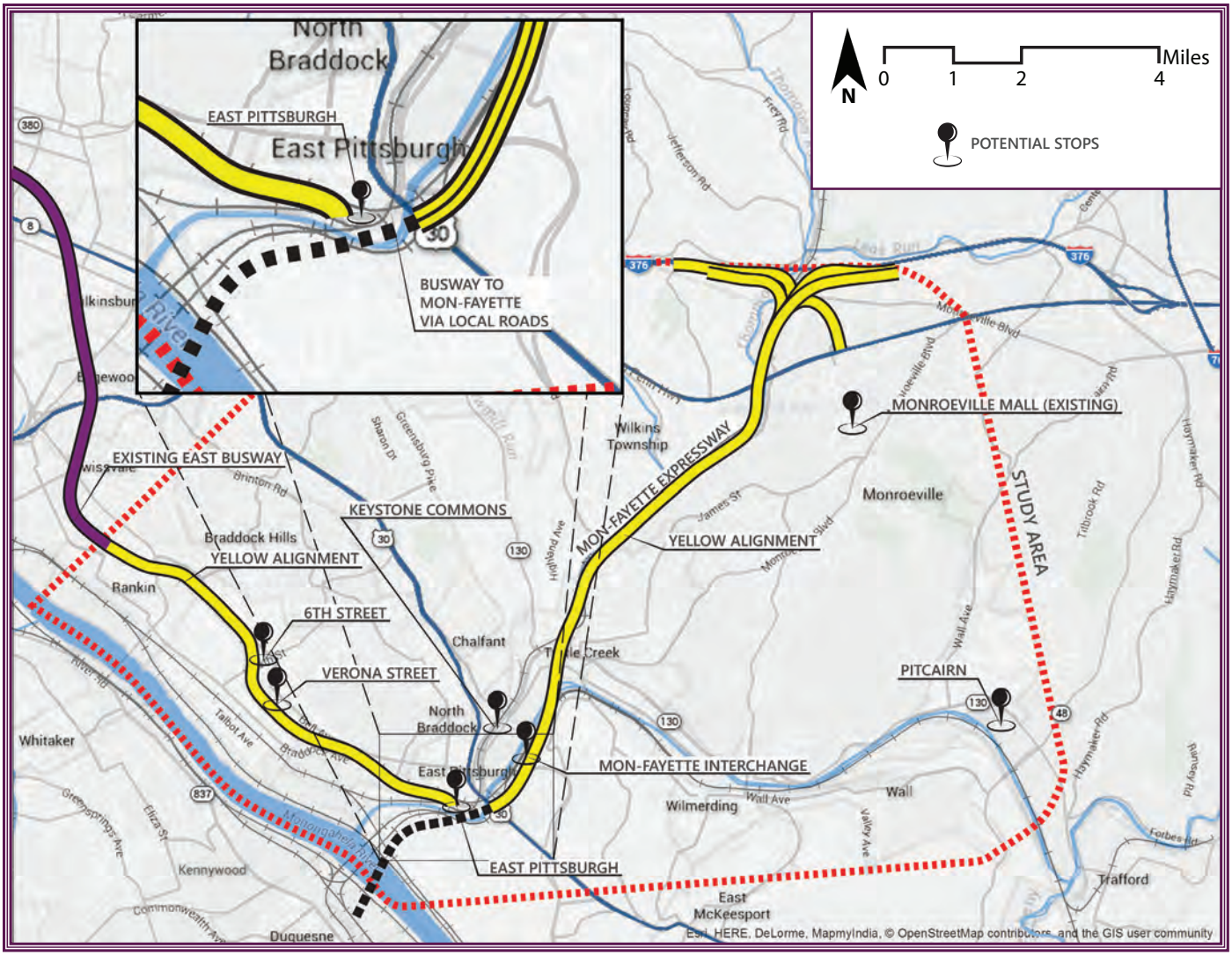
The proposed Mon Fayette Expressway occupies much of the available space in the Thompson Run Valley.

Stop Locations

Potential stop locations are at 6th Street and Verona Street in Braddock and Monroeville Mall.

The alignment for the Blue Alternative does not allow for connection to stops at East Pittsburgh, Keystone Commons the Mon Fayette Interchange, Turtle Creek and Pitcairn.

Yellow Alignment with Connection via Local Roads



Yellow Alternative – Mon Fayette Expressway (Swissvale to Monroeville)

Alignment

The alignment for the Yellow Alternative (10.0 miles) involves extending the East Busway to provide access to the Monroeville area via the proposed Mon Fayette Expressway.

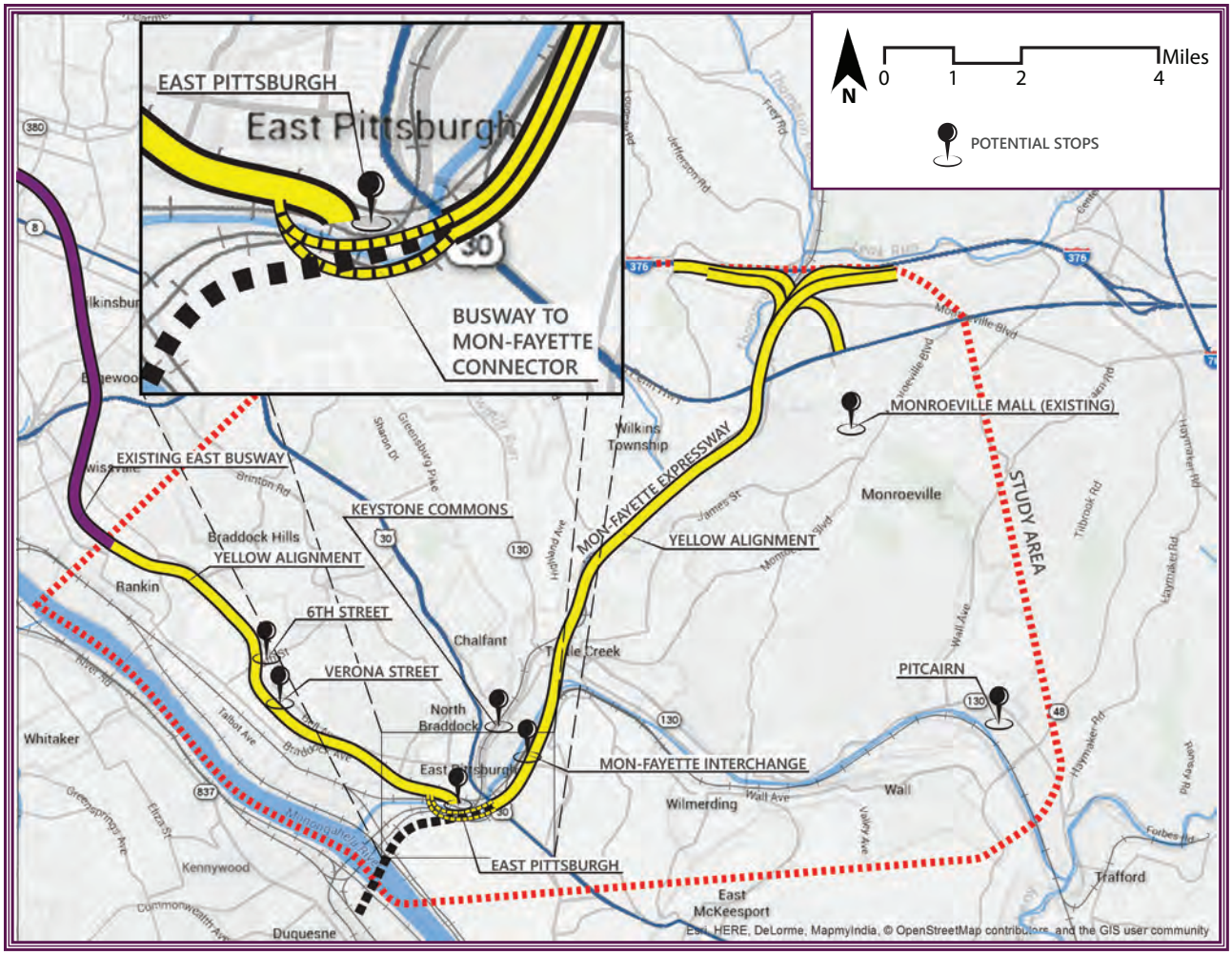
The alignment for the Yellow Alternative follows the Red Alternative from the Swissvale Station to Braddock Avenue just east of the Edgar Thomson Works. With a connection to the local roadway network at Braddock Avenue, the alignment joins the Mon Fayette Expressway at the proposed interchange with East Pittsburgh/McKeesport Boulevard. The alignment for the Yellow Alternative then utilizes the alignment of the Mon Fayette Expressway to reach the local roadway network in the Monroeville area at I376/Parkway East, Business Route 22 and the Monroeville Mall.

The Mon Fayette Expressway provides the means for bus service to reach the Monroeville Area with shared use of the proposed lanes or the potential for the addition of transit only "bus on shoulder" lanes.

Stop Locations

Potential stop locations are the same for the Yellow Alternative as for the Red Alternative at 6th Street and Verona Street in Braddock, East Pittsburgh, Keystone Commons, the Mon Fayette Expressway Interchange, Pitcairn and Monroeville Mall. The Mon Fayette Expressway provides additional access to the Monroeville area.

Yellow Alignment with Direct Connectors



Yellow Alternative with a Direct Connector to the Mon Fayette Expressway (Swissvale to Monroeville)

Alignment

The alignment for the Yellow Alternative with a Direct Connector involves extending the East Busway to provide access to the Monroeville area via the proposed Mon Fayette Expressway.

The alignment for the Yellow Alternative with a Direct Connector follows the Red Alternative from the Swissvale stop to Braddock Avenue just east of the Edgar Thomson Works. The alignment provides both a connection to the local roadway network at Braddock Avenue and a Direct Connection from the Busway extension to the Mon Fayette Expressway. This Direct Connection allows bus service to reach the Mon Fayette Expressway without traversing the local roadway network and then to travel northward to Monroeville on the Mon Fayette Expressway. The Direct Connection requires aerial structures that cross over the railroads and Turtle Creek and merge with the Mon Fayette Expressway underneath the Westinghouse Bridge. Providing a Direct Connection the Mon Fayette Expressway will require coordination with the PTC.

The alignment connection at Braddock Avenue provides access to and from the local roadway network for Braddock, East McKeesport, Keystone Commons and Turtle Creek.

Stop Locations

Potential stop locations are the same for the Yellow Alternative with a Direct Connector to the Mon Fayette Expressway as for the Yellow Alternative – Mon Fayette Expressway.

Ridership

SPC Evaluation

The number of daily rides (Daily Boardings) were projected for a combination of alternatives, route service changes and stops. These projections were accomplished by SPC utilizing their regional travel demand model. This model incorporates SPC Cycle 10a forecast of population, households, and employment that was adopted by the Commission in June 27, 2016.

Specific Alternatives Modeled

Five alternatives were modeled by SPC. Below is a description of each:

1) Existing System (Year 2017)

This alternative reflects the current transit system in terms of busways, stops, stations and routes. It also reflects the current highway system. It uses the population, employment, and household projections for the year 2017.

2) No-Build (Year 2035)

This alternative has 2 distinct differences from the Year 2017 Existing System Alternative. First, in incorporates any proposed highway changes (notably, the Mon Fayette Expressway) programmed to be constructed by the Year 2035. The inclusion of the Expressway does have a slight impact on the mode split results in the model, shifting some trips from transit to auto. The 2nd difference is this alternative uses the projected population, household, and employment projections for the region for Year 2035. In general, this increases the amount of both transit and highway trips in the region.

3) Red Alternative (Year 2035)

(Under SPC's modeling process, this alternative was originally labeled "Alternative 1/Option 1") This Alternative uses the Year 2035 No-Build Alternative as a base and incorporates the following changes:

- Busway Extension (This alternative includes the Red Alternative from Swissvale to Braddock Avenue)
- Mon/Fayette Expressway is not constructed.
- Stops: The following stops were included:
  - Braddock
  - Keystone Commons
  - Mon-Fayette Interchange at North Versailles
  - Pitcairn

All stops were assumed to have Park and Ride features and were modeled as "unconstrained" (i.e., they were not modeled with a limit on parking spaces. This was done to determine possible demand at each location. This does not reflect the anticipated land use at the proposed stops.)

Note: For comparison purposes, The Red Alternative ridership projections can also be applied to the Orange, Green and Pink Alternatives. The main difference being a Mon Fayette Interchange stop is not assumed in these alternatives.

New/Expanded Route Changes

The following routes were either added or expanded (i.e., increased service) in the Red Alternative:

- **Create new AEX Ardmore Boulevard Express route** - This route would operate on Ardmore Boulevard from Keystone Commons in East Pittsburgh to Wilkinsburg where it would enter the existing East Busway to run to Downtown Pittsburgh. This would be a peak period only service with service operating every 20 minutes.
- **Extend P1 East Busway** – All Stops to the Keystone Commons. No change in frequency of service.
- **Extend P3 East Busway –** Oakland to the Keystone Commons. Increase am peak frequency of service to every five minutes.
- **Extend 55 Glassport** from its existing northern terminus at the Walmart in North Versailles to the Keystone Commons. This will provide a new connection for people living in the southern part of the Monongahela Valley to areas served by the East Busway Extension.
- **Change the P69 Trafford Flyer** to enter the Keystone Commons prior to entering the East Busway Extension

destined to Downtown Pittsburgh. Double the number of trips (based on the assumption of a new park and ride at Pitcairn).

- **Change P76 Lincoln Highway Flyer** to enter the Keystone Commons where it would enter the East Busway Extension and operate to Downtown Pittsburgh. Reduce frequency of service by one half.

- **Adjust P68 Braddock Hills Flyer** route to enter the Keystone Commons to facilitate transfers to East Busway services. West of the Keystone Commons, P68 would remain on its existing routing via Brinton road to Wilkinsburg. No other changes are sought.

Note: For comparison purposes, The Red Alternative ridership projections can also be applied to the Orange, Green and Pink Alternatives.

4) Yellow Alternative (Year 2035)

(Under SPC's modeling process, this alternative was originally labeled "Alternative 1/Option 2") This Alternative incorporates all the elements of Red Alternative described above and the use of the Mon Fayette Expressway for routing. Bus routes accessing the Monroeville area would use Braddock Avenue and East Pittsburgh/McKeesport Boulevard to access the Mon Fayette interchange in North Versailles.

Note: For comparison purposes, the Yellow Alternative ridership projections can also be applied to the Blue Alternative. The main difference being a Mon Fayette Interchange stop is not assumed in this alternative.

Additionally, the following route changes were added to the routes included with the Red Alternative:

- **Extend P1 East Busway –** All Stops to the Monroeville Mall Park-and-Ride. No change in frequency of service.

- **Extend P3 East Busway –** Oakland to the Monroeville Mall Park-and-Ride. Increase am peak frequency of service to every five minutes.

5) Limited Yellow Alternative (Year 2035) This is the Yellow Alternative with peak hour only Monroeville service

(Under SPC's modeling process, this alternative was originally labeled "Alternative 2/Option 2") This alternative incorporates all the elements of the Yellow Alternative except the following:

- **Create new P1X East Busway Express route** - This route would operate the length of the extension and the existing East Busway. It would pick up and discharge riders at all stops from Monroeville to Hamnett Station (no stopping at the Keystone Commons – this stop will be served by the P1 and P3 routes) and then run non-stop to Downtown Pittsburgh. This would be a morning and evening peak period service operating every 10 minutes.

- **Extend P1 East Busway to Keystone Commons only –** All Stops to the Keystone Commons. No change in frequency of service.

- **Extend P3 East Busway to Keystone Commons only –** Oakland to the Keystone Commons. Increase am peak frequency of service to every five minutes.

Route Specific Daily Transit Boardings Projection Results

The table below represents the daily boarding projections for specific routes produced by the SPC modeling process for each of the alternatives described above. (*Please note that the modeling results at this level are subject to modeling sensitivity and should not be considered "absolute" projections.*)

The following table shows the change between Year 2017 and the Year 2035 No-Build, along with the change between each of the alternatives to the Year 2035 No-Build.

Projected Daily Boardings

Route	Existing System	No-Build (Year 2035)	Red Alternative (Year 2035)	Yellow Alternative (Year 2035)	Limited Yellow Alternative (Year 2035)
P1 - East Busway-All Stops	13,367	14,628	16,824	17,960	16,809
P2- East Busway Short	5,564	6,107	5,968	5,960	5,948
P3- East Busway-Oakland	6,540	6,669	6,908	7,020	6,876
AEX- Ardmore Boulevard Express	-	-	700	833	823
P1X- East Busway Express	-	-	-	-	340
55-Glassport	619	684	870	885	872
P68-Braddock Hills Flyer	793	775	430	390	420
P69-Trafford Flyer	463	453	436	438	436
P76-Lincoln Highway Flyer	1,268	1,288	390	394	391
P71-Swissvale Flyer	1,144	1,285	1,154	1,156	1,152
P7-McKeesport Flyer	1,069	1,154	1,102	1,106	1,102
P12-Holiday Park Flyer	667	684	623	607	607
59-Mon Valley	699	775	628	634	627
68 -Braddock Hills	670	664	652	269	652
69-Trafford	259	259	348	334	348
71-Edgewood Town Center	163	212	214	214	214
WCTA-1F (Westmoreland County Transit)	598	650	687	687	455
WCTA-2F (Westmoreland County Transit)	270	287	284	284	350
WCTA-3F (Westmoreland County Transit)	83	93	92	92	92
WCTA-4 (Westmoreland County Transit)	421	452	438	438	460
Total Daily Boardings	**34,657**	**37,119**	**38,748**	**39,557**	**38,974**
Boardings change from Year 2017		**2,462**	**4,091**	**4,900**	**4,317**
Boardings change from Year 2035 No-Build (New Riders)			**1,629**	**2,438**	**1,855**

Net Change in Daily Boardings

Route	2035 No-Build minus 2017 Existing (Daily Boardings)	Red Alternative minus 2035 No-Build (Daily Boardings)	Yellow Alternative minus 2035 No-Build (Daily Boardings)	Limited Yellow Alternative minus 2035 No-Build (Daily Boardings)
P1 - East Busway-All Stops	1,261	2,196	3,332	2,181
P2- East Busway Short	543	(139)	(147)	(159)
P3- East Busway-Oakland	129	239	351	207
AEX- Ardmore Boulevard Express	-	700	833	823
P1X- East Busway Express	-	-	-	340
55-Glassport	65	186	201	188
P68-Braddock Hills Flyer	(18)	(345)	(385)	(355)
P69-Trafford Flyer	(10)	(17)	(15)	(17)
P76-Lincoln Highway Flyer	20	(898)	(894)	(897)
P71-Swissvale Flyer	141	(131)	(129)	(133)
P7-McKeesport Flyer	85	(52)	(48)	(52)
P12-Holiday Park Flyer	17	(61)	(77)	(77)
59-Mon Valley	76	(147)	(141)	(148)
68 -Braddock Hills	(6)	(12)	(395)	(12)
69-Trafford	-	89	75	89
71-Edgewood Town Center	49	2	2	2
WCTA-1F (Westmoreland County Transit)	52	37	37	(195)
WCTA-2F (Westmoreland County Transit)	17	(3)	(3)	63
WCTA-3F (Westmoreland County Transit)	10	(1)	(1)	(1)
WCTA-4 (Westmoreland County Transit)	31	(14)	(14)	8

The above tables indicate the following:

- Overall, the three future "Build" alternatives (Red, Yellow and Limited Yellow) show a net increase in boardings over the Year 2035 No-Build. Specifically:
    * Red Alternative – 1,621 additional daily boardings
    * Yellow Alternative – 2,438 additional daily boardings
    * Limited Yellow Alternative – 1,855 additional daily boardings.
- The largest increase in boardings from *Year 2017 to the Year 2035 No-Build* are the:
    * P1 - East Busway-All Stops (1261 additional boardings)
    * P2- East Busway Short (543 additional boardings)
    * P71-Swissvale Flyer (141 additional boardings)
    * P3- East Busway-Oakland (129 additional boardings)
- Some routes show a decline in boardings. This is due to some of the new/expanded routes become more attractive than other routes and riders preferring the changed routes over the other routes (from a modeling perspective)
- P1-East Busway has an additional 2196-3332 boardings over the Year 2035 No-Build Alternative. This, however, also includes the loss of boardings on several other "competing" East Busway related routes including the P68-Braddock Hills Flyer, P2-East Busway Short, P71 Swissvale Flyer.

- The Proposed new AEX Ardmore Boulevard Express Route has 700-833 boardings over the Year 2035 No-Build Alternative. This, however, includes the equivalent loss of boardings on the competing P76-Lincoln Highway Flyer route.

- The proposed P1X East Busway Express is only in the Limited Yellow Alternative and primarily serves the Monroeville Park and Ride during peak period service. This route had 340 boardings.

- The 55-Glassport route had an additional 186-201 boardings. The competing 59-Mon Valley route experienced an equivalent loss of boardings.

- The WCTA routes combined showed a net decrease in boardings. No changes were made to these routes and the loss in boardings could be due to PAAC routes in the same corridor offering faster travel times to/from similar locations.

Year 2035 Daily Boarding Projections for Proposed Stops

The SPC modeling process provides general demand information for transit stops. As stated earlier, all modeled stops were assumed to have Park and Ride features and were modeled as "unconstrained" (i.e., they were not modeled with a limit on parking spaces.) This methodology does provide a general benchmark of where demand would be high or low, relative to other locations studied. But because the parking is unconstrained, the modeled daily weekday boarding numbers generated are generally higher than a more realistic, constrained projection.

Braddock

SPC projections indicated modest daily boardings of about 800 boardings for a Braddock stop in Year 2035 (Only one location was modeled to determine the potential ridership in this area.). The projections indicated a stronger peak period demand than an off-peak period by a 6:1 ratio.

East Pittsburgh

This location was not modeled by SPC.

Keystone Commons

Keystone Commons showed the highest weekday boardings of all the stop locations modeled - about 1800 boardings. This is due, in part, to the number of revised/new routes directly serving this location under the Red, Yellow and Limited Yellow Alternatives. Daily boardings at this location were 4 times higher in the Build Alternatives over the Year 2035 No-Build Alternative.

Mon Fayette Expressway Interchange

This location showed low weekday boarding demand in the model of 100 boardings. Reasons associated with this include its proximity to the Keystone Commons location and no route changes were made in this location for the alternatives modeled.

Turtle Creek

This location was not modeled because route changes in this area were not considered.

Monroeville Mall

The Monroeville Mall location showed modest weekday boarding demand of 700 boardings in the Yellow Alternative and modest daily boarding demand in the Red and Limited Yellow Alternatives of 400 boardings. The demand in the Yellow Alternative was nearly double the demand in the Limited Yellow Alternative. The largest difference between these two alternatives is the all-day service the Yellow Alternative offers to this site, versus the peak period only service the Limited Yellow Alternative offered from the revised/new routing service modeled. The Red Alternative did not include any revised/new service to Monroeville.

Pitcairn

The Pitcairn location showed modest daily boarding demands from the modeling. Both walking and driving users were evenly distributed in the demand.

Capital Costs

The capital cost for the Alternatives are shown in 2016 and 2026 (based upon a yearly 4% inflation rate) dollars. The costs include environmental clearance, preliminary and final design, construction services, construction, and right of way acquisition for both the alignments and stops.

The cost breakdown is provided to show the cost of each segment of the busway extension as it may be built from the existing Swissvale Station to the east and includes a cumulative total as well.

Red Alternative (Swissvale to Braddock)

Alignment	2016	2026
Swissvale to 6th Street	$112 M	$166 M
6th Street to Braddock Ave	$231 M	$342 M
Braddock Stop	$ 10 M	$ 14 M
Total	**$353 M**	**$522 M**
Off Alignment Stops		
Keystone Commons	$ 18 M	$ 27 M
Mon Fayette	$ 18 M	$ 27 M
Pitcairn	$ 10 M	$ 14 M
Monroeville Mall	$ 10 M	$ 14 M
Total	**$ 56 M**	**$ 82 M**

Green Alternative (Swissvale to Turtle Creek)

Alignment	2016	2026
Swissvale to 6th Street	$112 M	$166 M
6th Street to Braddock Ave	$213 M	$316 M
Braddock Ave to Turtle Creek	*$351 M	*$521 M
Braddock Stop	$ 10 M	$ 14 M
Total	**$686 M**	**$1,017 M**
Off Alignment Stops		
Keystone Commons	$ 18 M	$ 27 M
Pitcairn	$ 10 M	$ 14 M
Monroeville Mall	$ 10 M	$ 14 M
Total	**$ 38 M**	**$ 55 M**

* Includes a stop in Turtle Creek

Orange Alternative (Swissvale to Keystone Commons)

Alignment	2016	2026
Swissvale to 6th Street	$112 M	$166 M
6th Street to Braddock Ave	$213 M	$316 M
Braddock Ave/Keystone Commons	$251 M	$372 M
Braddock Stop	$ 10 M	$ 14 M
Keystone Commons	$ 18 M	$ 27 M
Total	**$604 M**	**$895 M**
Off Alignment Stops		
Mon Fayette	$ 18 M	$ 27 M
Pitcairn	$ 10 M	$ 14 M
Monroeville Mall	$ 10 M	$ 14 M
Total	**$ 38 M**	**$ 55 M**

Pink Alternative (Swissvale to Turtle Creek)

Alignment	2016	2026
Swissvale to 6th Street	$112 M	$166 M
6th Street to Braddock Ave	$213 M	$316 M
Braddock Ave to Turtle Creek	*$491 M	*$727 M
Braddock Stop	$ 10 M	$ 14 M
Total	**$826 M**	**$1,223 M**
Off Alignment Stops		
Keystone Commons	$ 18 M	$ 27 M
Pitcairn	$ 10 M	$ 14 M
Monroeville Mall	$ 10 M	$ 14 M
Total	**$ 38 M**	**$ 55 M**

* Includes a stop in Turtle Creek

Green to Blue Alternative (Swissvale to Monroeville)

Alignment	2016	2026
Swissvale to 6th Street	$112 M	$166 M
6th Street to Braddock Ave	$213 M	$316 M
Braddock Ave to Turtle Creek	$300 M	$444 M
Turtle Creek to Monroeville	$443 M	$656 M
Braddock Stop	$ 10 M	$ 14 M
Total	**$1,078 M**	**$1,596 M**
Off Alignment Stops		
Keystone Commons	$ 18 M	$ 27 M
Pitcairn	$ 10 M	$ 14 M
Monroeville Mall	$ 10 M	$ 14 M
Total	**$ 38 M**	**$ 55 M**

Pink to Blue Alternative (Swissvale to Monroeville)

Alignment	2016	2026
Swissvale to 6th Street	$112 M	$166 M
6th Street to Braddock Ave	$213 M	$316 M
Braddock Ave to Turtle Creek	$446 M	$661 M
Turtle Creek to Monroeville	$443 M	$656 M
Braddock Stop	$ 10 M	$ 14 M
Total	**$1,224 M**	**$1,813 M**
Off Alignment Stops		
Keystone Commons	$ 18 M	$ 27 M
Pitcairn	$ 10 M	$ 14 M
Monroeville Mall	$ 10 M	$ 14 M
Total	**$ 38 M**	**$ 55 M**

Yellow Alignment - Mon Fayette Expressway (Swissvale to Monroeville)

Alignment	2016	2026
Swissvale to 6th Street	$112 M	$166 M
6th Street to Braddock Ave	$231 M	$342 M
Braddock Stop	$ 10 M	$ 14 M
Mon Fayette	$ 18 M	$ 27 M
Total	**$371 M**	**$549 M**
Bus on Shoulder Lane	**$ 26 M	**$ 39 M
Total	**$397 M**	**$588 M**
Off Alignment Stops		
Keystone Commons	$ 18 M	$ 27 M
Pitcairn	$ 10 M	$ 14 M
Monroeville Mall	$ 10 M	$ 14 M
Total	**$ 38 M**	**$ 55 M**

** Bus on shoulder included if warranted

Yellow Alignment - Mon Fayette Expressway with Direct Connector Ramps (Swissvale to Monroeville)

Alignment	2016	2026
Swissvale to 6th Street	$112 M	$166 M
6th Street to Braddock Ave	$231 M	$342 M
Braddock Stop	$ 10 M	$ 14 M
Mon Fayette	$ 18 M	$ 27 M
Direct Connector Ramps	$ 95 M	$141 M
Total	**$466 M**	**$690 M**
Bus on Shoulder Lane	**$ 26 M	**$ 39 M
Total	**$492 M**	**$729 M**
Off Alignment Stops		
Keystone Commons	$ 18 M	$ 27 M
Pitcairn	$ 10 M	$ 14 M
Monroeville Mall	$ 10 M	$ 14 M
Total	**$ 38 M**	**$ 55 M**

** Bus on shoulder included if warranted

Operating & Maintenance Cost

Description of Operating & Maintenance (O&M) Cost Estimating Process

The cost of transit infrastructure and service is comprised of three components: the capital cost for the construction of the facility, the capital cost to purchase new rolling stock to deliver the proposed service, and the O&M cost to cover ongoing costs associated with delivering the service. O&M costs include all the ongoing costs including:

Vehicle Operations	Vehicle Maintenance	Non-Vehicle Maintenance	General Administration
Operators Salaries and Wages	Central Garage Motor Pool Rent	Other Salaries and Wages	Other Salaries and Wages
Other Salaries and Wages	Fringe Benefits	Fringe Benefits	Services
Fringe Benefits	Services	Services	Other Materials and Supplies
Fuel and Lubricants	Fuel and Lubricants	Other Materials and Supplies	Utilities
Tires and Tubes	Tires and Tubes	Utilities	Casualty and Liability
Other Materials and Supplies	Other Materials and Supplies	Casualty and Liability	Taxes
Utilities	Miscellaneous Expenses	Miscellaneous Expenses	Miscellaneous Expenses
Casualty and Liability			
Taxes			
Miscellaneous Expenses			

Typically, these various cost elements are determined for an entire system or specific service (e.g., express service, specific route) and can be applied to other similar services when estimating the O&M costs for such new service.

Basis for Analysis

O&M costs were estimated for the extension of the existing busway and include the cost of extending the existing P1 and P3 routes to the termini of the proposed new service as well as the implementation of a new route that would travel the existing busway and continue to Monroeville. All service on the existing busway operating today is not included in this estimate.

Cost Basis

The Port Authority of Allegheny County (PAAC) supplied system wide cost data for use in this analysis. According to PAAC, the cost of operating bus service, which considers those elements noted above, is:

- $14.11 per Revenue Mile
- $185.36 per Revenue Hour

These numbers consider the total cost of bus operations for the PAAC system divided by the number of miles all vehicles spend in operation and all hours all vehicles spend in operation. For a typical bus service, either basis, miles or hours can be applied.

As an independent verification, these unit costs were compared with the U.S. Department of Transportation National Transit Database, which is a summary of all transit systems in the United States. The last published data for PAAC was in 2014 and the numbers above are consistent with those numbers.

On top of the current operations and maintenance costs, East Busway vehicles would be charged a toll of $0.34 per trip based on the 2015 toll rate.

Explanation of Calculations

The proposed transit service on the East Busway is comprised of three operational components:

- Cruising between stations at 45 mph;
- Stopping and dwelling at busway stations to pick-up and discharge passengers (assumed to be 22.5 seconds per station based on the boarding of 10 passengers, which is based on the forecast ridership).

- Decelerating to a stop at each busway station and again accelerating after picking-up and discharging passengers.

Future service is based on the existing service. For the P1 service, approximately 127 roundtrips per weekday, 58 buses per Saturday, and 45 buses per Sunday. P3 service is 127 roundtrips per day. For the Limited Yellow Alternative, service would run during the peak periods only and on 10-minute headways or six buses per hour (no Saturday or Sunday service).

Where East Busway service typical of all PAAC routes, either the miles or hours unit cost would apply equally. With the East Busway, service will be appreciably faster than typical service, much of which operates in mixed traffic. The unit cost based upon hours was therefore used, recognizing that service can be delivered faster on the busway than elsewhere.

For each alternative, the running time to traverse the East Busway (and in the case of the P1EX, to run new service on the existing busway and on to the East Busway) was determined based on the Red, Yellow, and Limited Yellow Alternatives described in the Ridership Section. This travel time was then multiplied by the number of runs per week and then by 52, for the weeks in a year. The result is the total number of hours of revenue service anticipated. The vehicle-hours unit cost was then applied resulting in the results shown in the table below.

Estimate of Operations & Maintenance Costs by Alternative

Alternative/Route	Length (Miles) ****	Speed (Mph) ****	Time (hours)	Annual Miles Traveled	Annual Hours of Operation	Annual Hourly Operation and Maintenance Cost
Red Alternative*						
P1/P3 Service extension from Swissvale to Keystone Commons	4.31	30.7	0.14	456,414	14,866.91	$2,765,246
Yellow Alternative**						
P1/P3 Service extension From Swissvale to Monroeville Mall	10.62	36.1	0.29	1,124,572	31,151.59	$5,794,196
Limited Yellow Alternative**						
P1/P3 Service extension From Swissvale to Keystone Commons	4.31	30.7	0.14	456,414	14,866.91	$2,765,246
Proposed P1EX*** (From Downtown to Monroeville Mall)	19.05	37.5	0.51	336,804	8,981.44	$1,670,548
Limited Yellow Alternative Totals				793,218	23,848.35	$4,435,793

* Segments of each alternative operating on the proposed East busway extension obtained their speeds based off of existing P1 and P3 schedules.

** Segments of each alternative operating on the proposed East busway extension and Mon Fayette Expressway obtained their speeds through comparing existing P1 and P3 schedule and Mon Fayette Expressway posted speeds proportionate to the distance travelled on the two roadway facilities.

*** The Limited Yellow Alternative P1X required number of buses is based off of expected Peak Period Only 10-minute headway.

**** An assumed 22.5 seconds of dwell time, proper acceleration and deceleration per station serviced has been incorporated.

Toll costs for each alternative were calculated based upon the number of buses that would use the Mon Fayette Expressway and therefore incur the single toll charge. The results of this calculation are shown in the table below.

Toll Costs for East Busway Alternatives

Alternative/Route	Number of One-way Trips per Day	Number of One-way Trips per Saturday	Number of One-way Trips per Sunday	Number of One-way Trips per Week	Number of One-way Trips per Year	Number of Tolled One-way Trips per year	Total Cost per Year ($s)
Red Alternative*							
P1/P3 Service extension From Swiss to Keystone Commons	366	116	90	2036	105,872	-	0
Yellow Alternative**							
P1/P3 Service extension From Swiss to Monroeville Mall	366	116	90	2036	105,872	105,872	$35,996
Limited Yellow Alternative**							
P1/P3 Service extension From Swissvale to Keystone Commons	366	116	90	2036	105,872	-	0
Proposed P1EX*** (From Downtown to Monroeville Mall)	68	0	0	340	17,680	17,680	$6,011
Limited Yellow Alternative Totals							$6,011

* Segments of each alternative operating on the proposed East busway extension obtained their speeds based off of existing P1 and P3 schedules.

** Segments of each alternative operating on the proposed East busway extension and Mon Fayette Expressway obtained their speeds through comparing existing P1 and P3 schedule and Mon Fayette Expressway posted speeds proportionate to the distance travelled on the two roadway facilities.

*** The Limited Yellow Alternative P1X required number of buses is based off of expected Peak Period Only 10-minute headway.

**** An assumed 22.5 seconds of dwell time, proper acceleration and deceleration per station serviced has been incorporated.

Screening and Summary

Narrative of Alternatives

Each alternative has been evaluated to determine the feasibility of the proposed alignment and the potential stop locations. The feasibility of each alternative considers the following:

- The ability of the alternative to fit into the existing conditions,
- The engineering required to develop the alternative and the constructability of the alternative,
- The effectiveness of the alternative to develop ridership, and
- The capital costs for the alternative.

The narrative for each alternative provides a discussion of the screening criteria for both the alignment and the potential stop locations.

The summary and comparison tables provide parameters associated with the evaluation to indicate the feasibility of the alternatives with respect to the proposed alignments and potential stop locations and a comparative representation of the alternatives.

Note: Not all feasible stop locations were evaluated. A full planning study of all feasible stop locations should be considered if the extension of the busway is pursued. The Locations shown are not based on analysis, but are provided as examples.

Red Alternative – (Swissvale to Braddock)

See Figure for Red Alternative in the Alternatives Section.

Alignment

Existing Conditions

The alignment for the Red Alternative fits well within the existing conditions of the study area. Situated on the "up-hill" side of Norfolk Southern Railroad, the alignment extends the existing busway from the Swissvale Station to Braddock Avenue just east of the Edgar Thomson Works. This alignment has limited effect on the environmental features identified within the study area and limited impact to the existing roadway network.

Extending the busway to Braddock Avenue provides access to the local roadway network and existing transit service in Braddock, East Pittsburgh, Turtle Creek and communities to the east. A connection to the Mon Fayette Expressway via the local roadway network and a proposed Mon Fayette Expressway Interchange with East Pittsburgh/McKeesport Boulevard is possible and provides a means to provide transit service to the Monroeville Area.

Due to the connectivity of this alignment through the local roadway network and accessibility of the existing transit service, the alternative fits into the overall land use

of the study area and connects areas of population and employment density to the Busway extension.

The right of way needed to construct this alternative results in approximately 45 residential properties.

Engineering

The configuration of the alignment above the Norfolk Southern Railroad is similar to the existing East Busway. The horizontal and vertical alignment limits the need to relocate the railroad, facilitates crossing of side streets, and minimizes encroachment into the existing hillside.

Overall, this alignment connects well to the existing roadway infrastructure and does not require extensive side road construction to maintain and provide access to the alignment. There are nine new bridges that will be required to construct this alignment. At the eastern end of the Red Alternative, the alignment requires a structure to cross over the Norfolk Southern Railway and a portion of the Braddock Avenue-Tri-Boro Expressway Bridge will need to be reconstructed to provide a connection to the alignment.

The alignment could be constructed in two phases by considering a stop near the midpoint in Braddock.

Ridership

The Red Alternative develops ridership through faster travel time route connections with the local roadway network via Braddock Avenue and a stop near the midpoint of the alignment in Braddock. For the 20 service routes evaluated for this alternative, boardings estimated for the Year 2035 increased by approximately 4,100 boardings/ weekday over the Year 2017 estimate. The boarding increase over the Year 2035 No-Build Alternative is1,600 boardings/ weekday.

Cost

The capital cost to construct the Red Alternative is approximately $353 Million in 2016 dollars. This cost indicates an investment to extend the busway to Braddock Avenue that can be achieved in phases and provides access to the eastern communities and the proposed Mon Fayette Expressway.

Stop Locations

Stop Locations that were considered include:

- 6th Street in Braddock
- Verona Street in Braddock
- "East Pittsburgh" - Intersection of Braddock Avenue with "Old" Braddock Ave and Main Street
- Keystone Commons
- Mon Fayette Expressway Interchange with East Pittsburgh/McKeesport Boulevard
- Pitcairn
- Monroeville

Each potential stop location is evaluated individually as follows.

6th Street in Braddock

For Figure See 6th Street Stop in the Alternatives Section.

Existing Conditions

The topography at the 6th Street stop site allows for "at grade" access to the local roadway network and does not represent a difficult situation for acquisition of right of way. There does not appear to be any significant issues with environmental features.

Access to existing transit service can be achieved at this site and this site connects to land use and population density within walking proximity.

Engineering

With at grade access to the local roadway network, this site may be readily connected to the local roadway network. The site provides an area for parking and does not require significant right of way acquisition.

With this site near the mid-point of the alignment for the Red Alternative, it provides an opportunity to construct the Red Alternative in stages.

Boardings/ Walkability/ TOD Typology

The estimated daily weekday boarding projections for a location in Braddock indicates approximately 800

boardings. This estimate assumes both walking and parking users.

The Walk Score for Braddock locations is 61. This is the highest score for the potential new locations evaluated.

The TOD Typology for the Braddock Area is "Transit Neighborhood" – this typology has a moderate density and mix of uses. Residential portions of these neighborhoods can be similar in nature to both Suburban and Urban Neighborhoods. Transit Neighborhoods are unique due to the mid-level density of jobs and residents.

Costs

The capital cost of this site is estimated at $10 Million 2016 dollars.

The 6th Street location is feasible for further consideration but should be further evaluated with the Verona Street location to determine the optimal placement of a station in Braddock.

Verona Street in Braddock

For Figure See Verona Street Stop in the Alternatives Section

Existing Conditions

The topography at the Verona Street stop site allows for "at grade" access to the local roadway network. There are a significant number of residential properties in this area and this represents a difficult situation for acquisition of right of way. There does not appear to be any significant issues with environmental features. Access to existing transit service can be achieved at this site and this site connects to land use and population density within walking proximity.

Engineering

With "at grade" access to the local roadway network, this site may be readily connected to the local roadway network. The site could provide an area for parking but requires significant amount of right of way acquisition.

With this site near the mid-point of the alignment for the Red Alternative, it provides an opportunity to construct the Red Alternative in stages.

Boardings/ Walkability/ TOD Typology

The issues for the Verona Street site are similar to the 6th Street site.

Cost

The capital costs associated with the Verona Street site are similar to the 6th Street site except for the additional cost for right of way acquisition.

The Verona Street Stop location is feasible but should be further evaluated with the 6th Street location to determine the optimal placement of a station in Braddock.

"East Pittsburgh" - Intersection of Braddock Avenue with "Old" Braddock Ave and Main Street

For Figure See East Pittsburgh Stop in the Alternatives Section.

Existing Conditions

A stop location at the East Pittsburgh end of the alignment near the intersections of Braddock Avenue with "Old" Braddock Ave and Main Street could provide access to the busway extension. The site offers the opportunity to provide a stop at end of the busway extension, with access to the local roadway network, existing transit service and the potential for a park and ride lot.

The site topography is difficult with significant elevation differences from the Busway above the railroad to the south side of Braddock Avenue that would require long elevated ramps. The area south of Braddock Avenue is within the Edgar Thomson rail yard and is also an active industrial facility which represents a difficult right of way acquisition situation. The environmental conditions within the rail yard and the Edgar Thomson Works also pose a significant issue for encountering potentially contaminated materials. The Edgar Thomson facility may also pose an issue as an historic resource.

Engineering

The engineering associated with this site is difficult. The difference in elevation between the proposed busway alignment and the site is significant and would require long ramps to maintain a reasonable vertical alignment for access.

Access to and from Braddock Avenue would also be difficult due to the elevation differences and the existing structure carrying Braddock Avenue over the railroads and side roads.

The rail lines within the site would require relocation and site conditions indicate that handling of potentially contaminated materials will be required.

While these site conditions can be addressed, the effort required for engineering and construction serve to provide access to a site that is otherwise not suitable for a stop location.

Boardings/ Walkability/ TOD Typology

No estimated daily weekday boarding projections were developed for the East Pittsburgh location.

The Walk Score for the East Pittsburgh location is 34. While the site is near the population center of East Pittsburgh, the elevation difference renders this site unlikely for pedestrian access. The Edgar Thomson Works represents a significant employment center but this site is located well away from the entrances to the facility.

The TOD Typology for this location is "Suburban Neighborhood" – this typology is the most prevalent type within the Port Authority system. Classified with the lowest density and lowest levels of non-residential uses, Suburban Neighborhoods generally serve as a transit origin rather than a destination, and have less frequent off-peak, on-street transit service than destination areas.

Due to the Existing Conditions and Engineering issues the East Pittsburgh site is not feasible and should not be considered for further evaluation.

Keystone Commons

For Figure See for Keystone Commons Stop in the Alternatives Section.

Existing Conditions

A stop at Keystone Commons is a site that is not directly connected to the alignment but may be connected to the busway extension with service via the local roadway network. The Keystone Commons site represents the potential of a stop within the existing parking area for the facility which is a significant employment center with existing access to the local roadway network and transit service.

The site topography is well suited for a stop location and right of way acquisition would need to be coordinated with Keystone Commons. Environmental issues are manageable. The possibility for handling potentially contaminated materials exists due to the previous industrial use of the property.

Engineering

The engineering and constructability at this site are favorable. The access to the site is through the local roadway network which may require some modest improvements.

Boardings/ Walkability/ TOD Typology

The estimated daily weekday boarding projections for a location in Braddock indicates approximately 1800 boardings. This location has the highest estimated boarding of the new locations evaluated. Some of the reason for the higher than average boardings include the proximity of the Keystone Commons Industrial Park and the potential for park and ride at the site. During the ridership modeling, a number of new and existing routes were rerouted to this site, which also affected the estimated boardings estimate.

The Walk Score for Keystone Commons location is 29. As with East Pittsburgh location, the site location is not centrally located and has steep grades from the Central Business District of East Pittsburgh.

The TOD Typology for the Braddock Area is "Suburban Neighborhood

Cost

The capital cost for this site is estimated at $18 Million in 2016 dollars.

The Keystone Commons site for a stop is feasible and should be considered for further evaluation.

Mon Fayette Expressway Interchange with East Pittsburgh/McKeesport Boulevard

For Figure See Mon Fayette Expressway Stop in the Alternatives Section

Existing Conditions

The proposed Mon Fayette Interchange with East Pittsburgh/ McKeesport Boulevard provides an opportunity to develop a site that is not directly connected to the alignment but may be connected to the busway extension with service via the local roadway network. The Mon Fayette Interchange site represents the opportunity to develop transit ridership along the Mon Fayette Expressway with access to the local transit service and service to the extension of the East Busway at Braddock Avenue.

The site does not pose significant environmental issues and site preparation may be developed through coordination with the Pennsylvania Turnpike Commission.

While the land use, population density and employment density are not favorable at this site due to the pending construction of the Mon Fayette Expressway, the interchange location provides an opportunity to develop ridership to both the local transit service and busway extension.

Engineering

The engineering and constructability of this site are favorable. The access for this site, parking and the stop site development may be incorporated into the overall planning of the Mon Fayette Expressway and the proposed interchange. Coordination with the Pennsylvania Turnpike Commission would provide the opportunity to maximize the use of two significant infrastructure programs to enhance service throughout the eastern communities of Pittsburgh.

Boardings/ Walkability/ TOD Typology

The estimated daily weekday boarding projections for this location indicates approximately 100 boardings. It should be noted that no new or existing routings were changed to serve this location. Some potential boardings for this area may be utilizing the Keystone Commons location in the SPC model due to their proximity to each other.

The Walk Score for this location is 18. This represents the lowest Walk Score of the locations reviewed.

The TOD Typology for the Mon Fayette Expressway interchange location is “Suburban Neighborhood

Cost

The capital cost for this site are estimated at $18 Million in 2016 dollars.

The Proposed Interchange of the Mon Fayette Expressway with the East Pittsburgh / Mckeesport Boulevard site for a stop is feasible and should be considered for further evaluation.

Pitcairn

For Figure See Pitcairn Stop in the Alternatives Section

Existing Conditions

A stop near Pitcairn is a possible site that is not directly connected to the alignment but may be connected to the busway extension with service via the local roadway network. A stop near Pitcairn represents the potential to capture ridership from the east with connection to the busway extension via the local roadway network and transit service.

Engineering

The site topography is suitable for a stop location with accessibility to Broadway Avenue and Route 48. Modest improvements to the local roadway network may be necessary to provide access.

Boardings/ Walkability/ TOD Typology

The estimated daily weekday boarding projections for a location in Braddock indicates approximately 200 boardings. This estimated assumed the doubling of trips for the P69 Trafford Flyer, which would access this location.

The Walk Score for Pitcairn location is 47.

The TOD Typology for the Pitcairn Area is “Suburban Neighborhood

Cost

The capital cost for this site is estimated at $10 Million in 2016 dollars.

The Pitcairn site is feasible and should be considered for further evaluation.

Monroeville Mall

For Figure See Monroeville Mall Stop in the Alternatives Section.

Existing Conditions

There is an existing park and ride lot at the Monroeville Mall that operates with the current transit service. A stop at the Monroeville Mall represents the potential to capture ridership from the east with connection to the busway extension via the local roadway network and transit service.

Engineering

The parking lot at the Monroeville Mall provides access to the local roadway network, provides an area for parking would be suitable for construction activities.

Boardings/ Walkability/ TOD Typology

The estimated daily weekday boarding projections for this location is approximately 700 boardings.

The Walk Score for Monroeville Mall location is 40.

The TOD Typology for the Monroeville Mall Area is "Suburban Employment." Suburban Employment stations are in less dense areas with active employment centers where one would expect to find large, low- to mid-rise buildings. Sources of employment in the four Suburban Employment locations include retail and industrial businesses, and office space could be part of the mix of uses at these station areas.

All Suburban Employment station areas experience sparse, spread-out residential, and the land organization reflects this, usually catering to personal vehicle transportation.

Building strong pedestrian connectivity access may be a difficult and expensive task, especially given the context of large blocks and surface parking lots. Park and Rides in these areas could be the most beneficial land use since multimodal connections tend to be limited in these areas.

Cost

A capital cost for this site is estimated to be $10 Million in 2016 dollars

The Monroeville Mall site for a stop is feasible for further consideration.

Conclusion

The Red Alternative is feasible as a stand-alone project which extends the busway from the Swissvale Station to Braddock Avenue and also may be considered with options to extend the busway transit service to the east. Stop locations at 6th Ave in Braddock, Keystone Commons, Mon Fayette Interchange, Pitcairn and Monroeville are feasible and may be considered individually or in combination.

The Red Alternative is feasible and should be considered for further evaluation.

Orange Alternative – (Swissvale to Keystone Commons)

See Figure for Orange Alternative in the Alternatives Section

Alignment

Existing Conditions

The Orange Alternative follows the same alignment as developed for the Red Alternative from the Swissvale Station to East Pittsburgh where it diverges and takes a northerly path to provide direct access to Keystone Commons. A tunnel under East Pittsburgh is required to achieve this direct access to Keystone Commons. The tunnel underneath East Pittsburgh is necessary for the alignment to reach the Keystone Commons while maintaining a reasonable profile grade for the alignment.

While achieving a direct access to Keystone Commons, the alignment does not provide a connection to Braddock Avenue as did the alignment for the Red Alternative. Therefore, access to the local roadway network, the Mon Fayette Expressway and the local transit service would be from the busway connection to Keystone Commons.

Similar to the alignment for the Red Alternative, the alignment for the Orange Alternative provides connectivity to the local roadway network with accessibility of the existing transit service. The alignment fits into the overall

land use of the study area and connects areas of population and employment density to the Busway extension. The need for right of way and the impact on existing environmental conditions is similar to the Red Alternative.

Engineering

The alignment for the Orange Alternative encounters the same engineering issues as the alignment for the Red Alternative from the Swissvale Station along the "up hill" side of the railroad to Braddock Ave. Near Braddock Ave. the alignment turns northward toward Keystone Commons and a tunnel is required to provide an alignment with an appropriate grade to reach Keystone Commons.

The need for a tunnel poses significant engineering and constructability issues. While a tunnel may be possible the alignment needs to be evaluated for the benefits that it may provide compared to the effort to construct and maintain a tunnel for the busway.

The need for a tunnel limits the potential for this alignment to be viable for further consideration.

Ridership

The Orange Alternative develops ridership through connection to the local roadway network at Keystone Commons and a stop near the midpoint of the alignment in Braddock. The alternative's ridership projections would be similar to the Red Alternative projections.

Cost

The capital cost to construct the Orange Alternative is approximately $604 Million in 2016 dollars. This cost indicates a significant increase of investment to extend the busway to Keystone Commons as compared to the Red Alternative.

Stop Locations

Stop Locations that were considered include:

- 6th Street in Braddock – See Red Alternative
- Verona Street in Braddock – See Red Alternative
- "East Pittsburgh" - Intersection of Braddock Avenue with "Old" Braddock Ave and Main Street – Not viable with the Orange Alternative – See Below
- Keystone Commons – See Below
- Mon Fayette Expressway Interchange with East Pittsburgh/McKeesport Boulevard – See Below
- Pitcairn – See Red Alternative
- Monroeville Mall – See Red Alternative

"East Pittsburgh" - Intersection of Braddock Avenue with "Old" Braddock Ave and Main Street

The alignment for the Orange Alternative does not provide a connection to Braddock Avenue therefore the "East Pittsburgh" location is not viable for consideration with the Orange Alternative.

Keystone Commons

Existing Conditions

The existing conditions are as described for the Red Alternative. For the Orange Alternative, this site provides the opportunity for a direct connection to the alignment.

Engineering

The engineering and constructability at this site provide the opportunity to consider a direct connection to the alignment for the Orange Alternative. The access to the site is through the local roadway network which may require some modest improvements.

Boardings/ Walkability/ TOD Typology

The boardings/ walkability/ TOD typology are as described for the Red Alternative. See the Red Alternative.

Cost

The capital cost for this site is estimated at $18 Million in 2016 dollars.

The Keystone Commons site for a stop is feasible for consideration with the Orange Alternative.

Mon Fayette Expressway Interchange with East Pittsburgh/McKeesport Boulevard

A Stop at the Proposed Mon Fayette Interchange has all the similar issues as the Red Alternative, except that access to the Busway for the Orange Alternative would be

via the existing roadway network to the stop at Keystone Commons at the end of the alignment.

Conclusion

Overall the Orange Alternative is feasible to extend the busway from Swissvale to Keystone Commons with Stops that may be considered at 6th Ave in Braddock, Keystone Commons, Mon Fayette Expressway Interchange, Pitcairn, and Monroeville Mall.

Due to the significant construction cost associated with the tunnel and the cost to operate and maintain the tunnel and no anticipated increase in Ridership, the Orange Alternative should not be considered for further evaluation.

Green Alternative – (Swissvale to Turtle Creek)

See Figure for Green Alternative in the Alternatives Section.

Alignment

Existing Conditions

The alignment for the Green Alternative involves extending the busway from the existing Swissvale Station to the Borough of Turtle Creek. The alignment follows the same alignment as for the Red Alternative from the Swissvale Station to East Pittsburgh at Braddock Avenue. To reach the Borough of Turtle Creek the alignment passes over Braddock Ave, the railroads and Turtle Creek while passing below the Westinghouse Bridge. The topography at the Westinghouse Bridge provides a window of access for the alignment to reach Turtle Creek but is significantly congested with the existing roadways and railroads. From the Westinghouse Bridge the alignment follows the railroad to the Borough of Turtle Creek.

The existing conditions within the borough exhibit a well-developed town center and a dense local roadway network that would require significant right of way acquisition for construction. The accessibility of the alignment to the existing roadway network is extremely limited due to the built up condition of the Borough of Turtle Creek.

The environmental issues associated with the Borough of Turtle Creek are well documented through the development of the Environmental Impact Statement prepared by the PTC for the Mon Fayette Expressway. Through extensive coordination with the Borough of Turtle Creek, the PTC has committed to a mitigation measure for the Mon Fayette Expressway that is comprised of maintaining the expressway on aerial structures, which are 90 feet high, through the Borough of Turtle Creek. An alignment for the extension of the busway through the Borough of Turtle Creek would be subject to the same mitigation measures.

Engineering

The engineering for this alignment from the Swissvale Station to Braddock Ave is the same as the alignment for the Red Alternative.

At Braddock Ave the alignment for the Green Alternative passes over Braddock Ave, the Norfolk Southern Railroad, the Union Railroad, Turtle Creek and East Pittsburgh/McKeesport Boulevard which requires a vertically and horizontally curved structure that is approximately 2500 feet in length.

From East Pittsburgh/McKeesport Boulevard, the alignment follows the Norfolk Southern Railroad to another aerial structure that begins at the crossing of Turtle Creek and is maintained on aerial structure through the Borough of Turtle Creek. This aerial structure is approximately 1300 feet in length. The structures required for the alignment from Braddock Ave to the Borough of Turtle Creek are significant engineering and construction issues with complicated geometry, close proximity to existing infrastructure and difficult foundation conditions.

The proximity of the alignment along the Norfolk Southern Railroad from East Pittsburgh/McKeesport Boulevard may result in significant relocation of the railroad and encounter difficult geotechnical issues with the hillside through that area.

The end point of the alignment for the Green Alternative near the Borough of Turtle Creek is not an amenable location for a stop where access can be readily made to the existing local roadway network. Based on the need to maintain the alignment on aerial structure over the Borough of Turtle Creek, the touch down point of the alignment is difficult and would require significant site work, right of way acquisition and redevelopment of the local roadway network.

This alignment also poses a conflict with the proposed construction of the Mon Fayette Expressway.

The need for significant structures, coordination with the railroads, coordination with the development of the Mon Fayette Expressway and coordination with the Borough of Turtle Creek limits the potential for this alignment to be viable for further consideration.

Ridership

The Green Alternative considers ridership through connection to the local roadway network at the Borough of Turtle Creek and a stop in Braddock. The alternative's ridership projections would be similar to the Red Alternative projections.

Cost

The capital cost to construct the Green Alternative is approximately $686 Million in 2016 dollars. This cost indicates a significant increase of investment to extend the busway to Keystone Commons as compared to the Red Alternative.

Stop Locations

Stop Locations that were considered include:

- 6th Street in Braddock – See Red Alternative
- Verona Street in Braddock – See Red Alternative
- "East Pittsburgh" - Intersection of Braddock Avenue with "Old" Braddock Ave and Main Street – Not viable with the Green Alternative – See Orange Alternative
- Keystone Commons – See Red Alternative
- Mon Fayette Expressway Interchange with East Pittsburgh/McKeesport Boulevard – not viable with the Green Alternative – See Below
- Pitcairn – See Red Alternative
- Monroeville Mall – See Red Alternative
- Turtle Creek – See Below

Mon Fayette Expressway Interchange with East Pittsburgh/McKeesport Boulevard

The stop location at the Mon Fayette Expressway is not viable with the Green Alternative due to the alignment occupying the same footprint as the Mon Fayette Expressway. This conflict either precludes the Mon Fayette Expressway or causes a relocation of the Expressway and limits the potential for a stop in this location.

Turtle Creek

For Figure See Turtle Creek Stop in the Alternatives Section

Existing Conditions

The existing conditions at or near the Borough of Turtle Creek do not provide for a reasonable site to place a stop. The site topography is constrained by the built-up condition of Turtle Creek. The environmental issues identified for the alignment to be maintained on an aerial structure through the borough significantly lessen the potential for a stop location near the Borough of Turtle Creek. Significant right of way acquisition would be necessary to place a stop in or near the Borough of Turtle Creek.

Engineering

The existing conditions at or near the Borough of Turtle Creek and the need to maintain the alignment on an aerial structure through Turtle Creek require significant structures and roadway network revisions to achieve a connection to a stop and the alignment.

Boardings/ Walkability/ TOD Typology

No estimated daily weekday boarding projections were developed for the Turtle Creek location.

The Walk Score for the Turtle Creek locations is 37.

The TOD Typology for the Turtle Creek Area is "Suburban Neighborhood

Cost

A capital cost for this site is estimated at $30 Million in 2016 dollars and is included in the overall cost for the alignment above.

Conclusion

Overall the Green Alternative is not feasible to extend the busway from Swissvale to the Borough of Turtle Creek.

Due to the significant construction cost associated with the structures along the alignment and the difficulty with placing a stop in the Borough of Turtle Creek, the Green Alternative should not be considered for further evaluation.

Pink Alternative – (Swissvale to Turtle Creek)

See Figure for Pink Alternative in the Alternatives Section.

Alignment

Existing Conditions

The alignment for the Pink Alternative follows the same alignment as developed for the Red Alternative from the Swissvale Station to East Pittsburgh where it diverges and takes a northerly path along the Union Railroad to reach the Borough of Turtle Creek.

This alignment avoids the congestion of infrastructure associated with the Green Alternative at the Westinghouse Bridge, but it requires a tunnel to traverse below the topography of East Pittsburgh. This alignment does not provide a direct connection to Braddock Avenue.

The alignment emerges from the tunnel along the Tri-Boro Expressway and follows the Union Railroad, which is on a structure, toward the Borough of Turtle Creek. The topography of this hill side requires that the alignment for the busway also be on a lengthy structure. This alignment does not provide direct access to Keystone Commons.

A significant number of properties are impacted along the alignment from East Pittsburgh to the Borough of Turtle Creek. The existing conditions within the Borough of Turtle Creek are similar for this alignment as compared to the Green Alternative. The borough is a well-developed town center that would require significant right of way acquisition for construction. The accessibility of the alignment to the existing roadway network is extremely limited due to the built up condition in the Borough of Turtle Creek.

The environmental issues identified for the Green Alternative are the same for the Pink Alternative. An alignment passing through the Borough of Turtle Creek would be required to be on an aerial structure.

Engineering

The alignment for the Pink Alternative encounters the same engineering issues as the alignment for the Red Alternative from the Swissvale Station to Braddock Ave. Near Braddock Ave the alignment turns northward via a tunnel under East Pittsburgh that emerges near the Tri-Boro Expressway and the Union Railroad. The tunnel is required to achieve an appropriate vertical alignment, but the tunnel poses significant engineering and constructability issues. The alignment follows along the Union Railroad which requires a combination of retaining walls and aerial structures due to the hill side below East Pittsburgh, crossing of local roads and crossing of the railroad.

While avoiding the infrastructure issues at the Westinghouse Bridge and the conflict with the proposed Mon Fayette Expressway, the alignment requires a tunnel under East Pittsburgh and significant structures along the Union Railroad to reach the Borough of Turtle Creek.

At the Borough of Turtle Creek the alignment for the Pink Alternative passes northwest of the borough and faces the same issues as the alignment for the Green Alternative which requires an aerial structure in or near the borough. Potential locations for a stop are complicated by the aerial alignment and the touch down point of the alignment would require significant site work, right of way acquisition and redevelopment of the local roadway network.

The need for a tunnel under East Pittsburgh, the significant retaining wall and aerial structures along the Union Railroad and coordination with the Borough Turtle Creek limits the potential for this alignment to viable for further consideration.

Ridership

The Pink Alternative considers ridership through connection to the local roadway network at the Borough of Turtle Creek and a stop in Braddock. The alternative's ridership projections would be similar to the Red Alternative projections.

Cost

The capital cost to construct the alignment for Pink Alternative is approximately $826 Million in 2016 dollars. This cost indicates a significant increase of investment to extend the busway to Turtle Creek as compared to the Red Alternative and is higher than the alignment for the Green Alternative to reach Turtle Creek.

Stop Locations

Stop Locations that were considered include:

- 6th Street in Braddock – See Red Alternative
- Verona Street in Braddock – See Red Alternative
- "East Pittsburgh" - Intersection of Braddock Avenue with "Old" Braddock Ave and Main Street – Not viable with the Pink Alternative – See Orange Alternative
- Keystone Commons – See Red Alternative
- Mon Fayette Expressway Interchange with East Pittsburgh/McKeesport Boulevard – not viable with the Pink Alternative – See Green Alternative
- Pitcairn – See Red Alternative
- Turtle Creek – See Green Alternative
- Monroeville Mall – See Red Alternative

Conclusion

Overall the Pink Alternative is not feasible to extend the busway from Swissvale to the Borough of Turtle Creek. Due to the significant construction cost associated with the tunnel, the structures along the alignment and the difficulty with placing a stop in the Borough of Turtle Creek, the Pink Alternative should not be considered for further evaluation.

Blue Alternative – (Swissvale to Monroeville)

See Figure for Blue Alternative in the Alternatives Section.

Alignment

Existing Conditions

The alignment for the Blue Alternative follows the same alignment as the Red Alternative to reach Braddock Ave and then either the alignment for the Green or Pink Alternative to reach the Borough of Turtle Creek.

From Turtle Creek the alignment extends north through the Thompson Run Valley to Business Route 22 and I376/ Parkway East with ramp connections to the local roadway network.

Evaluation of the alignment through the Thompson Run Valley results in a similar line and grade taken by the proposed Mon Fayette Expressway. The elevation difference from the floor of the valley to the Monroeville Mall is approximately 250 feet. At Monroeville, there are significant infrastructure obstacles associated with I-376/Parkway East, Business Route 22 and the Union Railroad. An alignment for the Blue Alternative would require significant relocation of the Union Railroad, right of way acquisition throughout the Thompson Run Valley and into Monroeville.

The environmental conditions identified throughout the Thompson Run Valley and Monroeville do not indicate significant issues for construction of this alignment.

The proposed Mon Fayette Expressway occupies much of the available space in the Thompson Run Valley.

Engineering

The alignment for the Blue Alternative encounters the same engineering and construction issues associated with the Red, Green and Pink Alternatives to reach the Borough of Turtle Creek.

The Thompson Run Valley north of the Borough of Turtle Creek poses several significant engineering and construction issues. Large retaining wall structures are needed along the east side of the valley to provide an adequate horizontal and vertical alignment. A significant portion of the Union Railroad also requires relocation of approximately 4000 linear feet.

The elevation difference from the floor of the valley to the roadway network near Monroeville is approximately 250 feet. Coupled with providing access to the roadway network of I-376/Parkway East and Business Route 22, this results in long and elevated ramps to provide access to the alignment.

This alignment poses a conflict with the proposed construction of the Mon Fayette Expressway. There is limited space within the Thompson Run Valley to provide a both a significant roadway project and the alignment for the Blue Alternative. The Mon Fayette Expressway and the alignment for the Blue Alternative occupy the same footprint.

In addition to the engineering issues identified for the previous portions of this alignment under the Red, Green and Pink Alternatives, the alignment for the Blue Alternative requires significant retaining wall structures, railroad relocation, development of connection to the existing roadway network and coordination with the proposed Mon Fayette Expressway. These issues limit the potential for this alignment to be viable for further consideration.

Ridership

The Blue Alternative develops ridership through connection to the local roadway network in Monroeville and a stop in Braddock. The Blue Alternative ridership projections were not modeled but can be interpreted to be less than the Yellow Alternative projections. This is because of the reduced stop locations along the extension corridor.

Cost

The Capital Cost to construct the Blue Alternative is considered along two alignments.

The Green-Blue alignment capital cost is approximately $1,078M.

The Pink-Blue alignment capital cost is approximately $1,224M.

These capital cost indicate significant investment that would be required to construct an entirely dedicated busway from the Swissvale Station to Monroeville and indicate that Mon Fayette Expressway be considered as an option for extending busway service to the Monroeville area.

Stop Locations

Stop Locations that were considered include:

- 6th Street in Braddock – See Red Alternative
- Verona Street in Braddock – See Red Alternative
- "East Pittsburgh" - Intersection of Braddock Avenue with "Old" Braddock Ave and Main Street – Not viable with the Blue Alternative
- Keystone Commons – Not viable with the Blue Alternative
- Mon Fayette Expressway Interchange with East Pittsburgh/McKeesport Boulevard – not viable with the Blue Alternative
- Pitcairn – Not viable with the Blue Alternative
- Turtle Creek – Not viable with the Blue Alternative
- Monroeville Mall – See Red Alternative

The East Pittsburgh, Keystone Commons, Mon Fayette, Turtle Creek and Pitcairn Stops are not viable with the Blue Alternative, as the alignment provides connections to the existing roadway network only in Braddock and Monroeville.

Conclusion

Overall the Blue Alternative comprised of either the Green-Blue or Pink- Blue Alternatives requires significant structures and is in direct conflict with the Mon Fayette Expressway to extend the busway from Swissvale to the Borough of Monroeville. Due to the issues identified with the Green and Pink Alternatives and the additional issues associated with alignment through the Thompson Run Valley, this alternative should not be considered for further evaluation.

Yellow Alternative – Mon Fayette Expressway (Swissvale to Monroeville)

See Figure for Yellow Alternative in the Alternatives Section.

Alignment

Existing Conditions

The alignment for the Yellow Alternative involves extending the East Busway to provide access to the Monroeville area via the proposed Mon Fayette Expressway.

The alignment for the Yellow Alternative follows the alignment of the Red Alternative from the Swissvale Station to Braddock Avenue just east of the Edgar Thomson Works. With a connection to the local roadway network at Braddock

Avenue, the alignment joins the Mon Fayette Expressway at the proposed interchange with East Pittsburgh/McKeesport Boulevard. The alignment for the Yellow Alternative then utilizes the Mon Fayette Expressway to reach the local roadway network in the Monroeville area at I376/Parkway East, Business Route 22 and the Monroeville Mall.

The Mon Fayette Expressway provides the means for bus service to reach the Monroeville Area.

Engineering

The alignment for the Yellow Alternative encounters the same engineering issues as the alignment for the Red Alternative.

The engineering and constructability issues identified for the alignment of the Blue-Green Alternative are encountered along the route of the Mon Fayette Expressway from the Interchange of the East Pittsburgh/McKeesport Boulevard Interchange, through the Borough of Turtle and the Thompson Run Valley to Monroeville. However, the engineering and construction issues through the Thompson Run Valley will be addressed through the development and construction of the Mon Fayette Expressway by the PTC.

An operational improvement of adding additional width to the proposed Mon Fayette Expressway to provide a "bus on shoulder" lane is a possible consideration. The engineering to add additional width to the Mon Fayette Expressway would need to be coordinated with the PTC.

The alignment for the Yellow Alternative is viable for consideration as it optimizes the use of the existing and proposed infrastructure.

Ridership

The Yellow Alternative develops ridership through faster travel time route connections with the local roadway network via Braddock Avenue and Business Route 22 and a stop near the midpoint of the alignment in Braddock. For the 20 service routes estimated for this alternative, daily weekday boardings for the Year 2035 increased in the range of 4,300 to 4,900 over the Year 2017 estimate. The daily weekday boarding increase over the Year 2035 No-Build Alternative is in the range of 1,900 to 2,400.

Capital Cost

The capital cost to construct the Yellow Alternative is approximately $371 Million in 2016 dollars.

A potential to consider a "bus on shoulder" lane would add approximately $26 Million in 2016 dollars to the cost.

Stop Locations

Stop Locations that were considered include:

- 6th Street in Braddock - See Red Alternative
- Verona Street in Braddock – See Red Alternative
- Keystone Commons – See Red Alternative
- "East Pittsburgh" - Intersection of Braddock Avenue with "Old" Braddock Ave and Main Street – See Red Alternative
- Mon Fayette Expressway Interchange with East Pittsburgh/McKeesport Boulevard – See Red Alternative
- Pitcairn – See Red Alternative
- Monroeville Mall – See Red Alternative
- Turtle Creek – Not Feasible

Conclusion

The Yellow Alternative is feasible to extend the busway from the Swissvale Station to Monroeville. Stop locations at 6th Ave in Braddock, Keystone Commons, Mon Fayette Interchange, Pitcairn and Monroeville Mall are feasible and may be considered individually or in combination.

The Yellow Alternative is feasible and should be considered for further evaluation.

Yellow Alternative with a Direct Connector to the Mon Fayette Expressway (Swissvale to Monroeville)

See Figure for Yellow Alternative with a Direct Connector in the Alternatives Section.

Alignment

Existing Conditions

The existing conditions encountered by this alignment are the same as the conditions for the Yellow Alternative with the addition of addressing the area where the Direct Connector Ramps are provided from Braddock Ave over the existing railroads and Turtle Creek to the proposed Mon Fayette Expressway as it passes under the Westinghouse Bridge.

As mentioned with respect to the alignment for the Green Alternative, this is a highly congested area of existing infrastructure that, however, does provide a window of opportunity to connect to the proposed Mon Fayette Expressway.

The site has environmental conditions that may need to be addressed due to the railroads and the industrial use of the area.

Engineering

Introducing the potential to provide ramps that directly connect the Busway Extension to the proposed Mon Fayette Expressway raises several engineering and construction issue that need to be addressed.

The ramp connections will need to be aerial structures on both horizontally and vertically curved alignments that are approximately 2000 feet in length. The substructures for these ramps will need to be carefully considered to optimize placement with respect to the existing railroads, roads, Turtle Creek and the alignment of the Mon Fayette Expressway.

Due to significant grade and elevation differences, the ramps meet the busway alignment at an intersection that requires a stop condition.

Overall, the engineering and construction of direct connecting ramps are possible. Significant coordination is needed with the PTC for the Mon Fayette Expressway to accommodate these ramps. The cost of these structures requires evaluation with respect to potential increase in ridership and reduced travel time.

It is possible that with appropriate planning these ramps could be considered for construction in the future.

Ridership

The Yellow Alternative with a Direct Connector to the Mon Fayette Expressway develops ridership the same as the Yellow Alternative but considers the addition of the Direct Connection and the potential for reduced travel time. The travel time reduction with the direct connection was not modeled at this time, therefore, it is assumed this alternative would have similar (if not better) boarding projections as the Yellow Alternative.

Capital Cost

The Additional capital cost to construct the Yellow Alternative with the Direct Connection Ramps is approximately $95 Million in 2016 dollars.

Stop Locations

Potential stop locations are the same for the Yellow Alternative with a Direct Connector to the Mon Fayette Expressway as for the Yellow Alternative – Mon Fayette Expressway.

With the addition of the Direct Connection of the Busway Extension to the Mon Fayette Expressway, local and express routes may be considered for transit service.

Conclusion

The Yellow Alternative with a Direct Connector to the Mon Fayette Expressway is feasible to extend the busway from the Swissvale Station to Monroeville. Stop locations at 6th Ave in Braddock, Keystone Commons, Mon Fayette Interchange, Pitcairn and Monroeville Mall are feasible and may be considered individually or in combination.

The Yellow Alternative with a Direct Connection to the Mon Fayette Expressway should be considered and a determination should be made if the Ridership improvements are significant enough to continue further investigation.

Comparison Tables

The following tables show a comparative summary of the alternatives for both the alignments and the stop locations. The alternatives are compared relative to each other for each issue.

Alignments

	*Red Alternative	Orange Alternative	Green Alternative	Pink Alternative	Blue Alternative	*Yellow Alternative	*Yellow Alternative with Direct Connection
Existing Conditions Environmental	●	◐	●	◑	●	●	○
Existing Conditions Access to Roadways/Transit Service	●	◐	●	◑	○	●	◑
Existing Conditions and Engineering Coordination with Railroads	◐	◐	●	●	●	◐	◑
Engineering Structures	◐	●	●	●	●	◐	◑
Engineering Constructability	●	●	●	●	●	●	○
Engineering Coordination w/ Mon Fayette Expressway	●	○	●	◑	●	●	●
Ridership	◐	◐	○	○	○	●	●
Capital Cost	◐	●	●	●	●	●	○

* Alternatives for Further Consideration

● Very Favorable ◐ Favorable ○ Neutral ◑ Unfavorable ● Very Unfavorable

Existing Conditions

Environmental Issues

Considers the environmental issues identified for the alignments and also takes into consideration the commitments that have been previously made to local municipalities by PTC's EIS for the Mon-Fayette Expressway. A very favorable and favorable rating indicates that the environmental issues may be readily addressed or mitigated. Neutral to Unfavorable to Very Unfavorable ratings indicate that modest to extensive mitigation measures may be required to address the viability of the alternative.

Existing Conditions

Access to Roadway and Transit Service

Considers the ability of the alternative to provide access to the local roadway network and transit service. A Very Favorable to Favorable rating indicates that the alternative may be readily connected to the existing roadway network and transit service without significant reconstruction of the roadway network or the need for new roadways. A Neutral to Unfavorable or Very Unfavorable rating indicates that the existing roadway network requires adjustments or that new roadways and relocation of existing roadways are required to make connections to the alternative.

Existing Conditions and Engineering

Coordination with Railroads

Considers the impact that the alternative has on the existing railroads. A Very Favorable to Favorable rating indicates that the alternative requires little to modest adjustments to the railroads and requires only grade separation structures and walls to construct the alternative in proximity to the railroads. A Neutral to Unfavorable and Very Unfavorable rating indicates that the alternative requires significant structures and modest to extensive relocation of the railroad to allow for construction of the alternative.

Engineering

Structures

Considers the need that the alternative has for structures to maintain the alignment. These structures may be retaining walls, grade crossings, aerial viaducts or tunnels. A Very Favorable to Favorable rating indicates that the alternative requires modest grade separation structures and walls. A Neutral to Unfavorable and Very Unfavorable rating indicates that the alternative requires significant retaining walls, aerial structures or tunnels for construction of the alternative.

Engineering

Constructability

Considers the topography of the alternative, the impact to the existing infrastructure during construction, temporary measures needed for construction and access to the construction sites. A Very Favorable to Favorable rating indicates that the construction access to the alternative and temporary measures to construct the alternative may be accomplished with conventional construction means and methods. A Neutral to Unfavorable or Very Unfavorable rating indicates that construction site access is complicated, temporary measures are needed to achieve construction and unconventional construction methods are required to construct the alternative.

Engineering

Coordination with the Mon Fayette Expressway

Considers the ability to utilize the Mon Fayette Expressway. A Very Favorable to Favorable rating indicates that the alternative would have no conflict with accessing the expressway. A Neutral to Unfavorable or Very Unfavorable rating indicates a number of issues accessing or a direct conflict exists between the alternative and the expressway.

Ridership

Considers the ability of the alternative to develop ridership together with the potential station locations. A Very Favorable to Favorable rating indicates that the alternative works well in developing ridership and connecting to existing transit. A Neutral to Unfavorable to Very Unfavorable rating indicates that the alternative does not provide an advantage to developing ridership or may require additional measures to provide connectivity to develop ridership.

Cost

Capital Cost

Considers the cost to construct the alternative. A Very Favorable to Favorable rating indicates that the cost for the alternative is reasonable when compared to construction costs for similar transportation projects. A Neutral to Unfavorable or Very Unfavorable rating indicates that the cost for the alternative is high as compared to the other alternatives and other transportation projects mostly due to the need for significant structures to address topography and existing infrastructure issues.

Potential New Stop Locations

The table below compares a number of parameters of each potential new stop evaluated with existing Busway (East and West) information and averages.

Note: Not all feasible stop locations were evaluated. A full planning study of all feasible stop locations should be considered if the extension of the busway is pursued. The Locations shown are not based on analysis, but are provided as examples.

Engineering/Constructability

Considers the topography of the alternative, the impact to the existing infrastructure during construction, temporary measures needed for construction and access to the construction sites. A Feasible rating indicates that the construction access to the alternative and temporary measures to construct the alternative may be accomplished with conventional construction means and methods. If

a feasible rating is not indicated, the main reason for impedance to the site is indicated.

Daily Weekday Boarding Estimates

For the Potential Stop Locations, these values represent the projected Year 2035 weekday boardings projected by SPC for one of the three ridership alternatives evaluated. For the Existing Busway (East and West) Average, this number represents Year 2016 average for all existing stations.

Walk Score

Considers the walkability of a location. It incorporates the walking proximity to amenities of a location. Amenities include businesses, parks, theaters, schools, and other common destinations. The Walk Score algorithm awards points based on the distance to the closest amenity in each category. If the closest amenity in a category is within .25 miles, it is assigned the maximum number of points. The number of points declines as the distance approaches 1 mile. No points are awarded for amenities farther than 1 mile. Each category is weighted equally and the points are summed and normalized to yield a score from 0–100. The number of nearby amenities is the leading predictor of whether people walk.

TOD Typology

Considers both the Jobs+Resident density and Jobs:Residents ratio of a location. To understand TOD opportunities and user relationships at each station in the Port Authority system, a typology was created in the Authority's publication, Transit-Oriented Development Guidelines (April 2016). The density and Jobs:Residents ratio are used to determine the TOD Typology for each stop location.

Potential Stop Location Summary

Stop Location	Engineering/ Constructability	Daily Weekday Boardings Estimates	Walk Score	TOD Typology
Braddock Area	Feasible	800	61	Transit Neighborhood
East Pittsburgh	Site Topography Difficult /Possible Environmental Issues	NA	34	Suburban Neighborhood
Keystone Commons	Feasible	1800	29	Suburban Neighborhood
Mon Fayette Expressway Interchange	Feasible	100	18	Suburban Neighborhood
Turtle Creek	Would Require Significant Elevated Station / Structure	NA	37	Suburban Neighborhood
Pitcairn	Feasible	200	47	Suburban Neighborhood
Monroeville Mall	Feasible	700	40	Suburban Employment
Existing Busway (East and West) Average	**N/A**	**768***	**67 (High: 94 Low: 32)**	**Downtown/Special events: 1 Urban Mixed Use: 4 Urban Neighborhood: 2 Transit Neighborhood: 5 Suburban Neighborhood: 2 Suburban Employment: 1**

*2016 Average Weekly Boardings

Conclusion

Alternatives Feasible for Further Consideration

Red Alternative

The Red Alternative may be considered as a phase of the busway extension that can provide service to Braddock, Turtle Creek and East Pittsburgh and allow for connection to additional phases of construction for the busway to reach Monroeville. Stop locations associated with the Red Alternative that are feasible for further consideration include a stop in Braddock, Keystone Commons, the proposed Mon Fayette Expressway Interchange, Monroeville Mall, and Pitcairn. The stop location at East Pittsburgh, near the Edgar Thomson Works is not feasible.

Yellow Alternative – Mon Fayette Expressway

The Yellow Alternative, utilizing the Mon Fayette Expressway to provide service to Monroeville is feasible for further consideration. Access to the Mon Fayette Expressway will be via the proposed interchange with East Pittsburgh/ McKeesport Boulevard. Bus service will connect to the Mon Fayette Expressway via the local roadway network at Braddock Ave. Bus service will also have access to Business Route 22 and the Monroeville Mall via connector ramps for the Mon Fayette Expressway. The stop locations for the Yellow Alternative are the same as the Red Alternative. The Mon Fayette Expressway does not require additional capital costs. The evaluation of dedicated bus lanes along the Mon Fayette Expressway may be considered and evaluated based upon potential time savings of bus service.

Yellow Alternative with a Direct Connector to the Mon Fayette Expressway

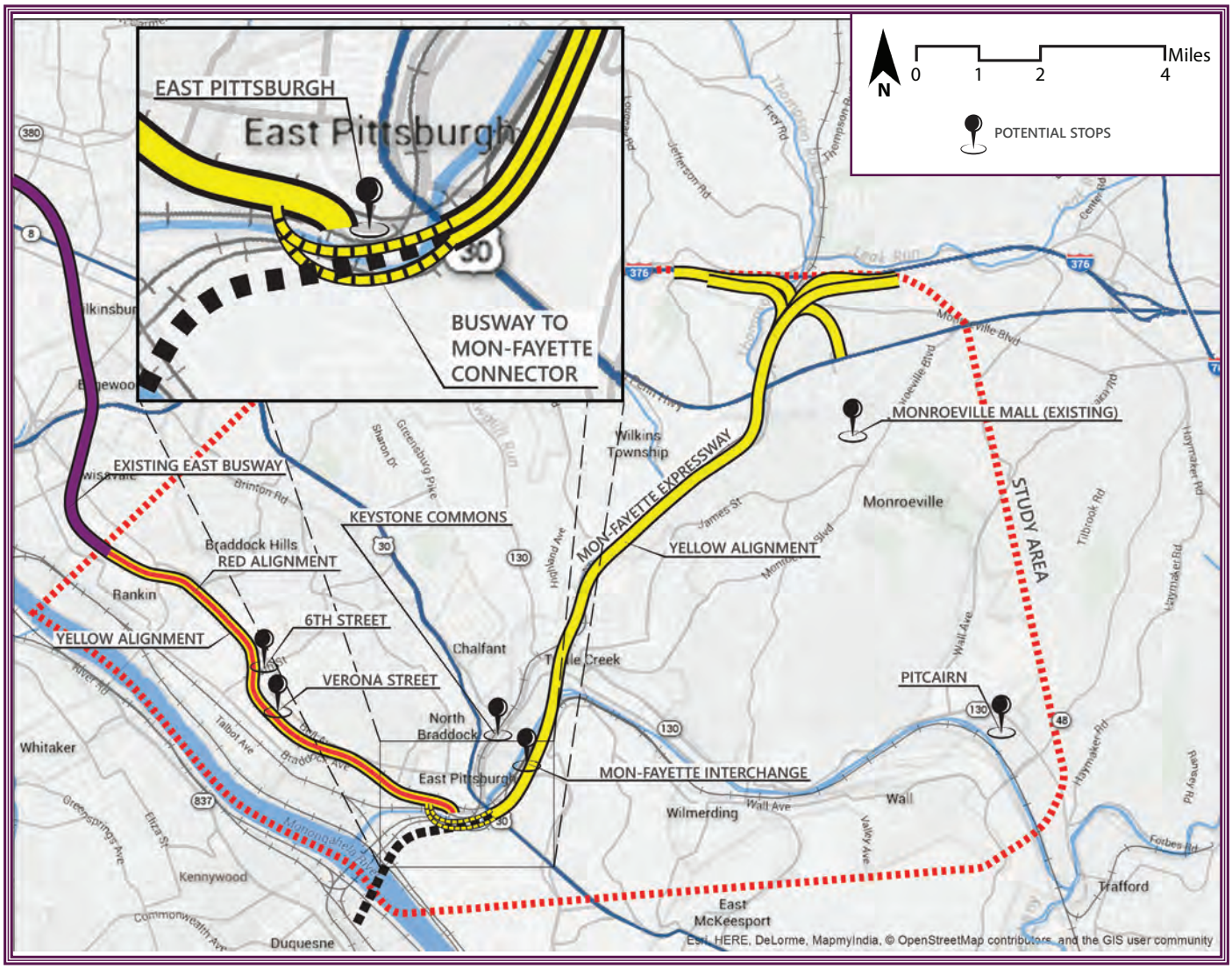
The Yellow Alternative, utilizing the Mon Fayette Expressway to provide service to Monroeville may also consider providing a direct connection between the busway extension at Braddock Avenue and the Mon Fayette Expressway via a set of direct connection ramps. Construction of the direct connection ramps requires an evaluation of potential time savings for bus service compared to utilizing the existing roadway network to provide access. The stop locations that are feasible are the same as the Yellow Alternative.

The most feasible alternative to extend the East Busway from the Swissvale Station to Monroeville is comprised of the Red Alternative from the Swissvale Station to Braddock Ave near East Pittsburgh and the Yellow Alternative (The Mon Fayette Expressway) from East Pittsburgh to Monroeville. A direct connection from the end of the Red Alternative at Braddock Ave to the Mon Fayette Expressway is a potential consideration. The most likely stop locations are in Braddock, Keystone Commons (East Pittsburgh) and at the Monroeville Mall. The other feasible stop locations that were evaluated may be considered in the future based upon further detailed study.

The following represents the estimated costs of the most likely feasible alternatives.

The most feasible alternative to extend the East Busway from the Swissvale Station to Monroeville is comprised of the Red Alternative from the Swissvale Station to Braddock Ave near East Pittsburgh and the Yellow Alternative (The Mon

Alternatives Feasible for Further Consideration



Fayette Expressway) from East Pittsburgh to Monroeville. A direct connection from the end of the Red Alternative at Braddock Ave to the Mon Fayette Expressway is a potential consideration. The most likely stop locations are in Braddock, Keystone Commons (East Pittsburgh) and at the Monroeville Mall. The other feasible stop locations that were evaluated may be considered in the future based upon further detailed study.

The following represents the estimated costs of the most likely feasible alternatives:

Overall Summary of Costs for Feasible Alternatives

Estimate Cost Summary	2016 Dollars	2026 Dollars*
Swissvale to East Pittsburgh (Red Alternative)		
Swissvale to East Pittsburgh Busway	$343 Million	$508 Million
Braddock Station	$10 Million	$14 Million
East Pittsburgh Station with Parking Facility	$18 Million	$27 Million
Total Red Alternative	**$371 Million**	**$549 Million**
East Pittsburgh to Monroeville (Yellow Alternative)**		
Mon Fayette Expressway Direct Connect	$95 Million	$141Million
Monroeville Mall Station	$10 Million	$14 Million
Total Yellow Alternative	**$105 Million**	**$155 Million**
Total Swissvale to Monroeville using Mon Fayette	**$476 Million**	**$704 Million**

*Assumes a 4% per year rate of inflation

**Assumes the future Mon Fayette without any other additional improvements

A timeline for development of the extension of the East Busway is comprised of several major planning, engineering and construction activities as follows:

EstimatedTimeline

Phase	Duration	Start	End
Programming of Project/ Design RFP	1 Year	2017	2018
Environmental Study	2 Years	2018	2020
Preliminary and Final Design	2 Years	2020	2022
ROW/Property Acquisition	2 Years	2021	2023
Construction	3 Years	2023	2026
Overall Schedule	9 Years	2017	2026

Alternatives Not Feasible for Further Consideration

Orange Alternative

The orange alternative is not feasible for further consideration due to capital cost and constructability issues associated with the tunnel that is needed to reach Keystone Commons.

Green Alternative

The Green Alternative is not feasible for further consideration due to the capital cost and constructability issues associated with the structures required to traverse the railroads at the Westinghouse Bridge, the potential alignment conflict with the proposed Mon Fayette Expressway and the lack of access to the roadway network in the Borough of Turtle Creek.

Pink Alternative

The Pink Alternative is not feasible for further consideration due to the capital cost and constructability issues associated with the tunnel that is needed to reach the Borough of Turtle Creek as well as the capital costs for the structure that will be required along the Union Railroad and the lack of access to the roadway network in the Borough of Turtle Creek.

Blue Alternative

The Blue Alternative is not feasible for further consideration due to the issues associated with the Green and Pink Alternatives as well as the capital cost of constructing the busway through the Thompson Run Valley and the associated connections that would be required at Monroeville. The Blue Alternative also occupies the same footprint as the proposed Mon Fayette Expressway through the Thompson Run Valley.

Appendices

Appendix A

Engineering

Design Criteria

The Design Criteria for the Extension of the East Busway is based upon the Port Authority of Allegheny County Busway Design Manual for the Airport Busway 1994. This Design Criteria was provided by the Port Authority for guidance in developing the geometric alignment for the Extension of the East Busway.

The alignment shown on the 200 Scale Engineering Plates was developed base upon Table 4.8.A - Busway Geometric Criteria Summary.

Table 4.8.A - Busway Geometric Criteria Summary

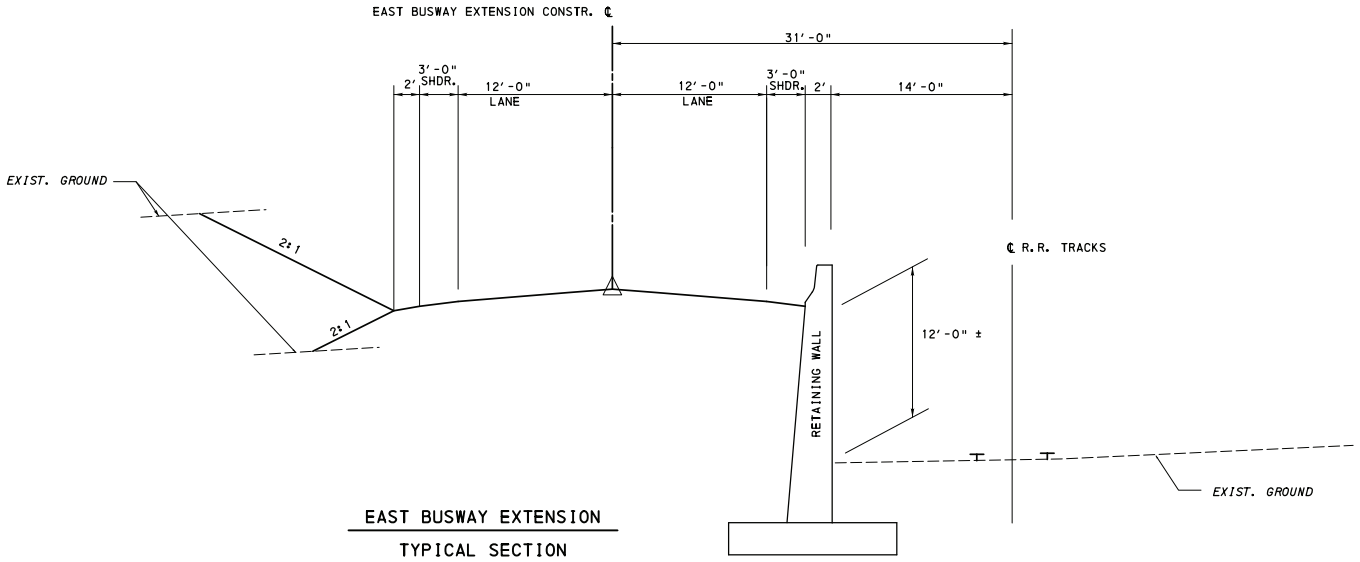
Criteria	Recommended*
Design Speed - Mainline	55 mph
Design Speed - Station and Downtown Areas	35 mph
Design Speed - Ramps	25 mph
Design Speed - Turning Radii	20 mph desirable
Sight Distance	Penn DOT[1]
Stopping Sight Distance	Penn DOT[1]
Passing Sight Distance	Penn DOT[1]
Minimum Horizontal Curve Radius, Mainline	R = 1100
Minimum Horizontal Curve Radius, Stations	R = 430'
Minimum Horizontal Curve Radius, Ramps	R = 180'
Minimum Turning Radii at Intersections	75' desirable 50' minimum
Spirals	Penn DOT[1]
Maximum Superelevation	6%
Superelevation Run-out — Main Busway	1:400
Superelevation Run-out — At Stations	1:200
Pavement Crossfall — Busway	2%
Pavement Crossfall — Station Platform Areas	reverse 2%
Minimum Tangent at Station Ends (Platform)	100' beyond
Maximum Grade, Mainline, Desirable	3%
Maximum Grade, Mainline	5%
Maximum and Desirable Grade, Stations	0.50%
Minimum Grade, Stations	0.35%
Maximum Grade, Ramps	6%
Minimum Grade (Curbed main Busway, ramps & access roads)	0.50% desirable 0.35% minimum
Crest Curves — Main Busway	K = 180' min..
Crest Curves — Stations	K = 50' min.
Sag Curves — Main Busway	K = 130' min.
Sag Curves — Stations	K = 65' min.
Acceleration Lane Length	300'
Acceleration Lane Taper	150'
Deceleration Lane Length	150'
Deceleration Lane Taper (minimum)	100'
Intersection Angle	70 ° min.-90° max.

* Recommended values are to be applied where possible. For variations in maximum or minimum criteria, refer to the applicable section of text.

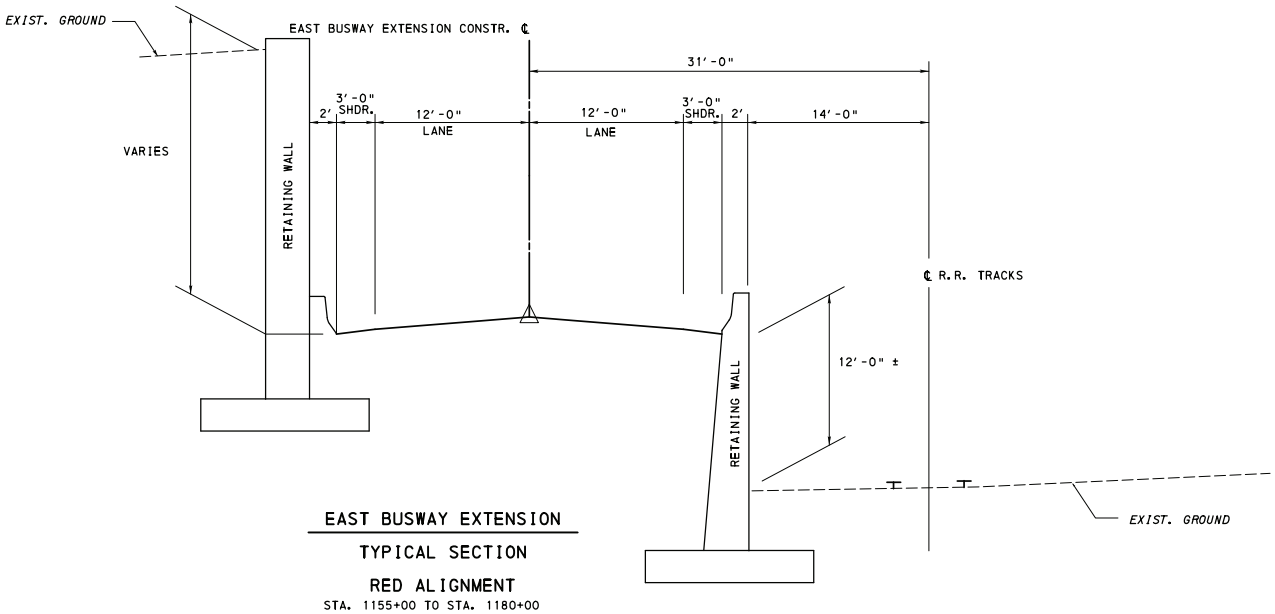
Typical Sections

The Design Criteria for the Extension of the East Busway is based upon the Port Authority of Allegheny County Busway Design Manual for the Airport Busway 1994. This Design Criteria was provided by the Port Authority for guidance in developing the geometric alignment for the Extension of the East Busway.

The alignment shown on the 200 Scale Engineering Plates was developed base upon Table 4.8.A - Busway Geometric Criteria Summary.



EAST BUSWAY EXTENSION
TYPICAL SECTION
RED ALIGNMENT
STA. 1034+00 TO STA. 1155+00



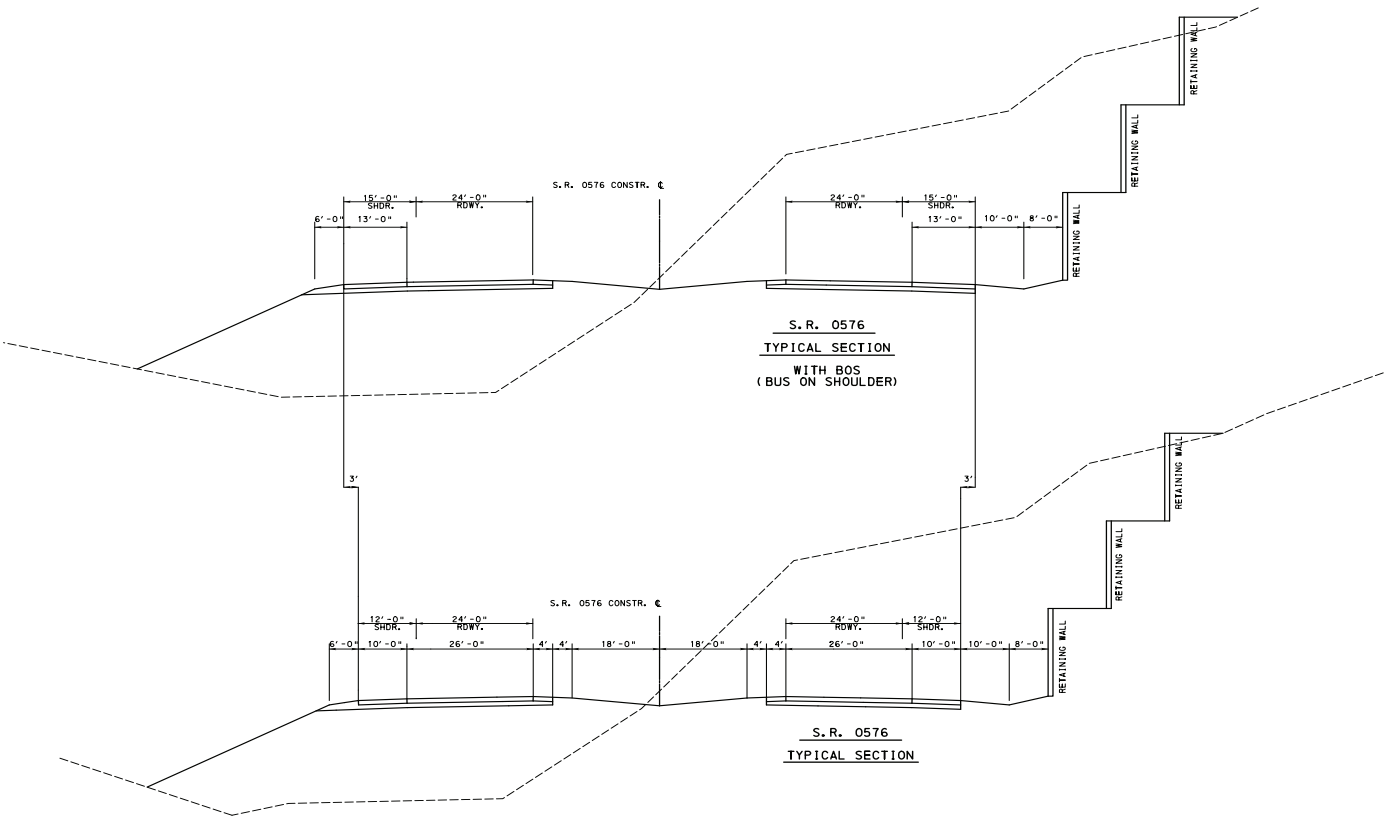
EAST BUSWAY EXTENSION
TYPICAL SECTION
RED ALIGNMENT
STA. 1155+00 TO STA. 1180+00

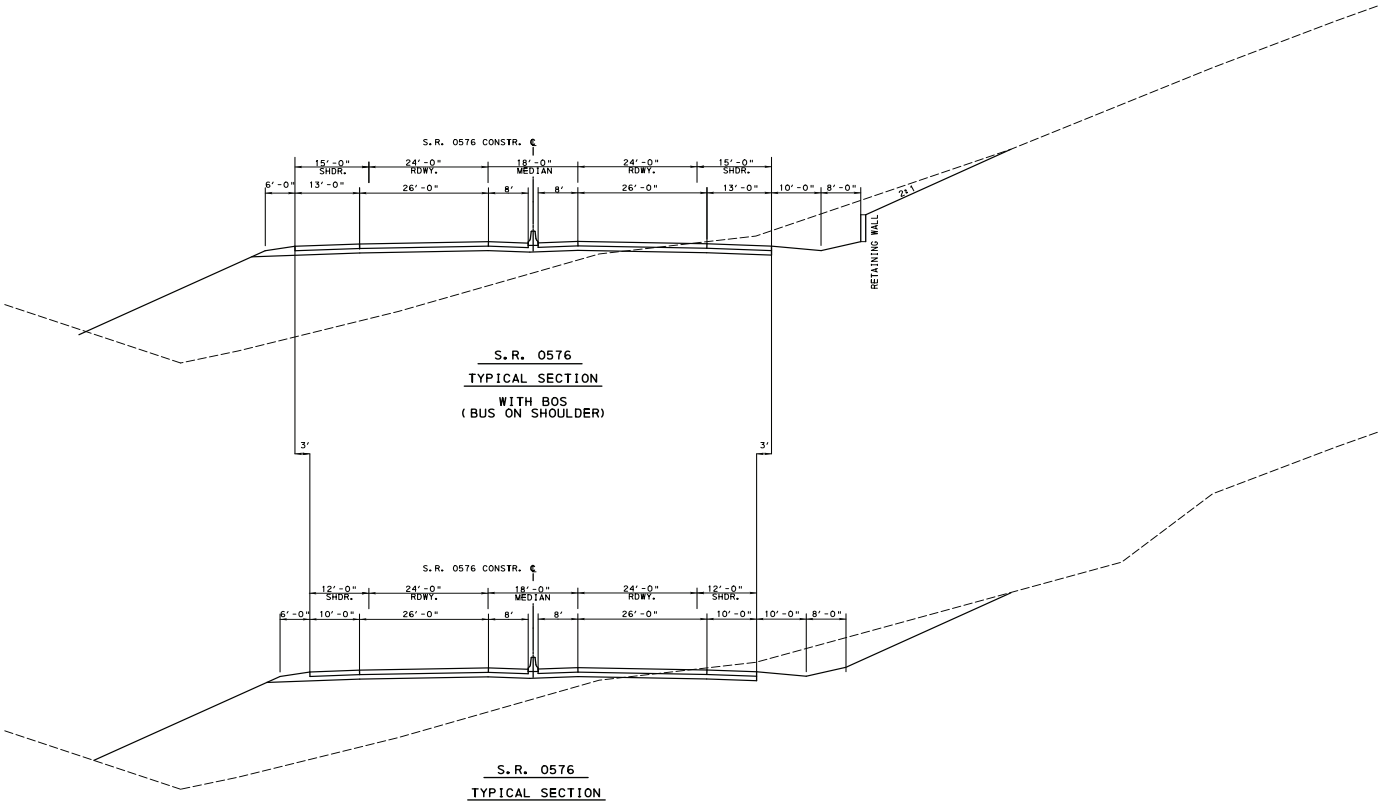
Typical Section Mon Fayette Expressway

The Typical Section for the Mon-Fayette Expressway is comprised of two 12' lanes in each direction with an outside shoulder of 12' and an inside shoulder of 4'. This roadway section provides an adequate template to be used as a busway.

The 12' outside shoulder provides adequate width to serve as a bypass for the buses in the event of an emergency and the outside shoulder was investigated to serve as a dedicated "bus on shoulder" lane by increasing the outside shoulder width to 15'.

The Typical Sections for the Mon-Fayette Expressway depict the varying topography that requires significant slopes and/or walls to achieve construction of the expressway.

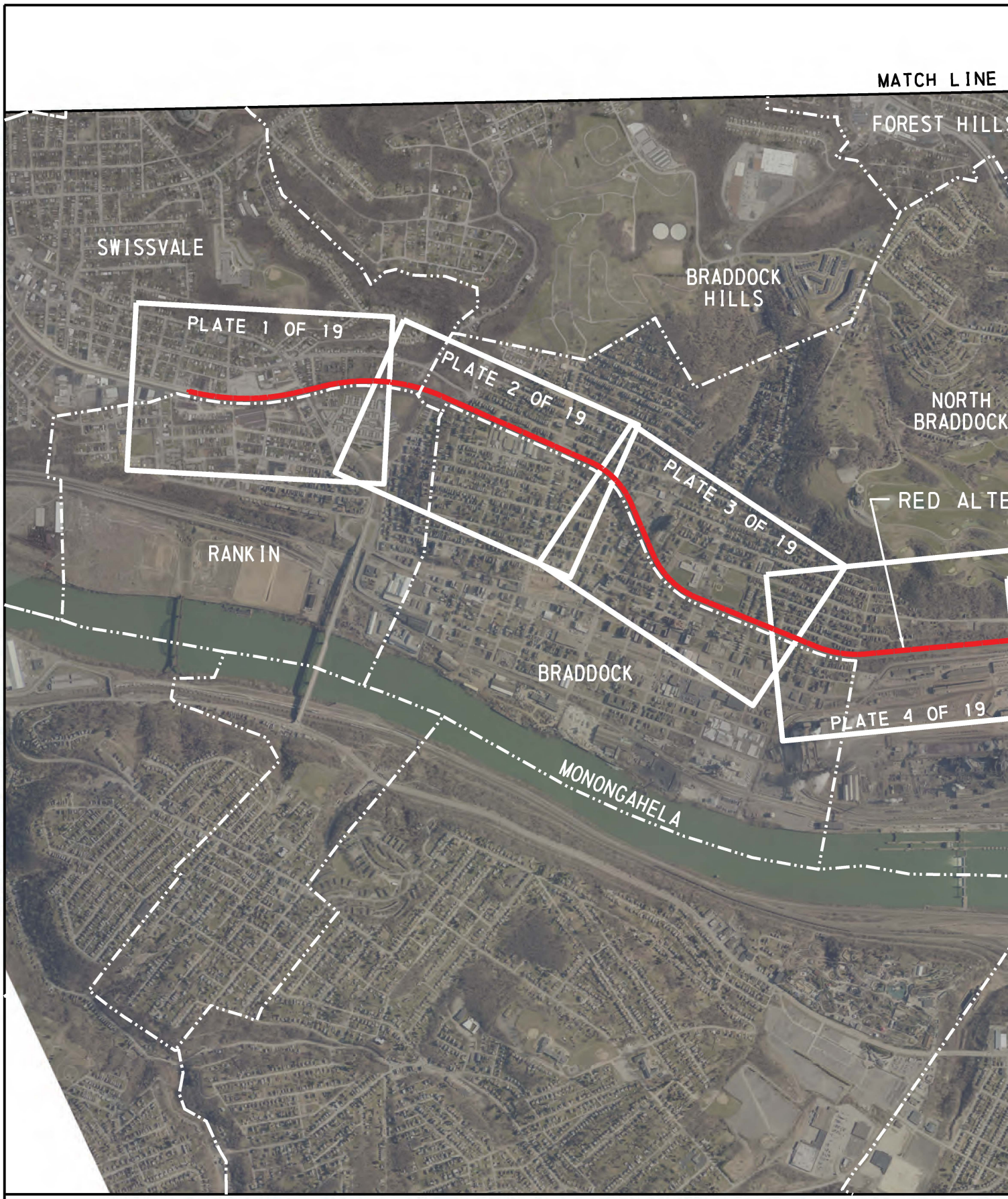



S.R. 0576 CONSTR. ℄
15'-0" SHDR.
24'-0" RDWY.
18'-0" MEDIAN
24'-0" RDWY.
15'-0" SHDR.
6'-0"
13'-0"
26'-0"
8'
8'
26'-0"
13'-0"
10'-0"
8'-0"
2%
RETAINING WALL
S.R. 0576
TYPICAL SECTION
WITH BOS
(BUS ON SHOULDER)
3'
3'
S.R. 0576 CONSTR. ℄
12'-0" SHDR.
24'-0" RDWY.
18'-0" MEDIAN
24'-0" RDWY.
12'-0" SHDR.
6'-0"
10'-0"
26'-0"
8'
8'
26'-0"
10'-0"
10'-0"
8'-0"
S.R. 0576
TYPICAL SECTION

Alternatives for Further Consideration - 200 Scale Engineering Plates

The 200 Scale Engineering Plates are photo based 3 Dimensional files that utilizes LIDAR (Light Detection and Ranging) data from PASDA (The Pennsylvania Spatial Data Clearinghouse of the Pennsylvania State University - official public access geospatial information clearinghouse for the state of Pennsylvania). The photo base provides the means to generate geometric alignments tied to the coordinate geometry for both horizontal and vertical control.

The alignments considered for Extension of the East Busway were developed in Microstation CADD utilizing the LIDAR files. The horizontal and vertical geometry developed for the alignments provide the means to evaluate the ability to provide connections to the existing infrastructure.



ALTERNATIVE/ALIGNMENT FOR FURTHER CONSIDERATION PLATE LAYOUT

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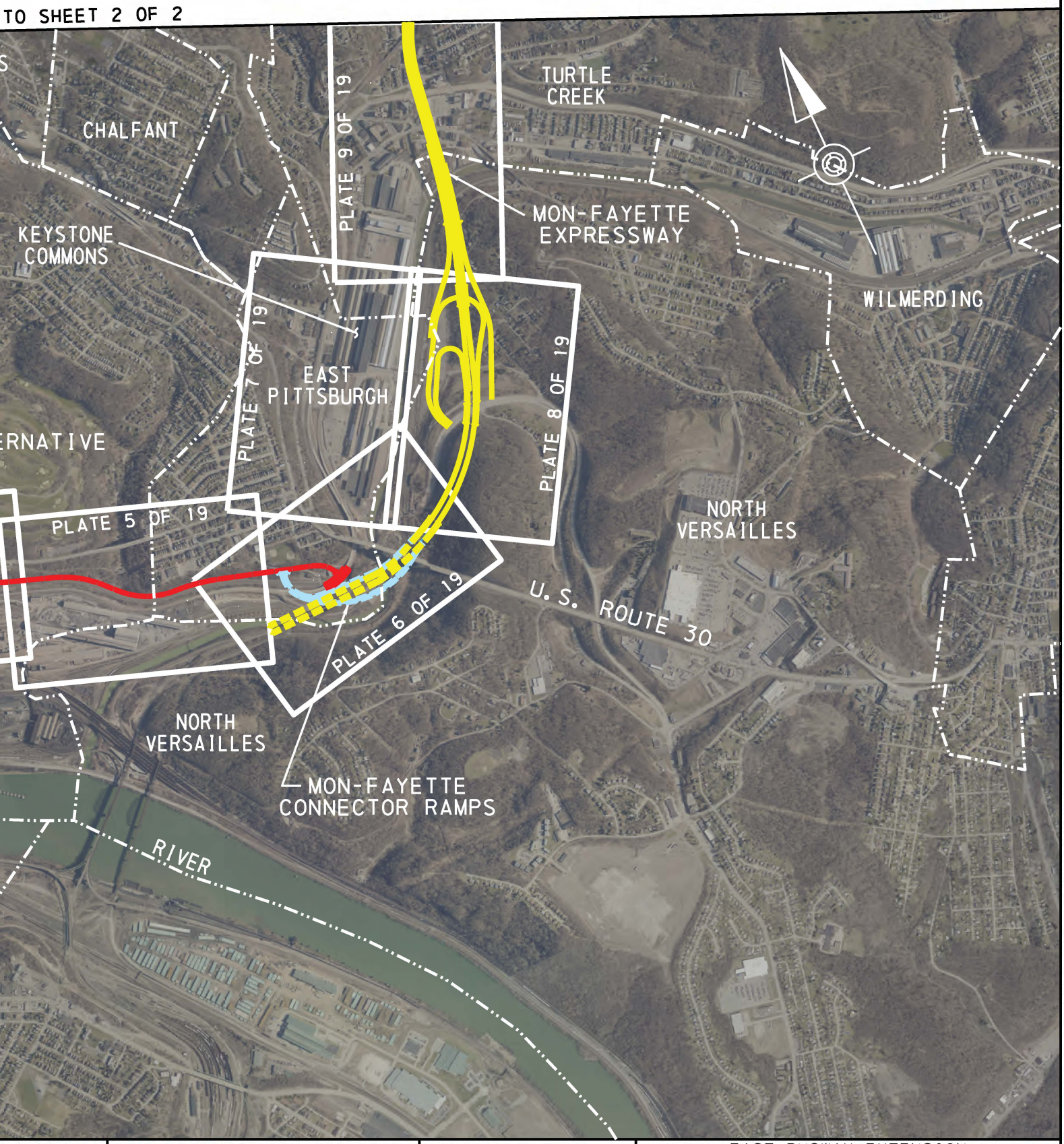

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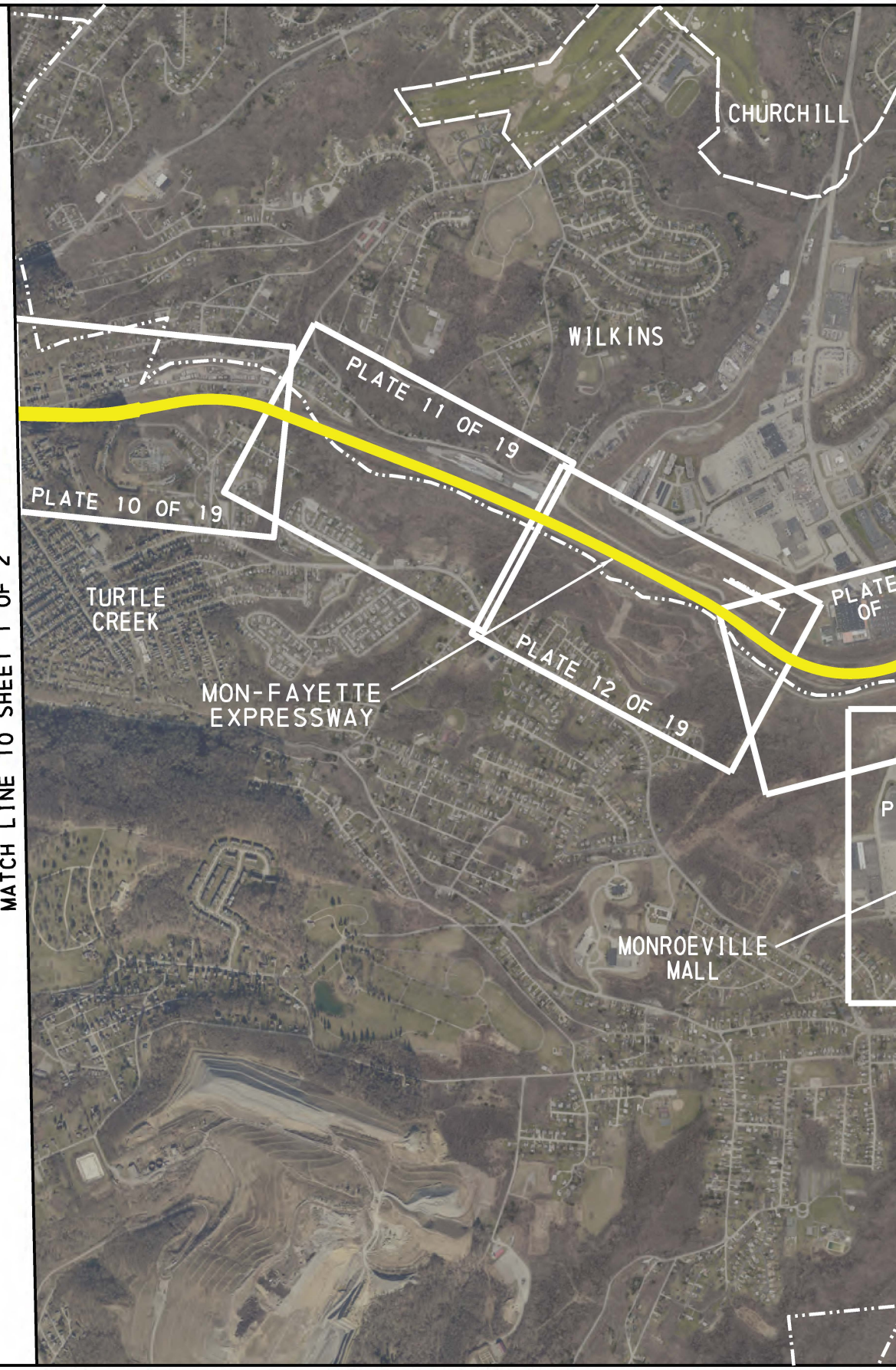
EAST BUSWAY EXTENSION
FEASIBILITY STUDY
SWISSVALE TO MONROEVILLE

JUNE 2016

SCALE IN FEET
800' 0 800' 1600'

SHEET 1 OF 2



ALTERNATIVE/ALIGNMENT FOR FURTHER CONSIDERATION PLATE LAYOUT

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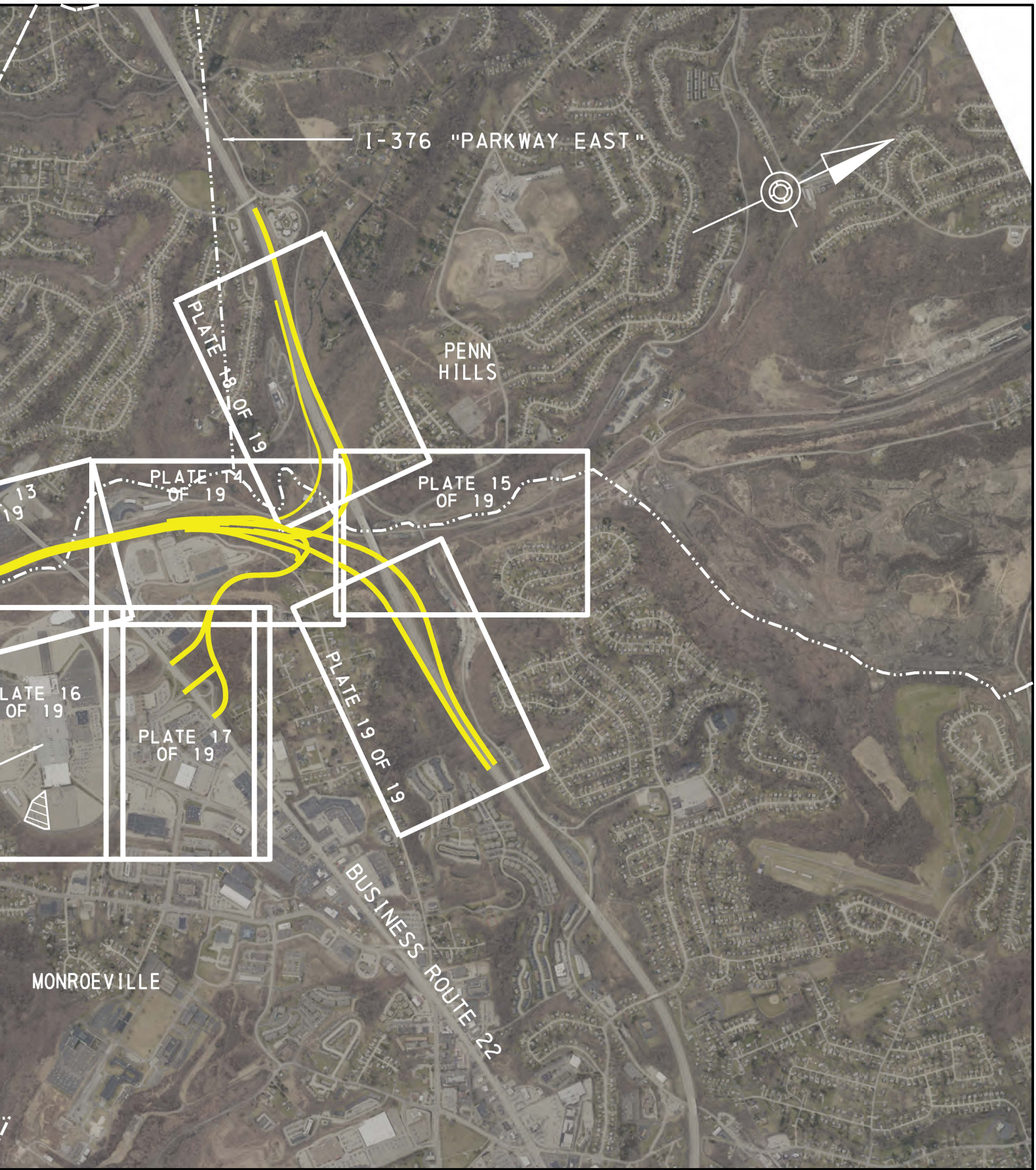

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EAST BUSWAY EXTENSION
FEASIBILITY STUDY
SWISSVALE TO MONROEVILLE

JUNE 2016

SCALE IN FEET
800' 0 800' 1600'

SHEET 2 OF 2

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D
PARK
E

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EAST BUSWAY EXTENSION
FEASIBILITY STUDY
SWISSVALE TO MONROEVILLE

JUNE 2016

SCALE IN FEET
100′ 0 100′ 200′

PLATE 1 OF 19

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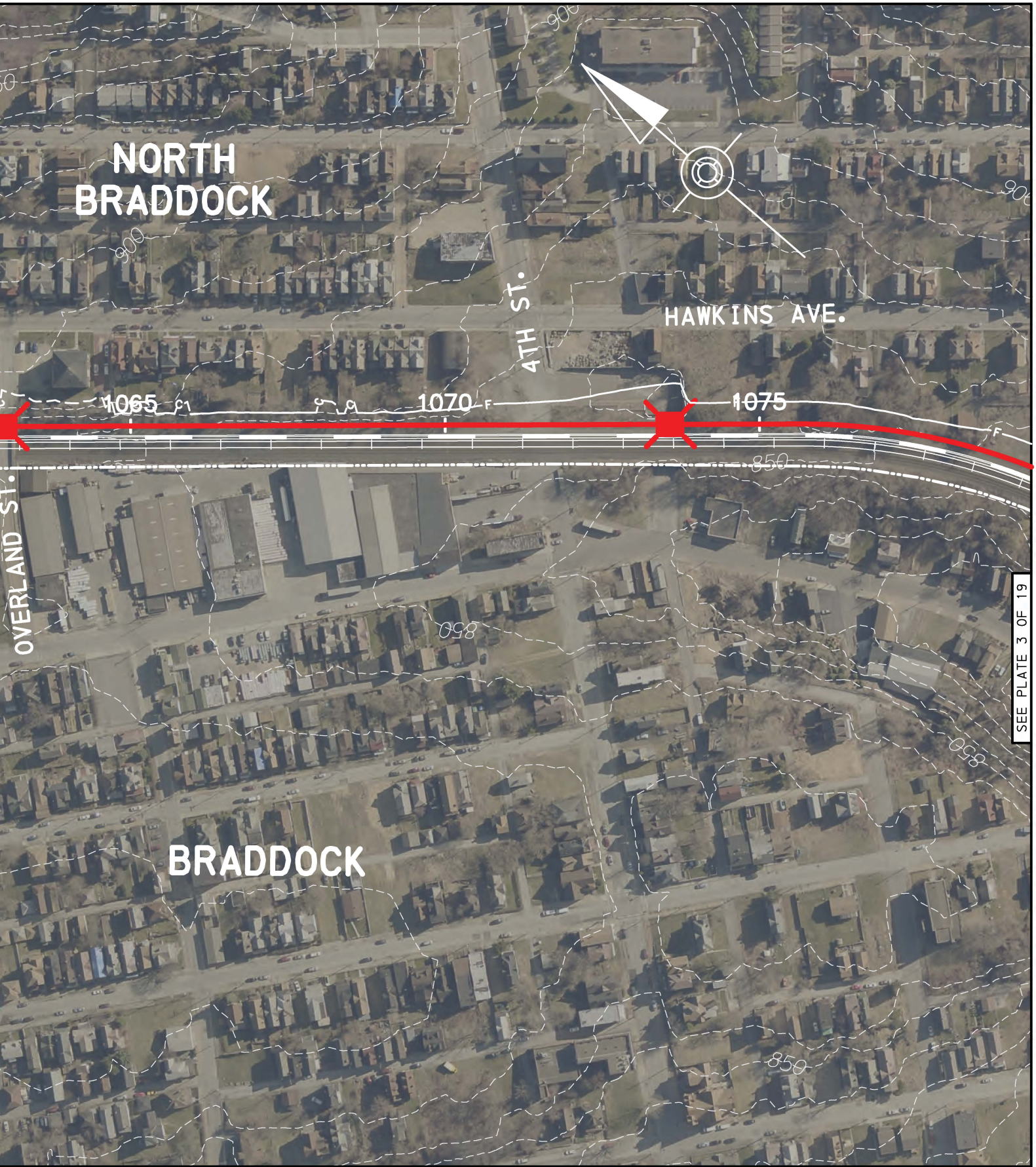

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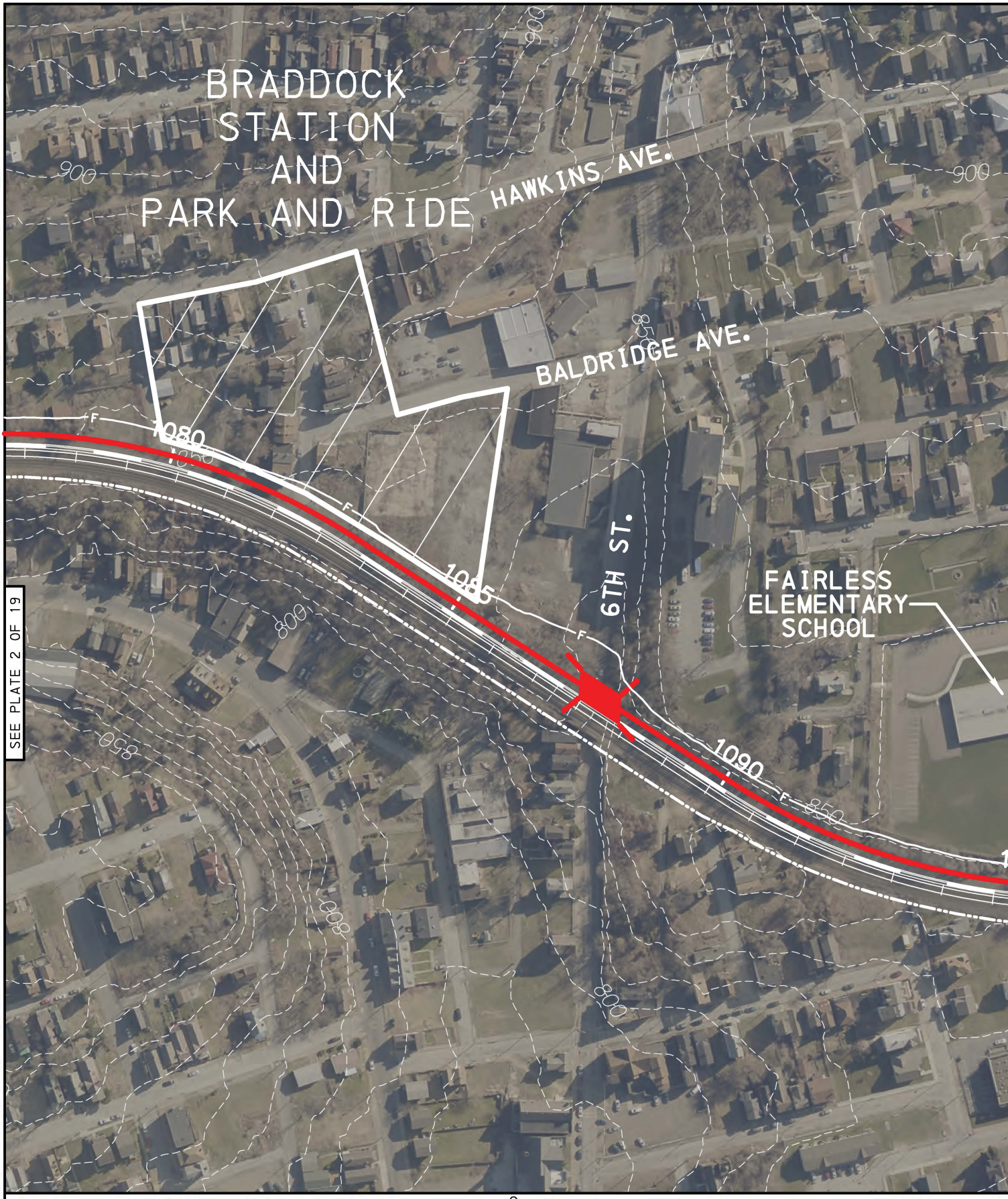
EAST BUSWAY EXTENSION
FEASIBILITY STUDY
SWISSVALE TO MONROEVILLE

JUNE 2016

SCALE IN FEET
100′ 0 100′ 200′

PLATE 2 OF 19



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PARK
E

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EAST BUSWAY EXTENSION
FEASIBILITY STUDY
SWISSVALE TO MONROEVILLE

JUNE 2016

SCALE IN FEET
100′ 0 100′ 200′

PLATE 3 OF 19

FILE: \\gfp101s\CADD\057779 - PAAC Open End R13-09-A\W025- East Busway Extension Project\E. Project Working Files\A. CADD\Presentation\PLATE 4.dgn
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PARK
E

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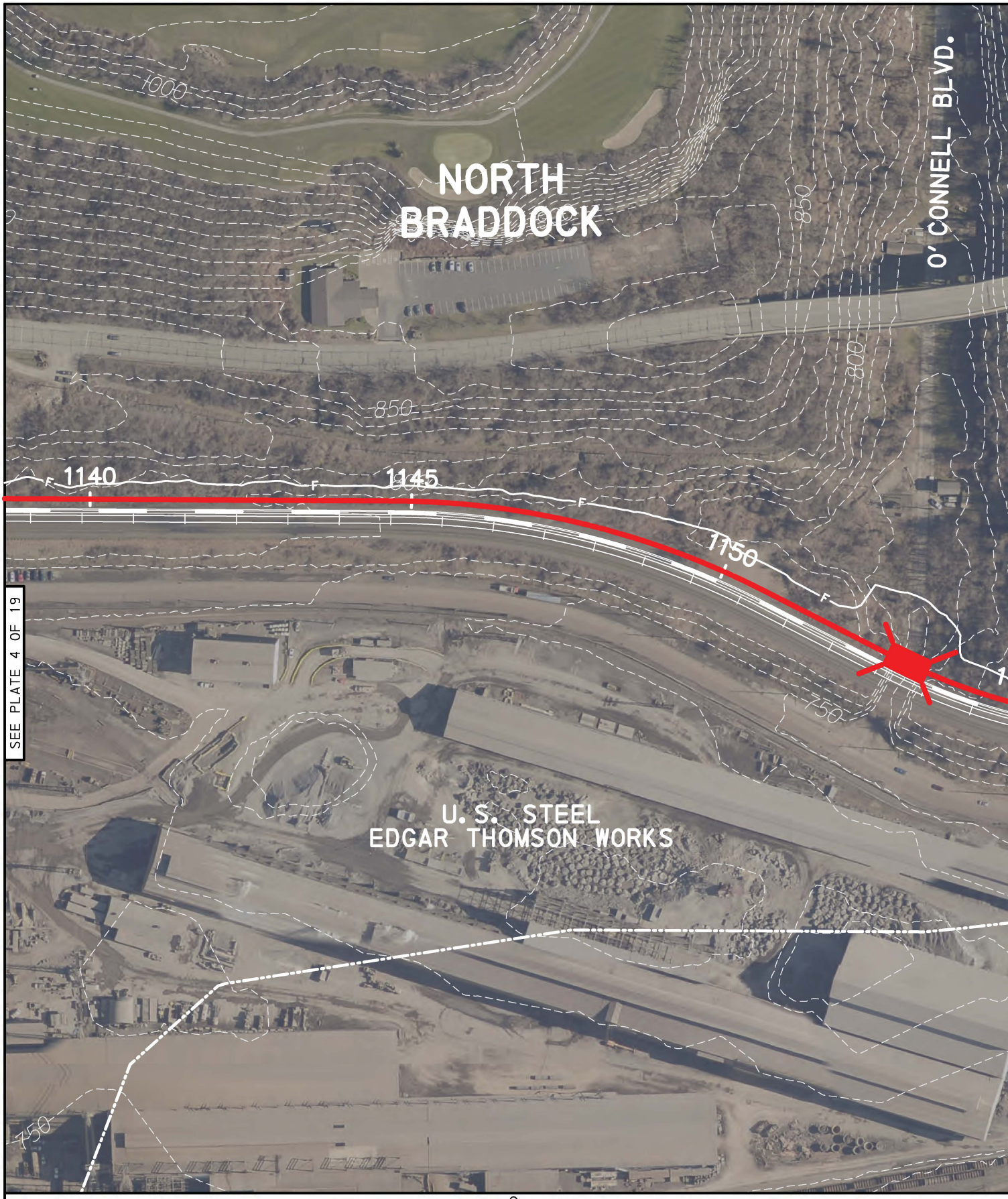
EAST BUSWAY EXTENSION
FEASIBILITY STUDY
SWISSVALE TO MONROEVILLE

JUNE 2016

SCALE IN FEET
100′ 0 100′ 200′

PLATE 4 OF 19



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D
PARK
E

Gannett Fleming

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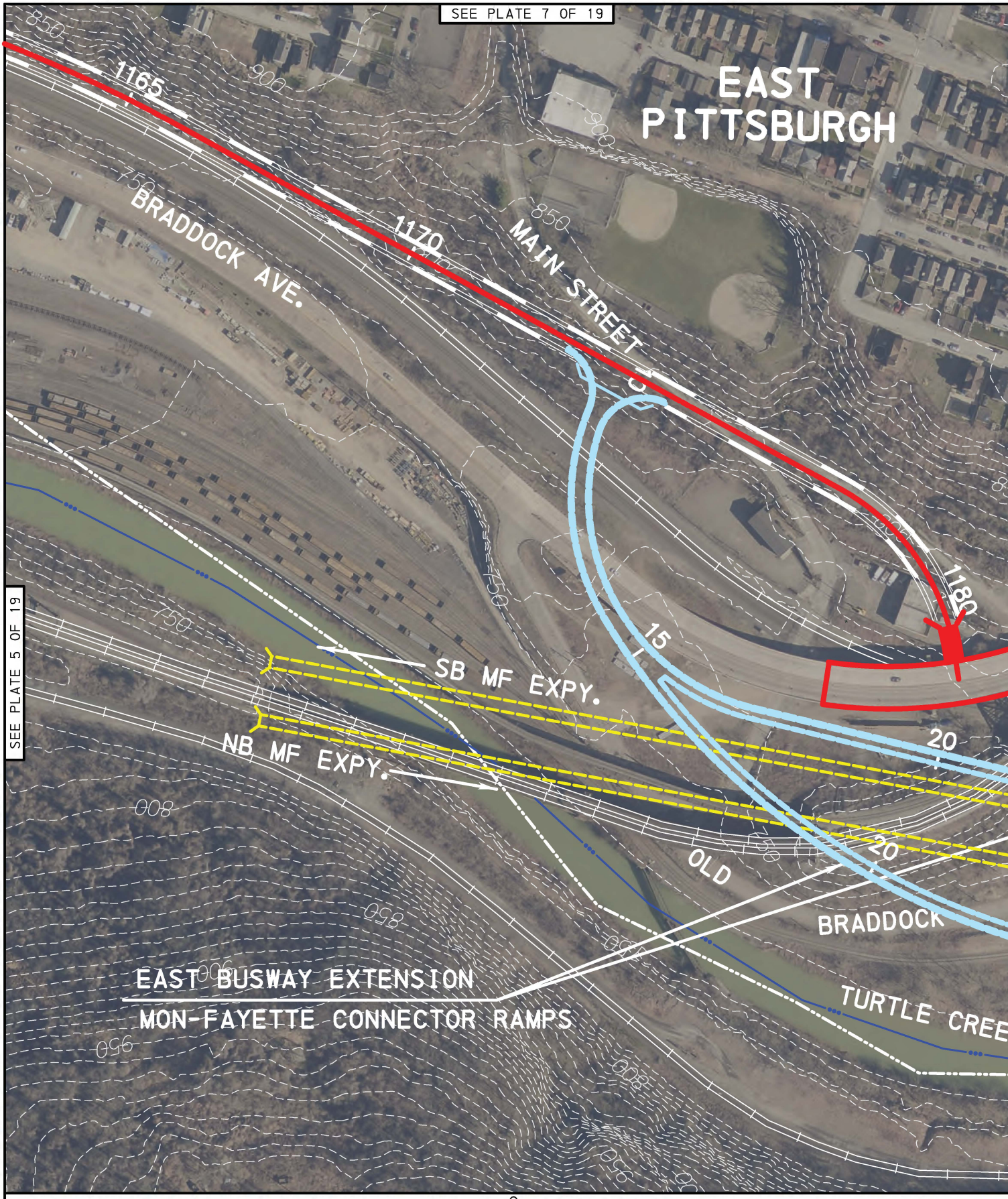
EAST BUSWAY EXTENSION
FEASIBILITY STUDY
SWISSVALE TO MONROEVILLE

JUNE 2016

SCALE IN FEET
100′ 0 100′ 200′

PLATE 5 OF 19



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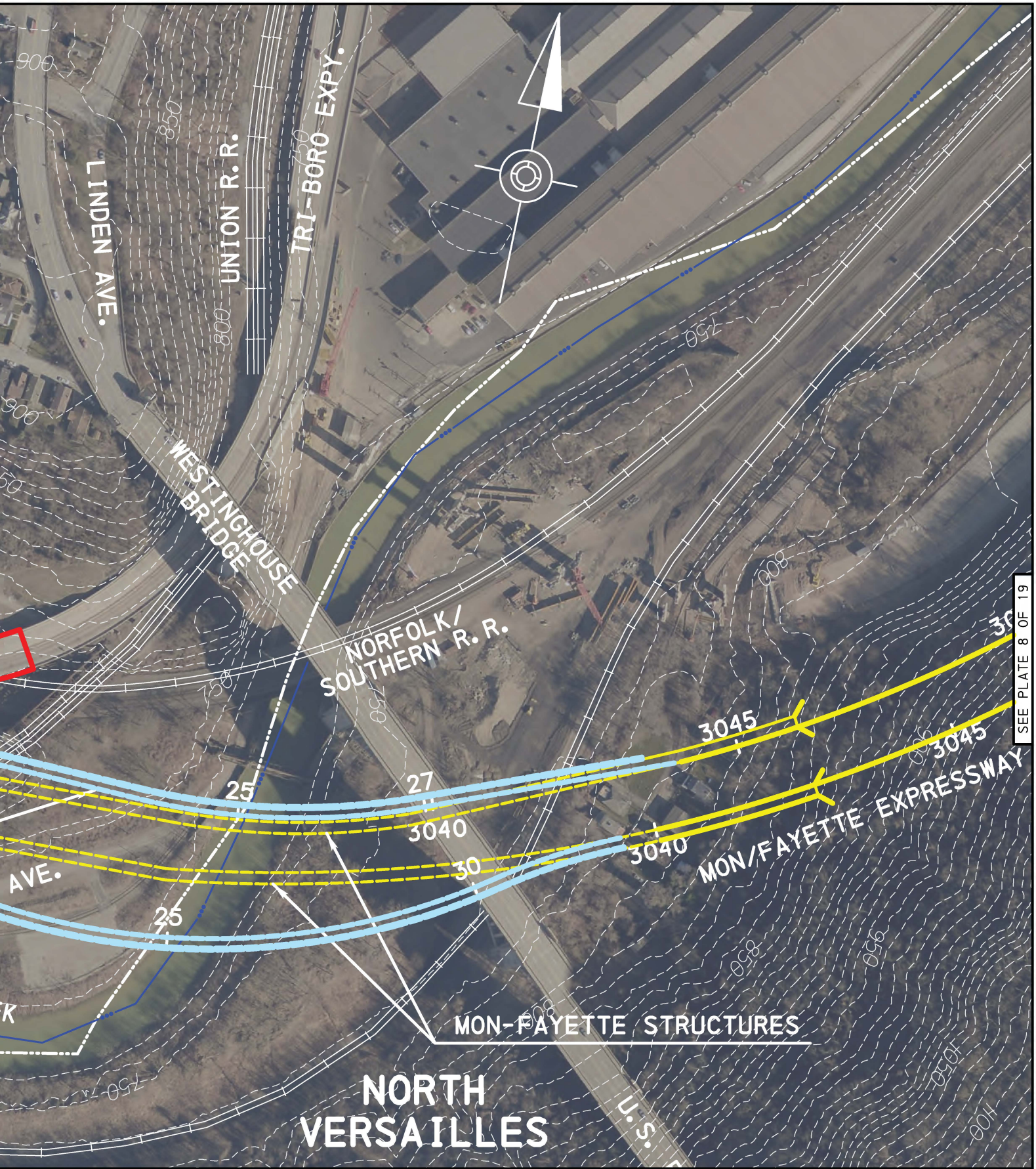

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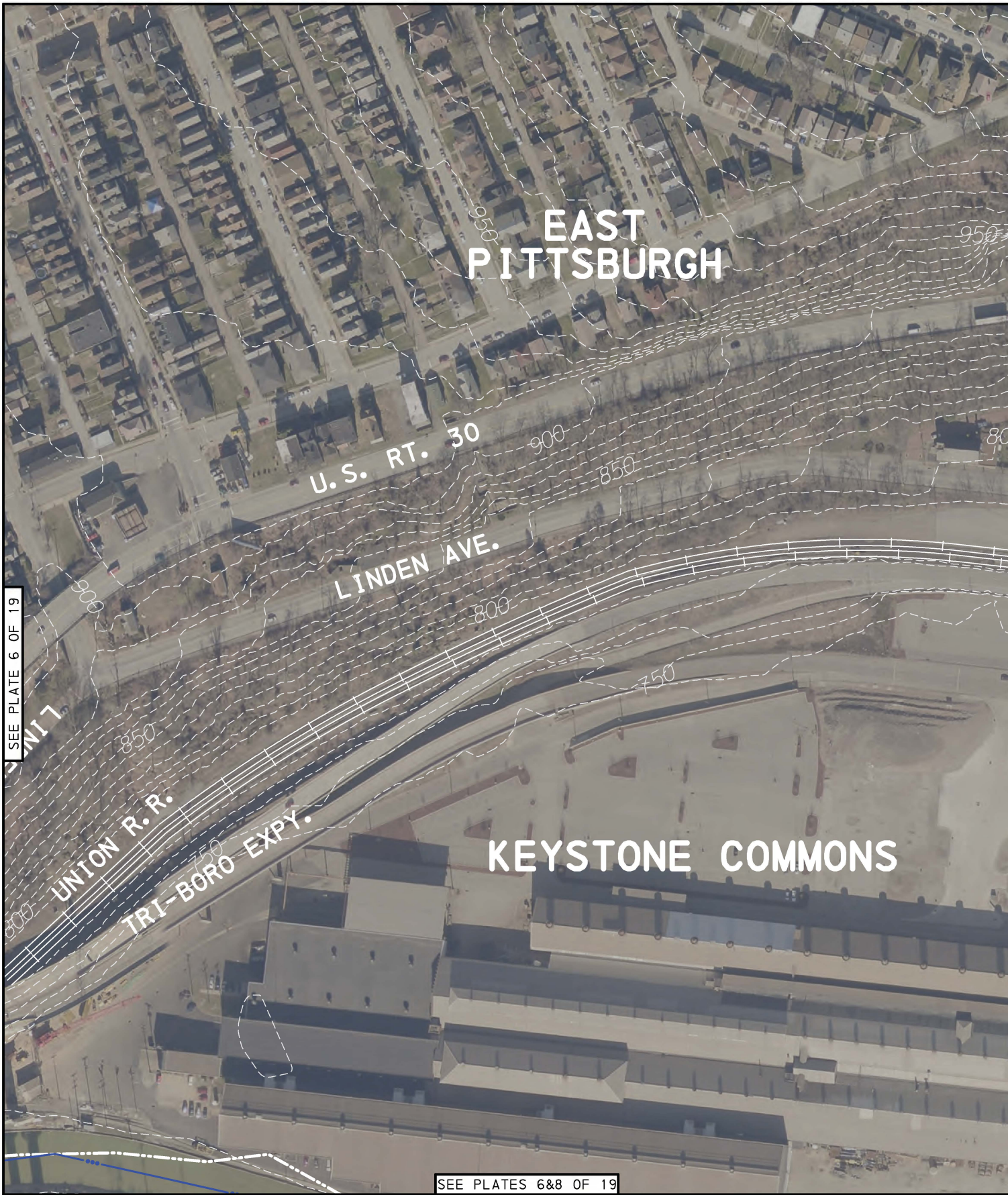
EAST BUSWAY EXTENSION
FEASIBILITY STUDY
SWISSVALE TO MONROEVILLE

JUNE 2016

SCALE IN FEET
100′ 0 100′ 200′

PLATE 6 OF 19



SWISSVALE TO BRADDOCK AVE.

EAST BUSWAY EXTENSION TO MON-FAYETTE EXPY. CONNECTOR

MON-FAYETTE EXPY.

BOROUGH BOUNDARY

CUT/FILL LINE

STREAM

RETAINING WALL

STRUCTURE

RAILROA

STATION AND RID

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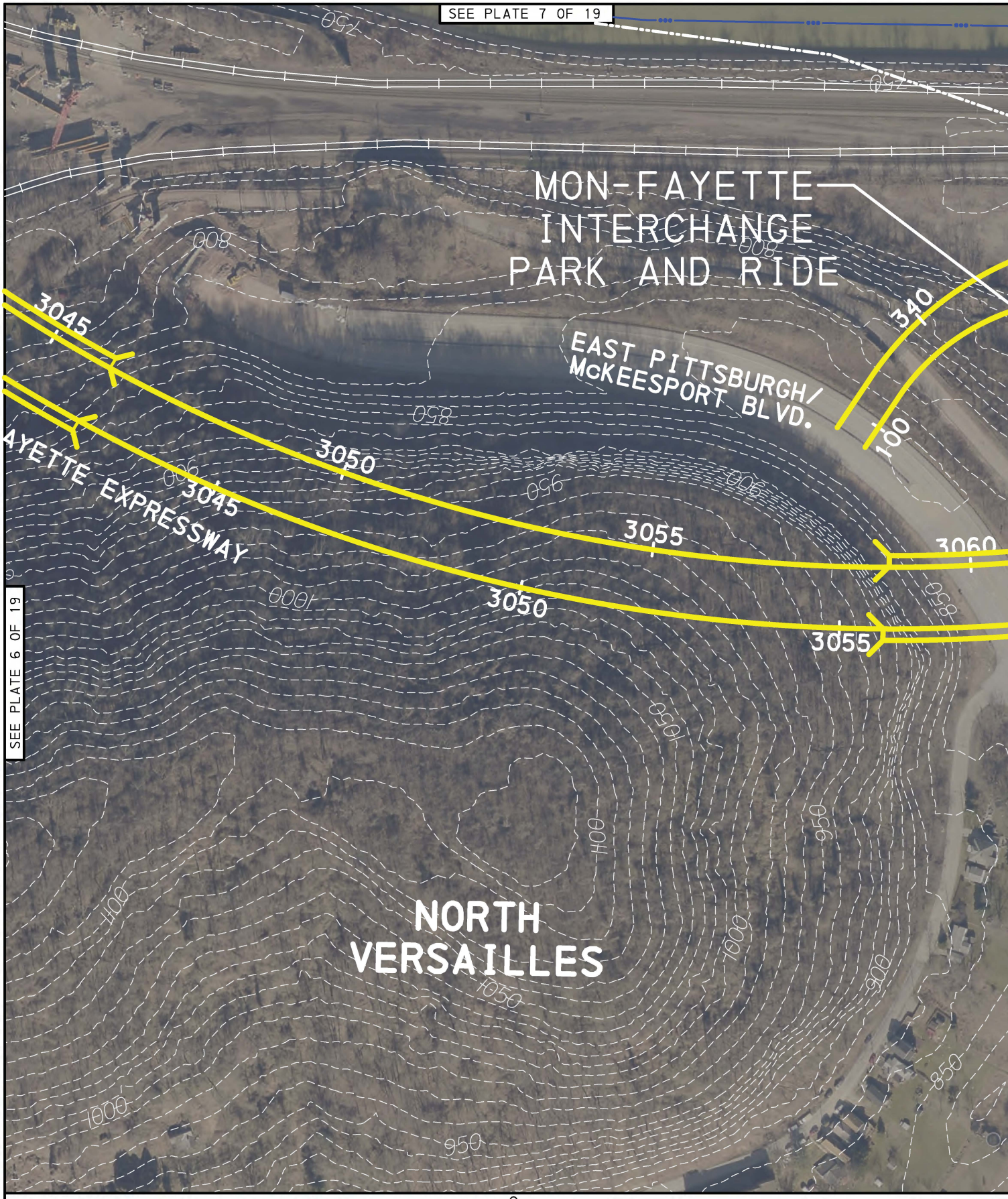
EAST BUSWAY EXTENSION
FEASIBILITY STUDY
SWISSVALE TO MONROEVILLE

JUNE 2016

SCALE IN FEET
100′ 0 100′ 200′

PLATE 7 OF 19



SWISSVALE TO BRADDOCK AVE.

EAST BUSWAY EXTENSION TO MON-FAYETTE EXPY. CONNECTOR

MON-FAYETTE EXPY.

BOROUGH BOUNDARY

CUT/FILL LINE

STREAM

RETAINING WALL

STRUCTURE

RAILROA

STATION AND RID

FILE: \\gfp101s\CADD\057779 - PAAC Open End R13-09-AWO25- East Busway Extension Project\E. Project Working Files\A. CADD\Presentation\PLATE 8.dgn
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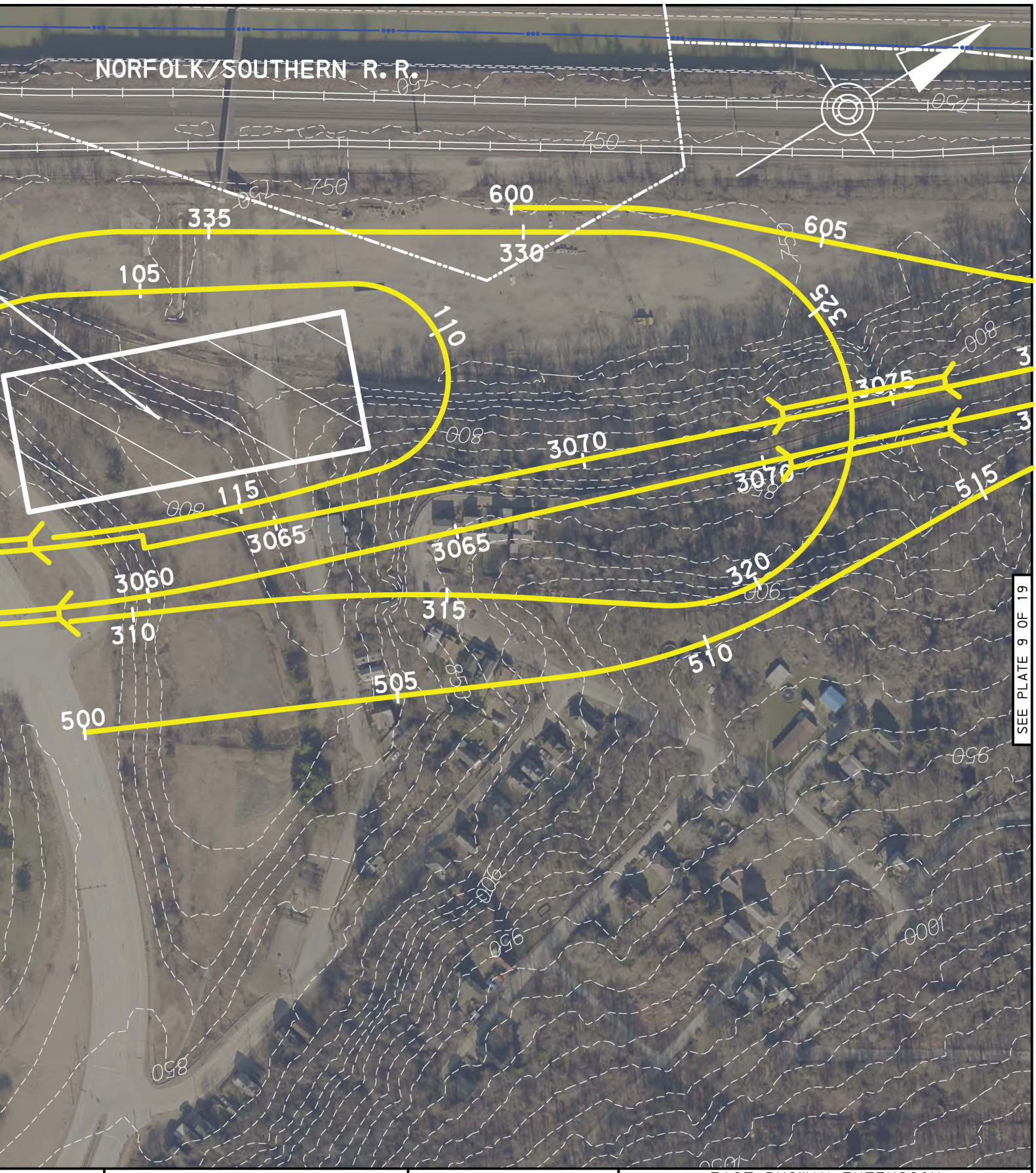

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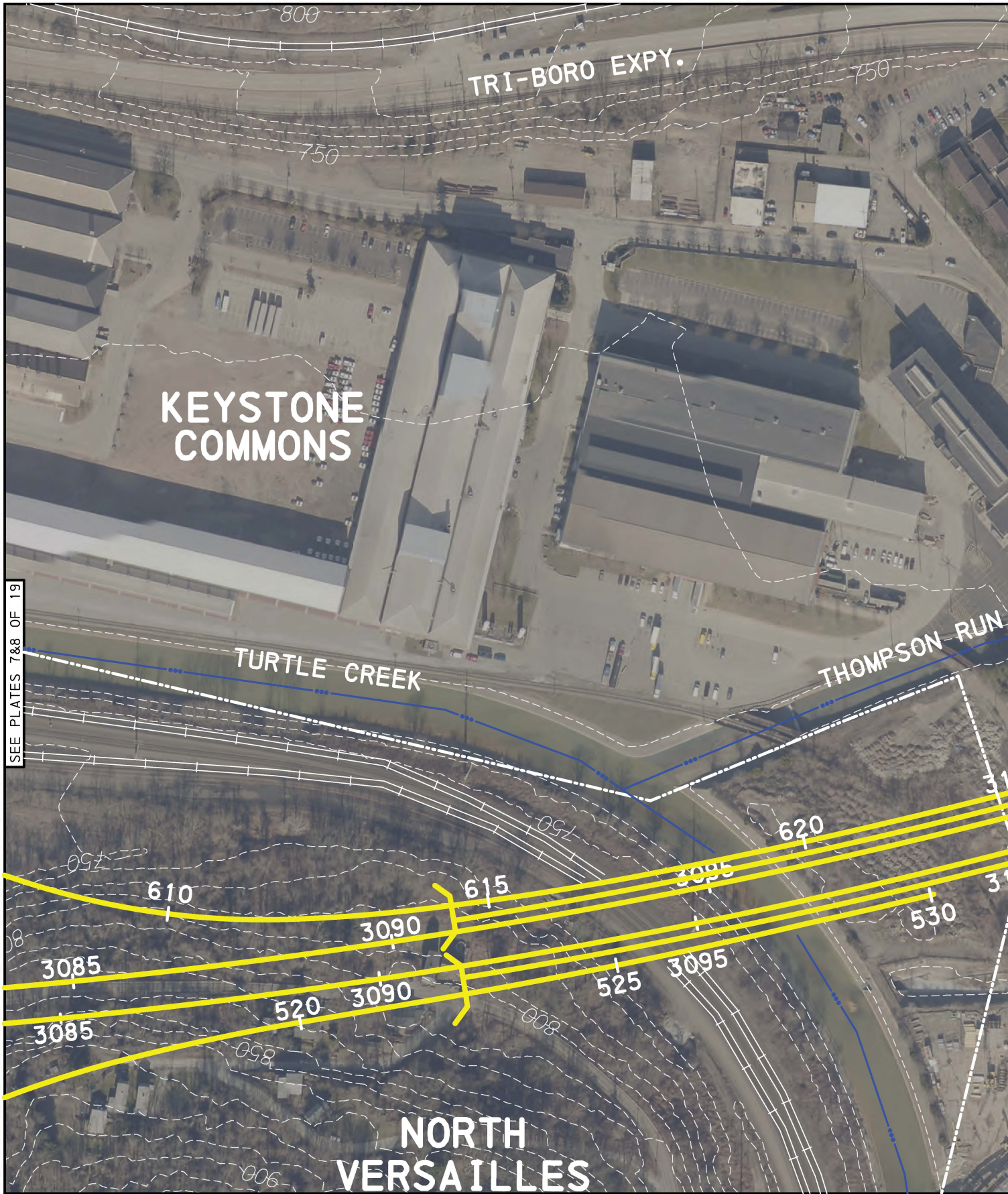
EAST BUSWAY EXTENSION
FEASIBILITY STUDY
SWISSVALE TO MONROEVILLE

JUNE 2016

SCALE IN FEET
100′ 0 100′ 200′

PLATE 8 OF 19



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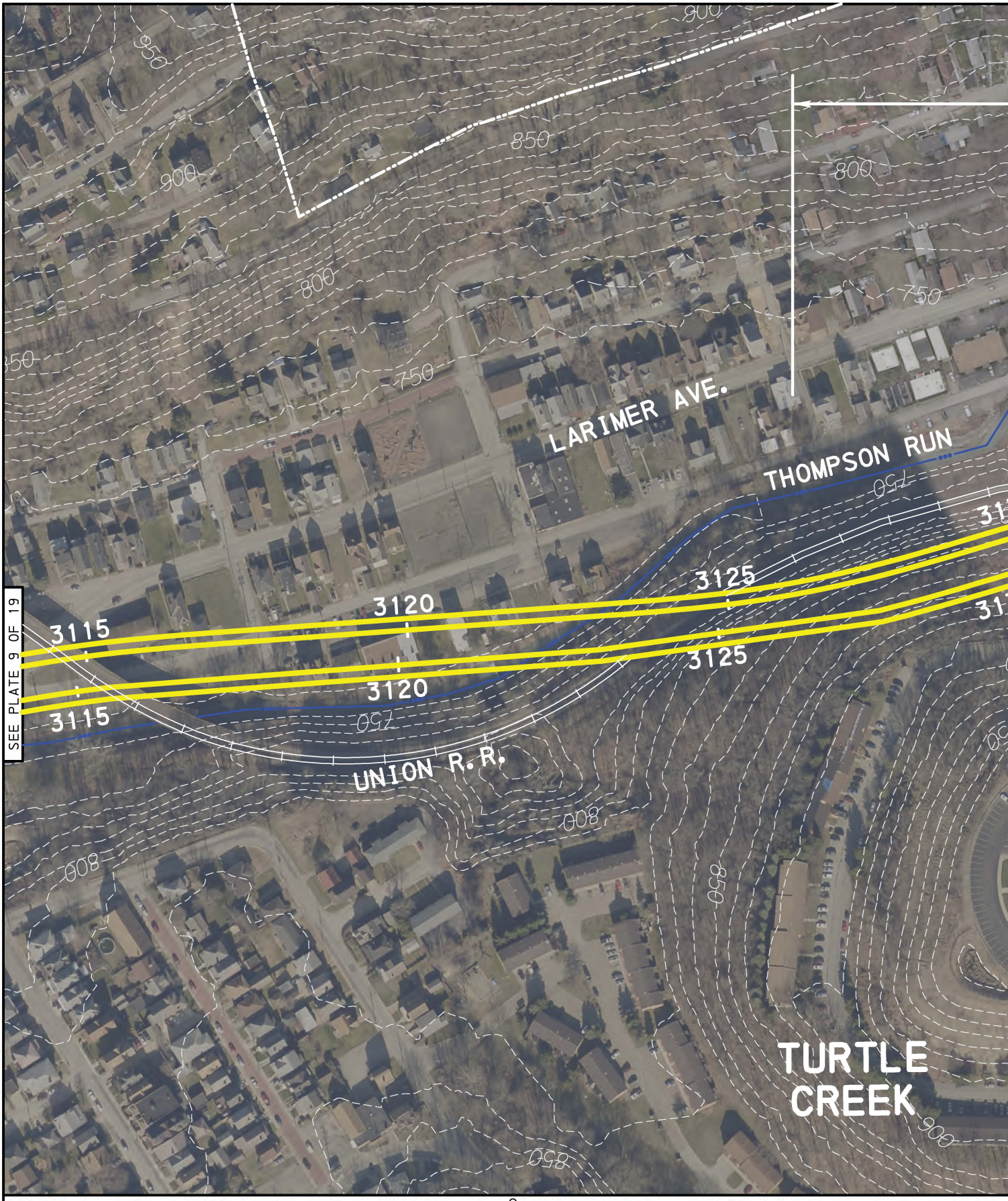
EAST BUSWAY EXTENSION
FEASIBILITY STUDY
SWISSVALE TO MONROEVILLE

JUNE 2016

SCALE IN FEET
100′ 0 100′ 200′

PLATE 9 OF 19



SWISSVALE TO BRADDOCK AVE.

EAST BUSWAY EXTENSION TO MON-FAYETTE EXPY. CONNECTOR

MON-FAYETTE EXPY.

BOROUGH BOUNDARY

CUT/FILL LINE

STREAM

RETAINING WALL

STRUCTURE

RAILROA

STATION AND RID

FILE: \\gfp1101s\CADD\057779 - PAAC Open End R13-09-AVW025- East Busway Extension Project\E. Project Working Files\A. CADD\Presentation\PLATE 10.dgn
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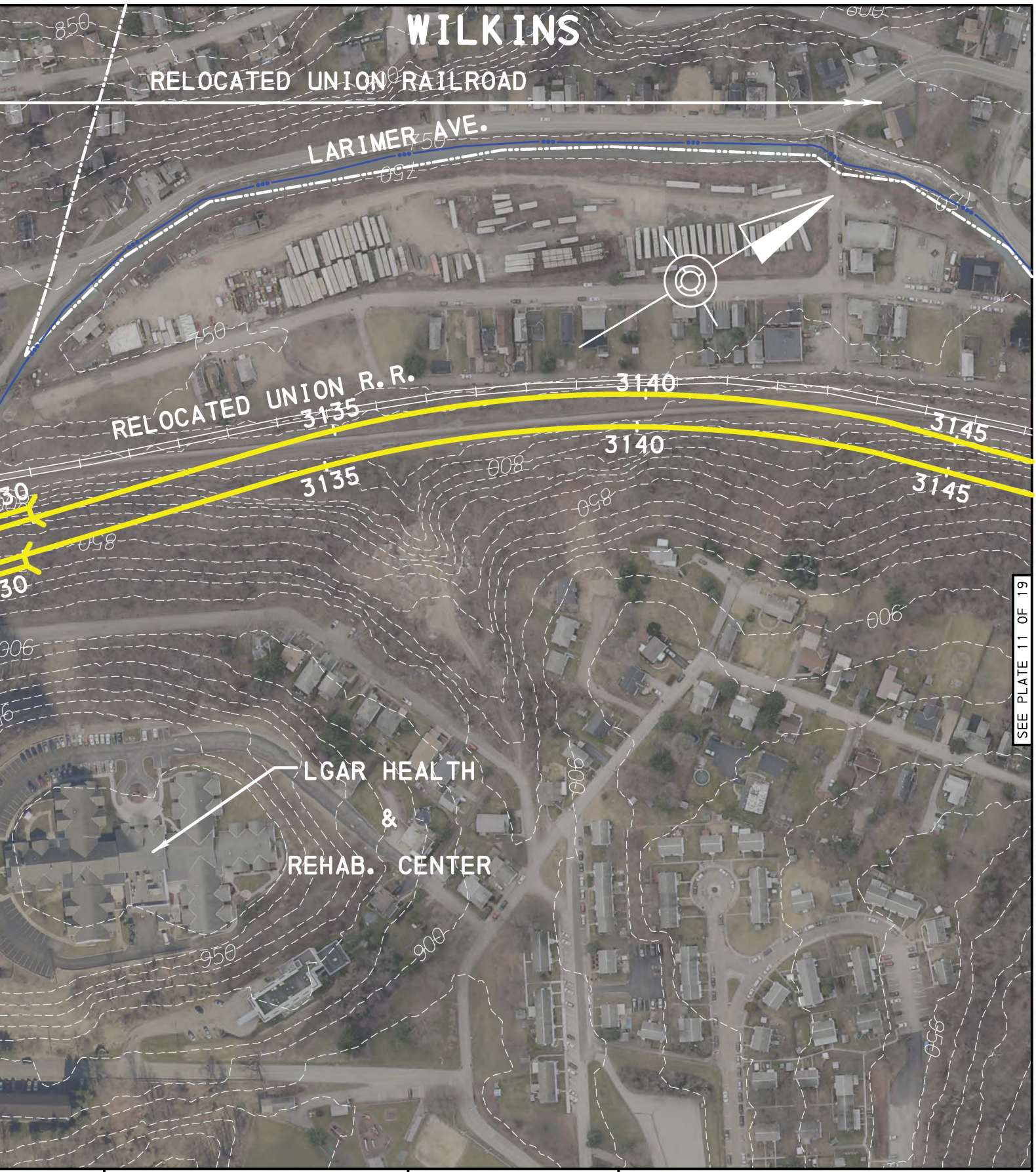

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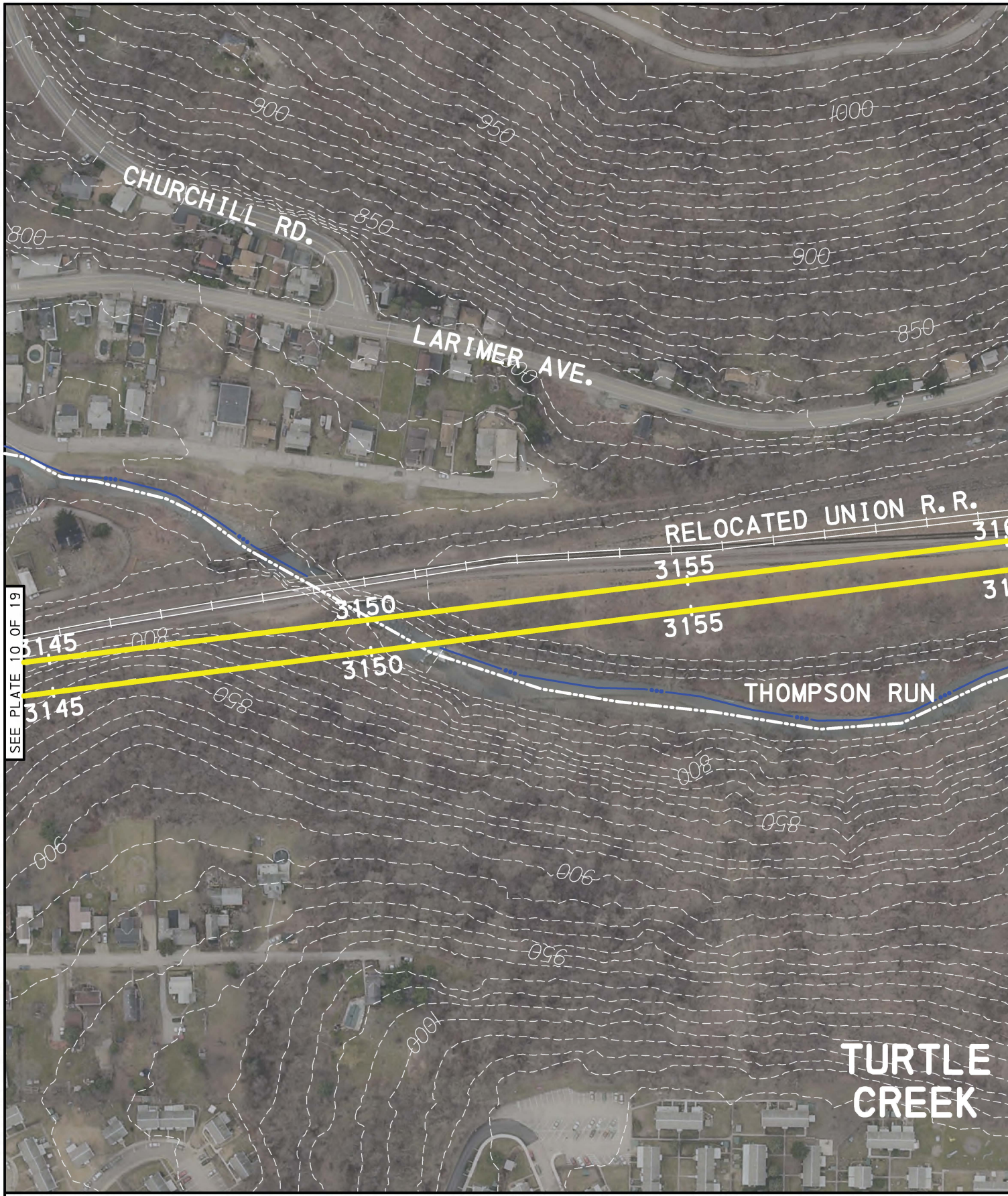
EAST BUSWAY EXTENSION
FEASIBILITY STUDY
SWISSVALE TO MONROEVILLE

JUNE 2016

SCALE IN FEET
100′ 0 100′ 200′

PLATE 10 OF 19



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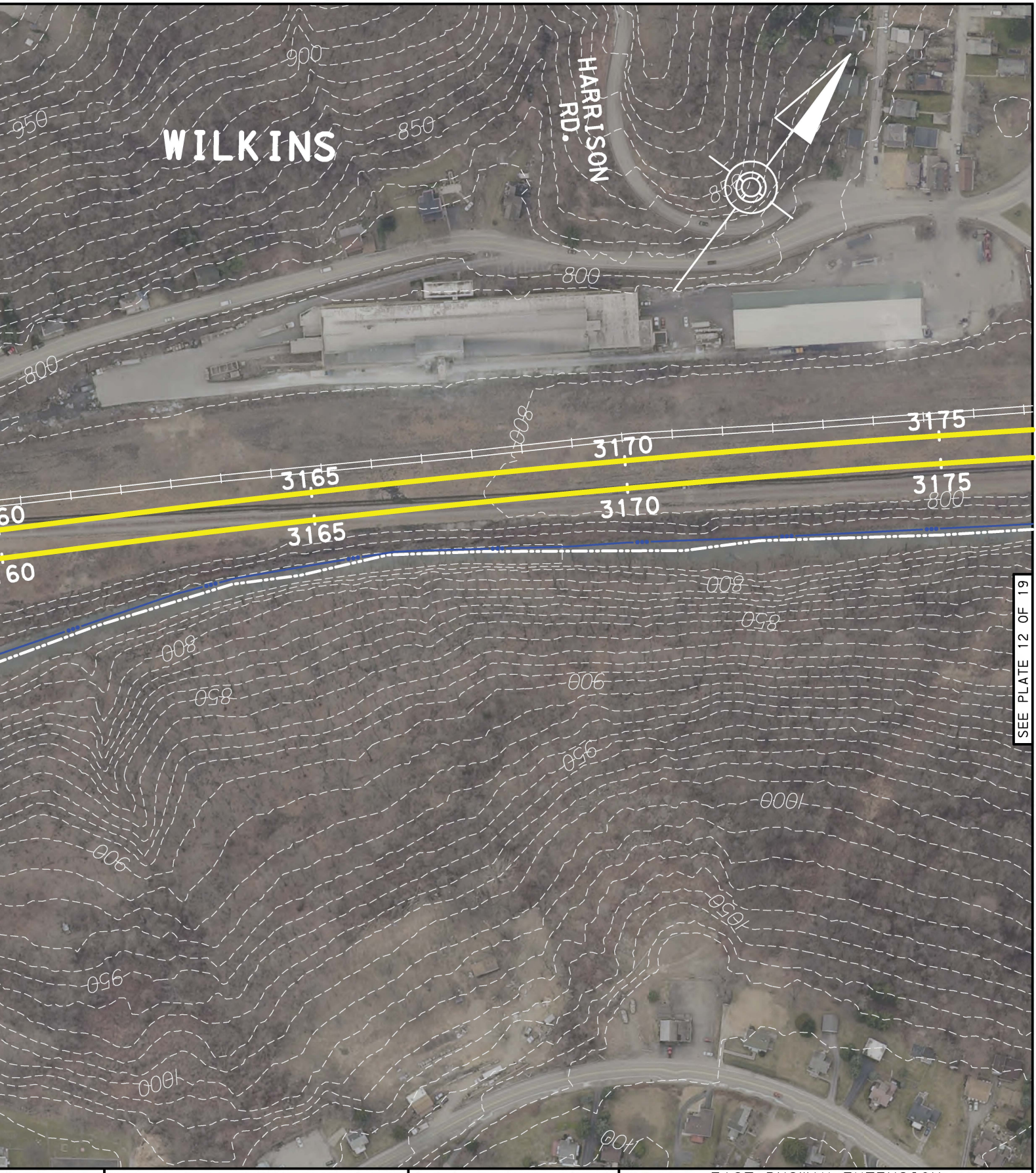

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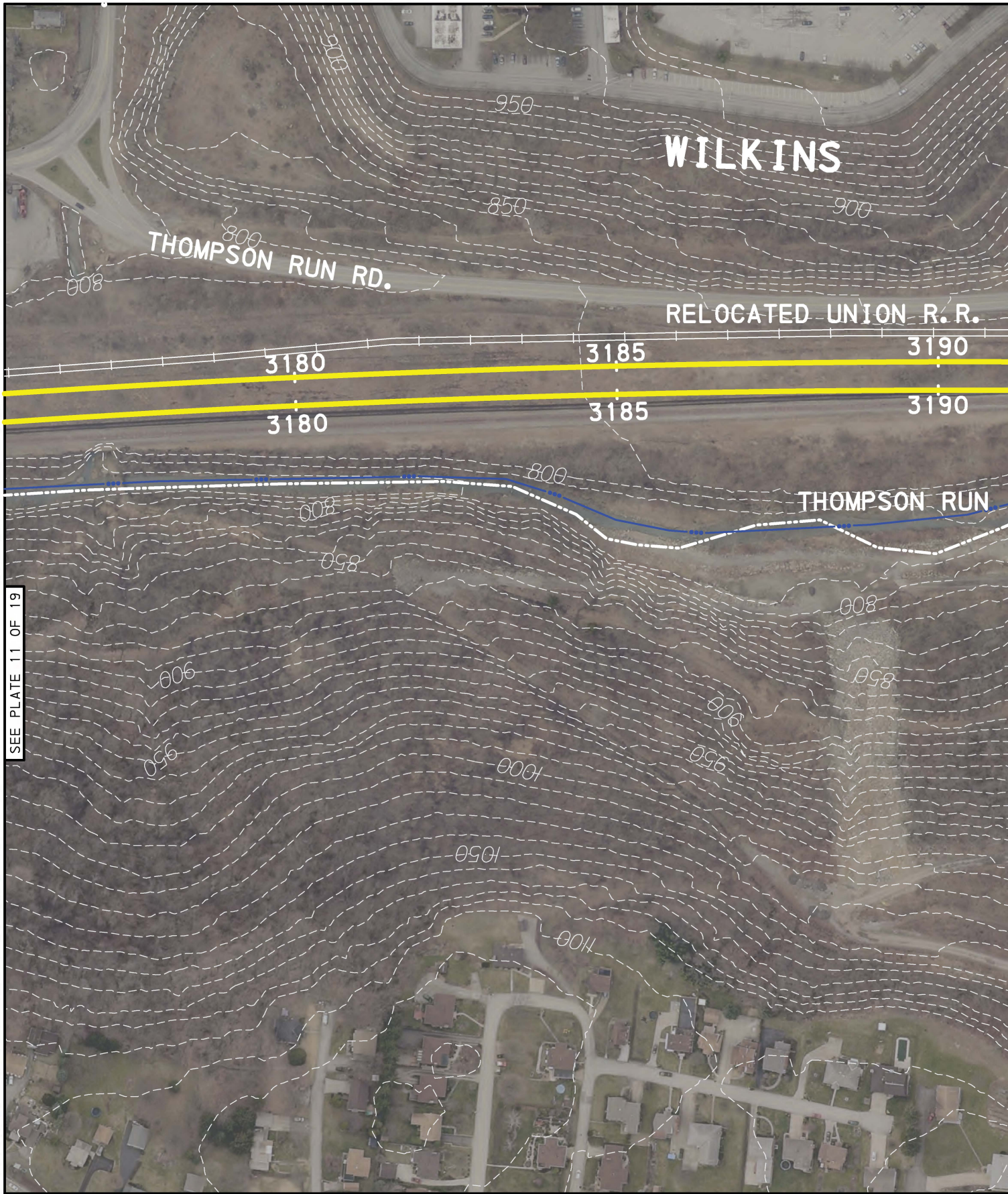
FEASIBILITY STUDY
SWISSVALE TO MONROEVILLE

JUNE 2016

SCALE IN FEET
100′ 0 100′ 200′

PLATE 11 OF 19



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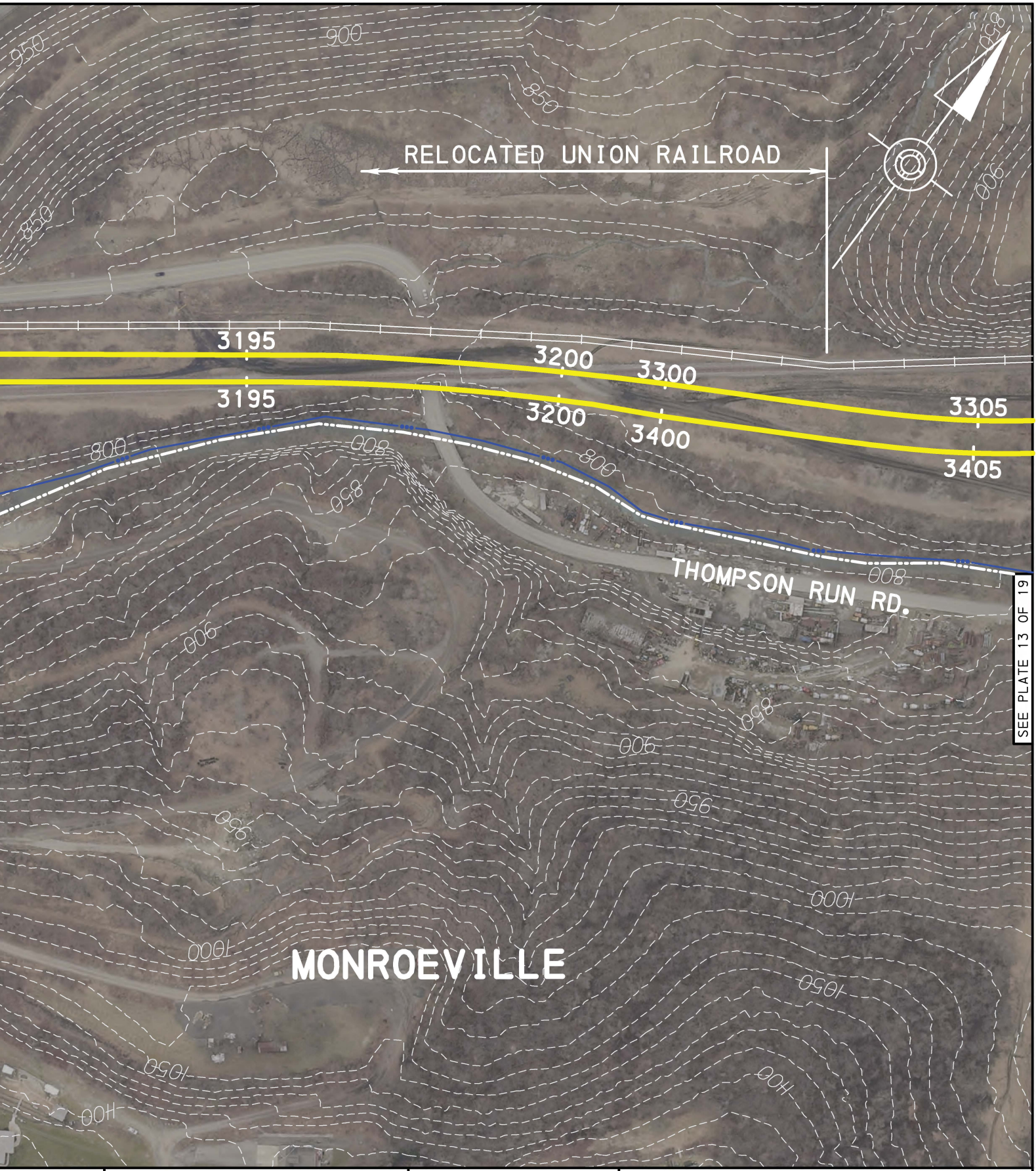

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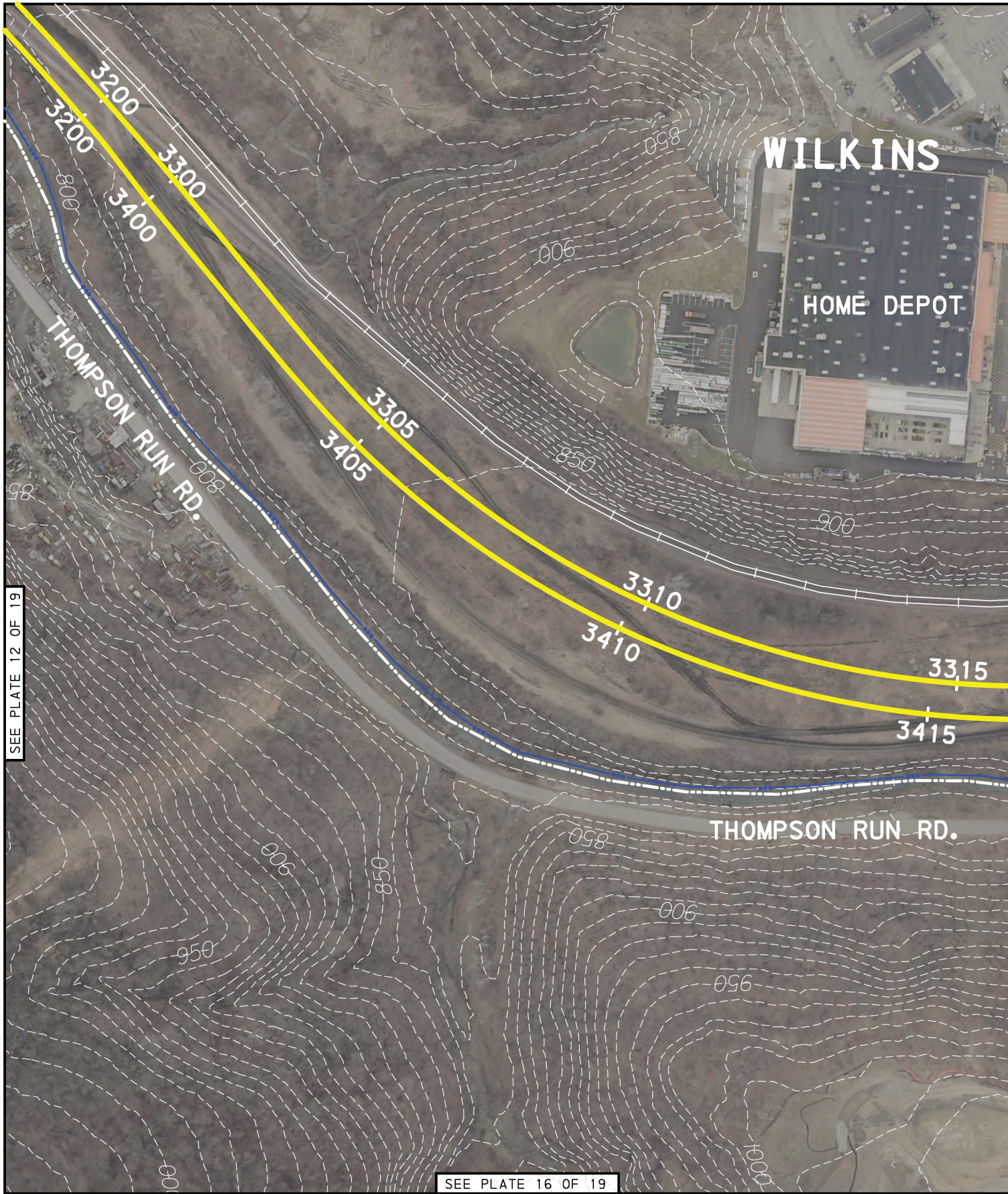
EAST BUSWAY EXTENSION
FEASIBILITY STUDY
SWISSVALE TO MONROEVILLE

JUNE 2016

SCALE IN FEET
100′ 0 100′ 200′

PLATE 12 OF 19



SWISSVALE TO BRADDOCK AVE.

EAST BUSWAY EXTENSION TO MON-FAYETTE EXPY. CONNECTOR

MON-FAYETTE EXPY.

BOROUGH BOUNDARY

CUT/FILL LINE

STREAM

RETAINING WALL

STRUCTURE

RAILROA

STATION AND RID

FILE: \\gfp1101s\CADD\057779 - PAAC Open End R13-09-AIW025- East Busway Extension Project\E. Project Working Files\A. CADD\Presentation\PLATE 13.dgn
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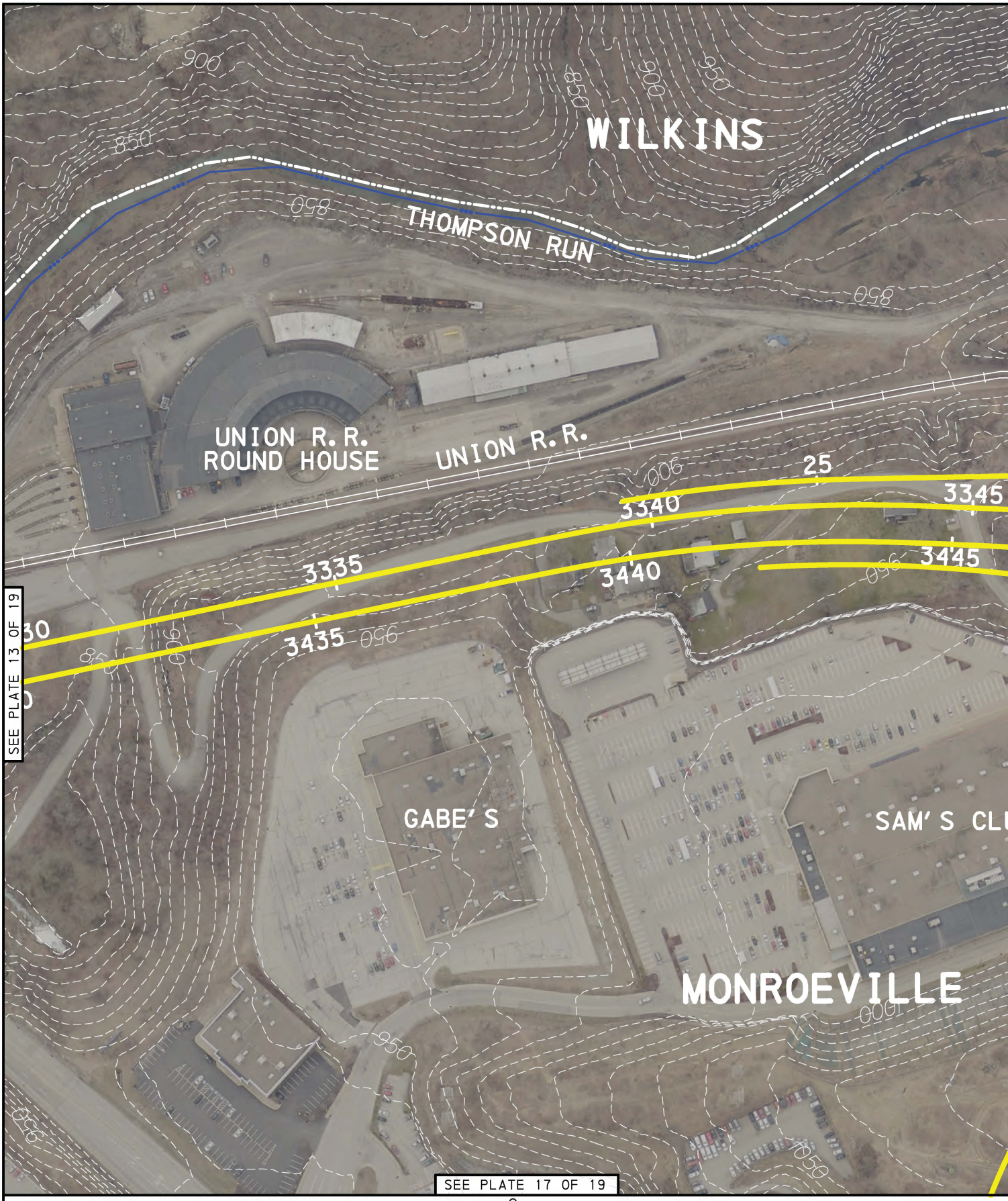
EAST BUSWAY EXTENSION
FEASIBILITY STUDY
SWISSVALE TO MONROEVILLE

JUNE 2016

SCALE IN FEET
100′ 0 100′ 200′

PLATE 13 OF 19



SWISSVALE TO BRADDOCK AVE.

EAST BUSWAY EXTENSION TO MON-FAYETTE EXPY. CONNECTOR

MON-FAYETTE EXPY.

BOROUGH BOUNDARY

CUT/FILL LINE

STREAM

RETAINING WALL

STRUCTURE

RAILROA

STATION AND RID

FILE: \\gfp101s\CADD\057779 - PAAC Open End R13-09-AVW025- East Busway Extension Project\E. Project Working Files\A. CADD\Presentation\PLATE 14.dgn
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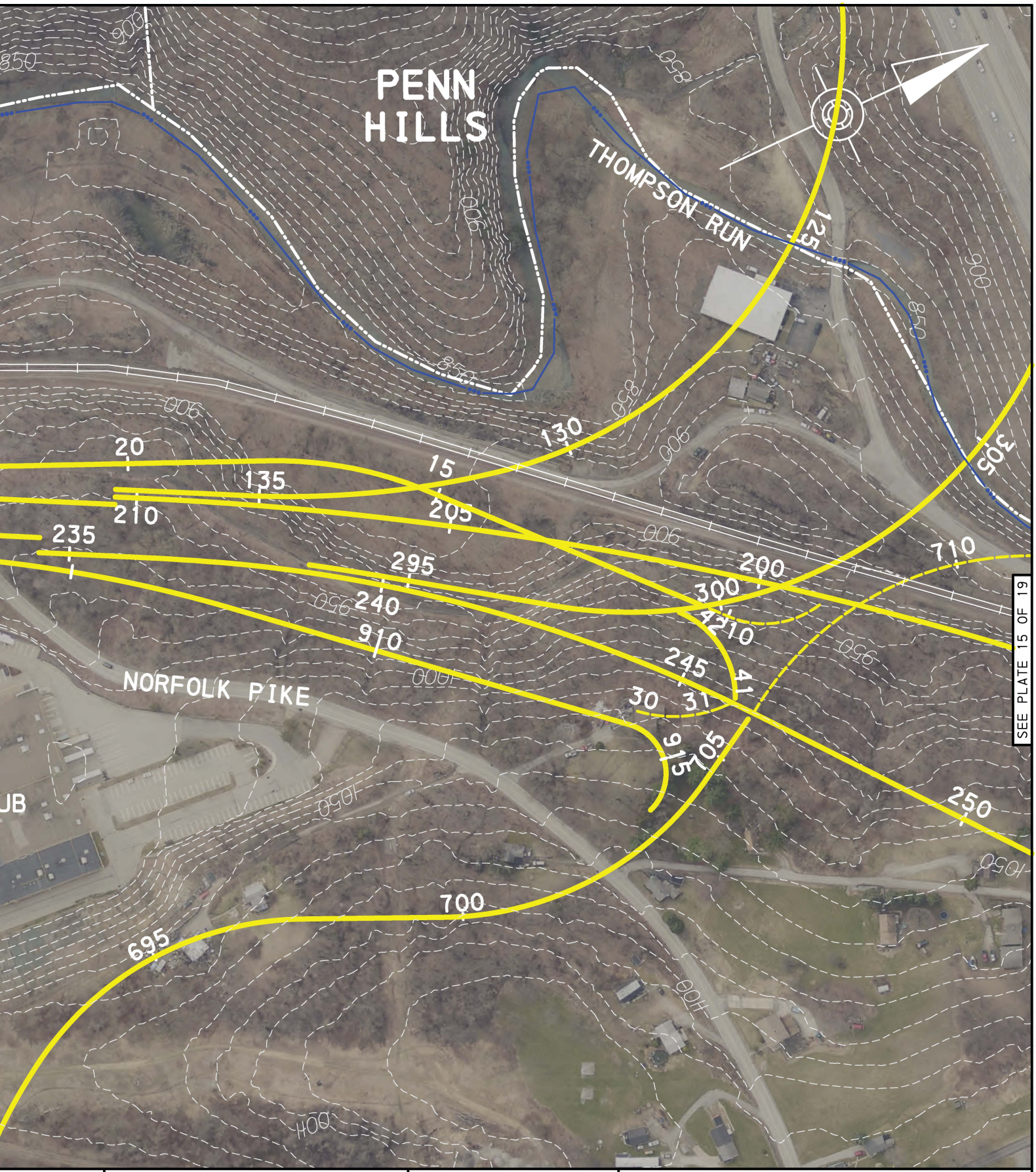

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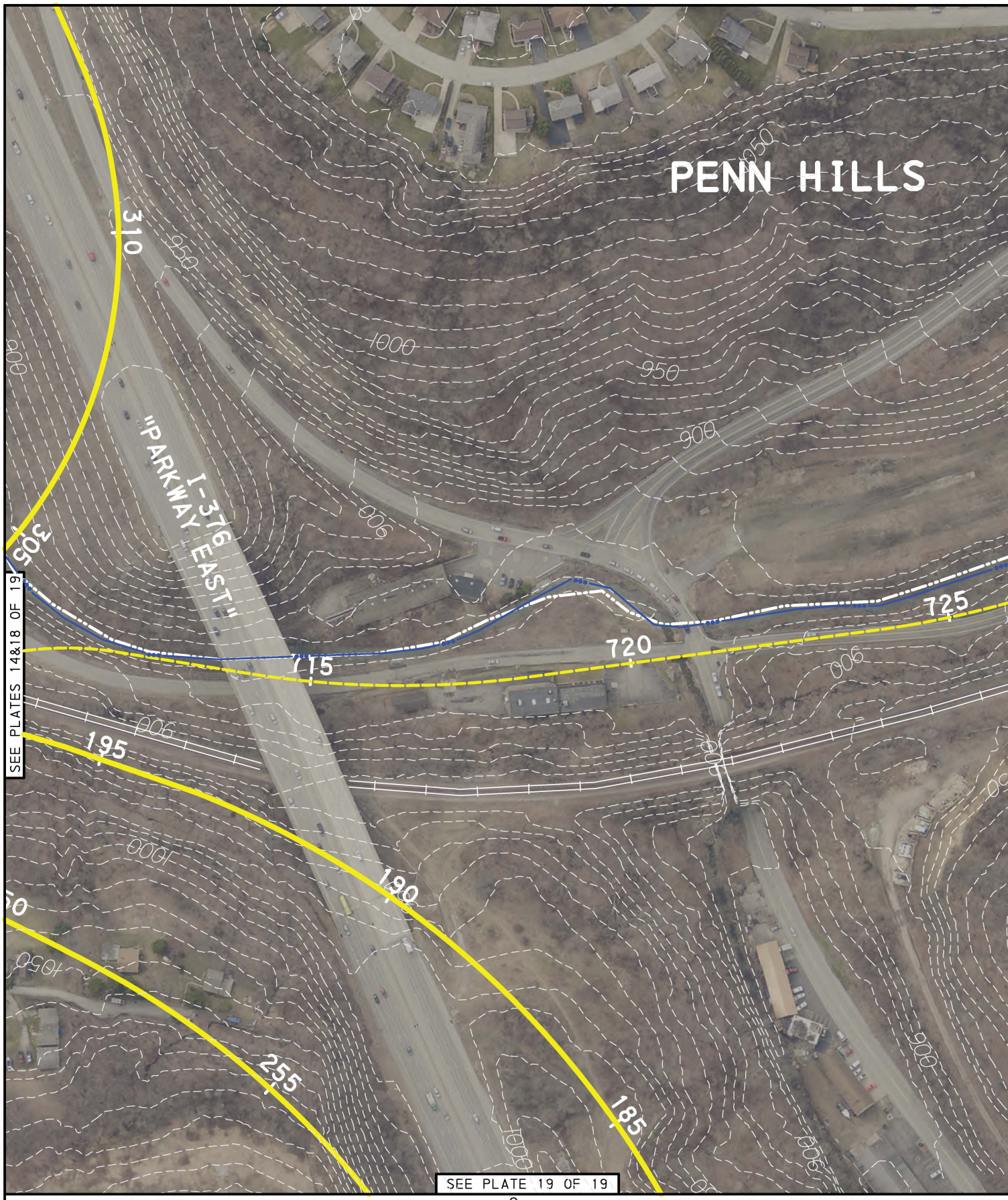
EAST BUSWAY EXTENSION
FEASIBILITY STUDY
SWISSVALE TO MONROEVILLE

JUNE 2016

SCALE IN FEET
100′ 0 100′ 200′

PLATE 14 OF 19



SWISSVALE TO BRADDOCK AVE.

EAST BUSWAY EXTENSION TO MON-FAYETTE EXPY. CONNECTOR

MON-FAYETTE EXPY.

BOROUGH BOUNDARY

CUT/FILL LINE

STREAM

RETAINING WALL

STRUCTURE

RAILROA

STATION AND RID

FILE: \\gfp1101s\CADD\057779 - PAAC Open End R13-09-AW025- East Busway Extension Project\E. Project Working Files\A. CADD\Presentation\PLATE 15.dgn
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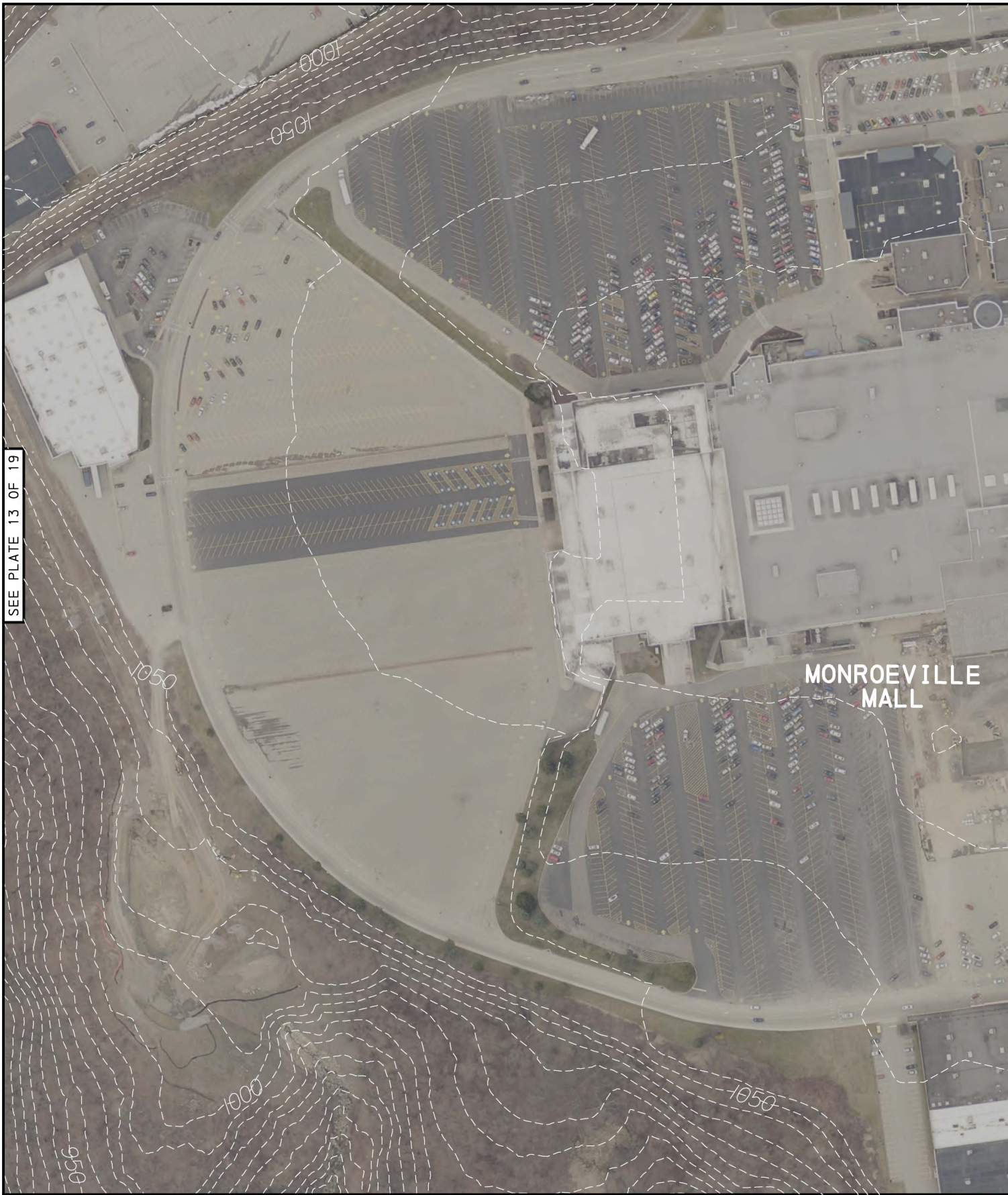
EAST BUSWAY EXTENSION
FEASIBILITY STUDY
SWISSVALE TO MONROEVILLE

JUNE 2016

SCALE IN FEET
100′ 0 100′ 200′

PLATE 15 OF 19



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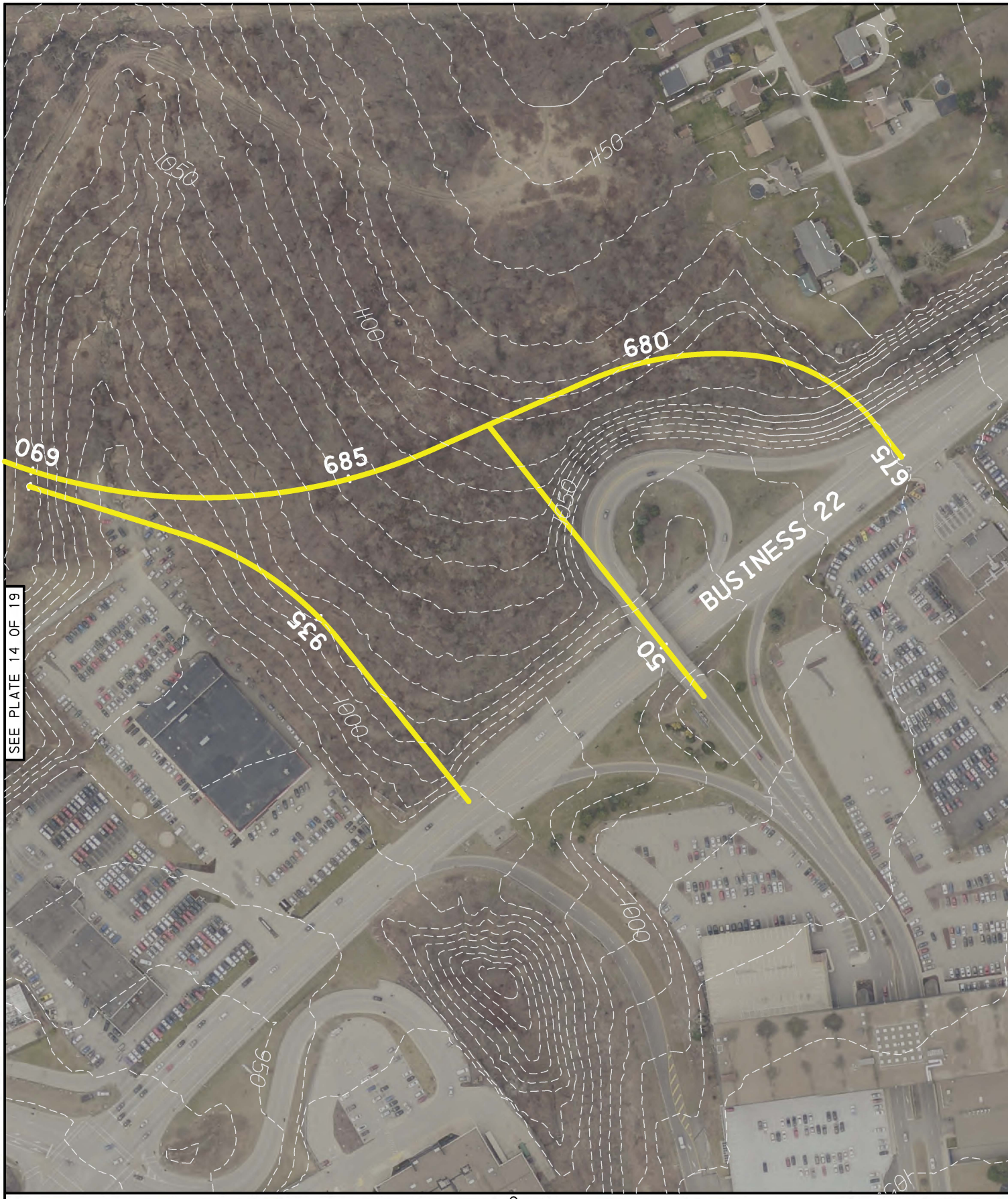
EAST BUSWAY EXTENSION
FEASIBILITY STUDY
SWISSVALE TO MONROEVILLE

JUNE 2016

SCALE IN FEET
100′ 0 100′ 200′

PLATE 16 OF 19



SWISSVALE TO BRADDOCK AVE.

EAST BUSWAY EXTENSION TO MON-FAYETTE EXPY. CONNECTOR

MON-FAYETTE EXPY.

BOROUGH BOUNDARY

CUT/FILL LINE

STREAM

RETAINING WALL

STRUCTURE

RAILROA

STATION AND RID

FILE: \\gfp101s\CADD\057779 - PAAC Open End R13-09-A\W025- East Busway Extension Project\E. Project Working Files\A. CADD\Presentation\PLATE 17A.dgn
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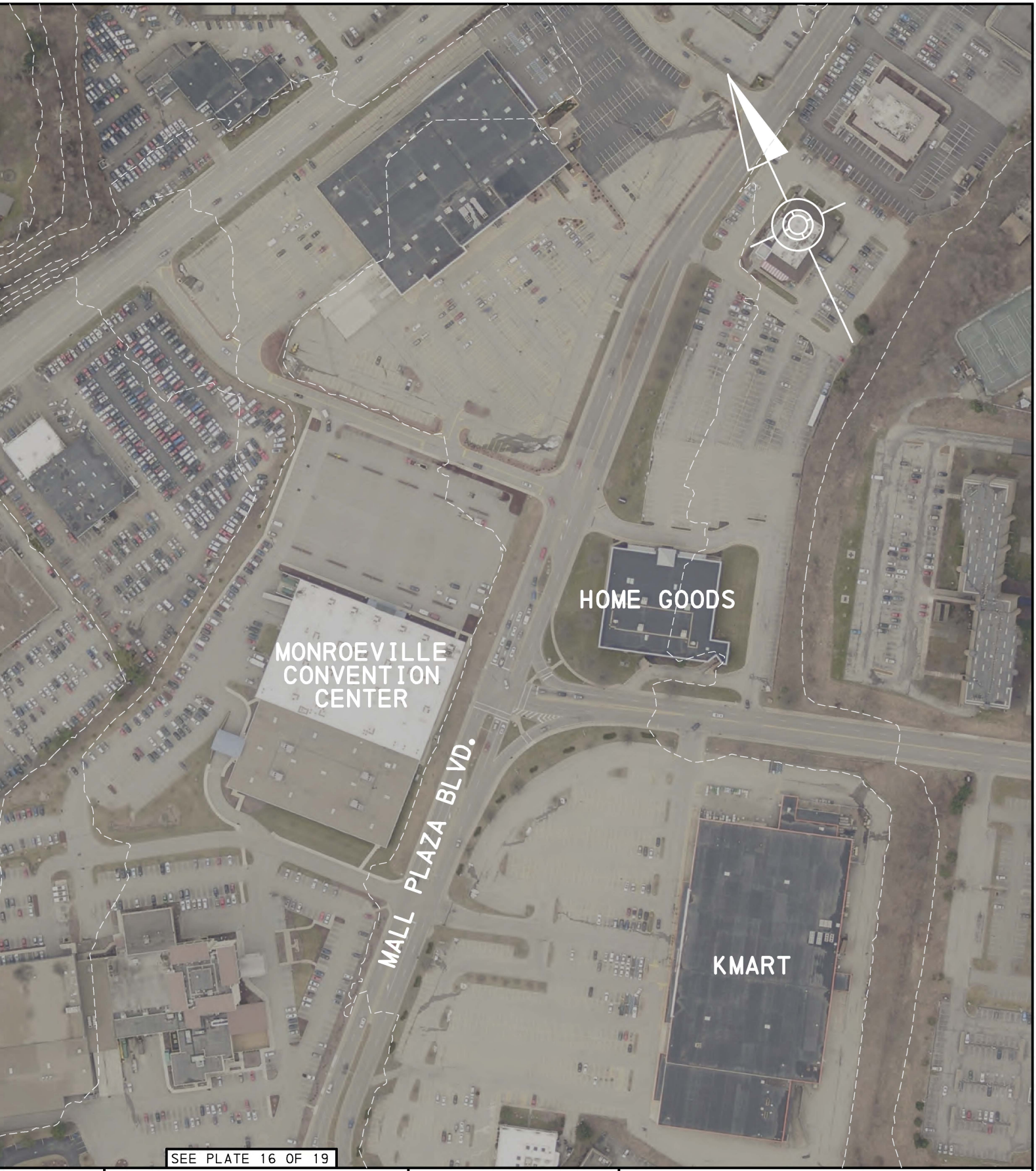

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EAST BUSWAY EXTENSION
FEASIBILITY STUDY
SWISSVALE TO MONROEVILLE

JUNE 2016

SCALE IN FEET
100′ 0 100′ 200′

PLATE 17 OF 19

SWISSVALE TO BRADDOCK AVE.

EAST BUSWAY EXTENSION TO MON-FAYETTE EXPY. CONNECTOR

MON-FAYETTE EXPY.

BOROUGH BOUNDARY

CUT/FILL LINE

STREAM

RETAINING WALL

STRUCTURE

RAILROA

STATION AND RID

FILE: \\gfp101s\CADD\057779 - PAAC Open End R13-09-A\W025- East Busway Extension Project\E. Project Working Files\A. CADD\Presentation\PLATE 18.dgn
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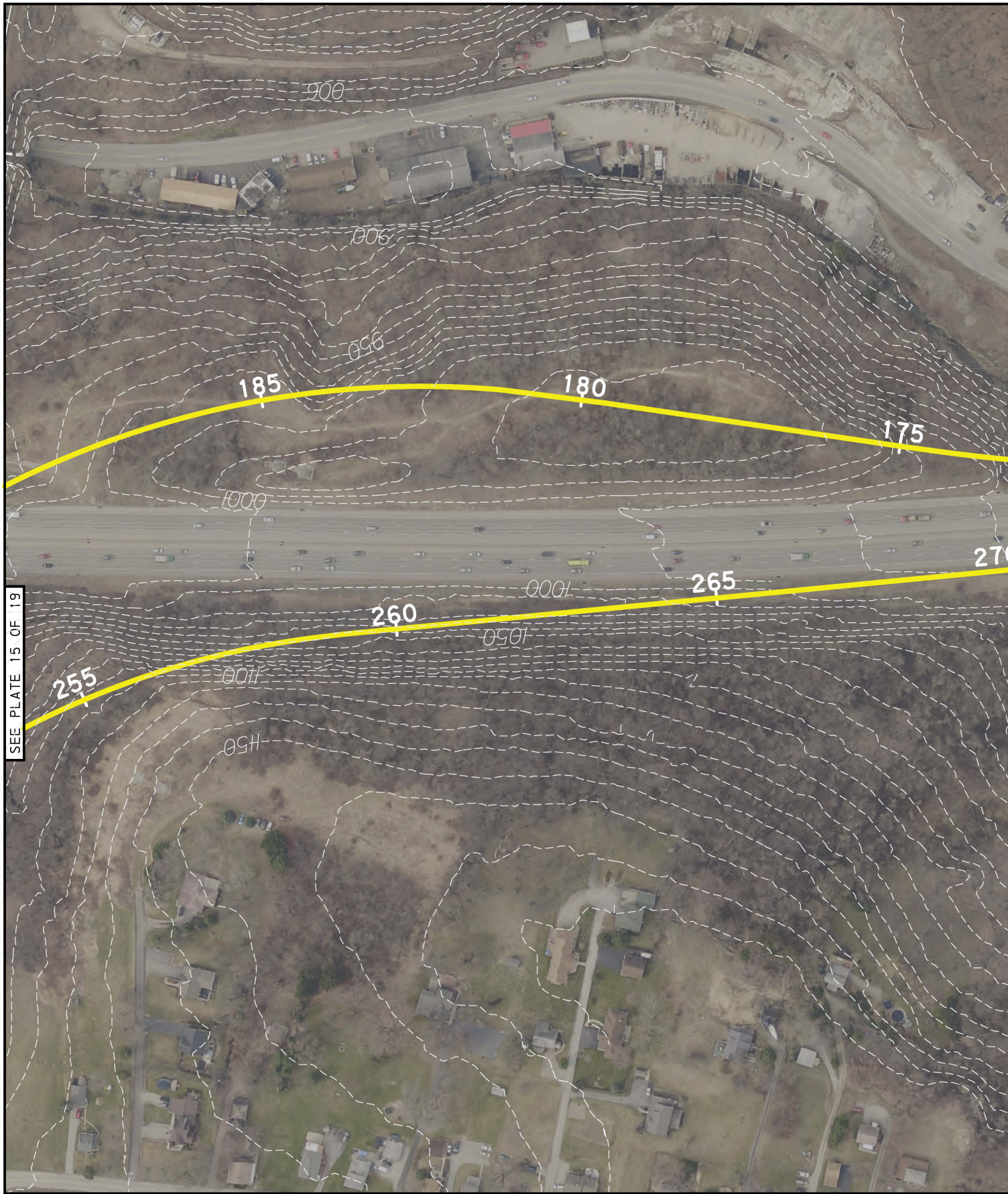
EAST BUSWAY EXTENSION
FEASIBILITY STUDY
SWISSVALE TO MONROEVILLE

JUNE 2016

SCALE IN FEET
100′ 0 100′ 200′

PLATE 18 OF 19



SWISSVALE TO BRADDOCK AVE.

EAST BUSWAY EXTENSION TO MON-FAYETTE EXPY. CONNECTOR

MON-FAYETTE EXPY.

BOROUGH BOUNDARY

CUT/FILL LINE

STREAM

RETAINING WALL

STRUCTURE

RAILROA

STATION AND RID

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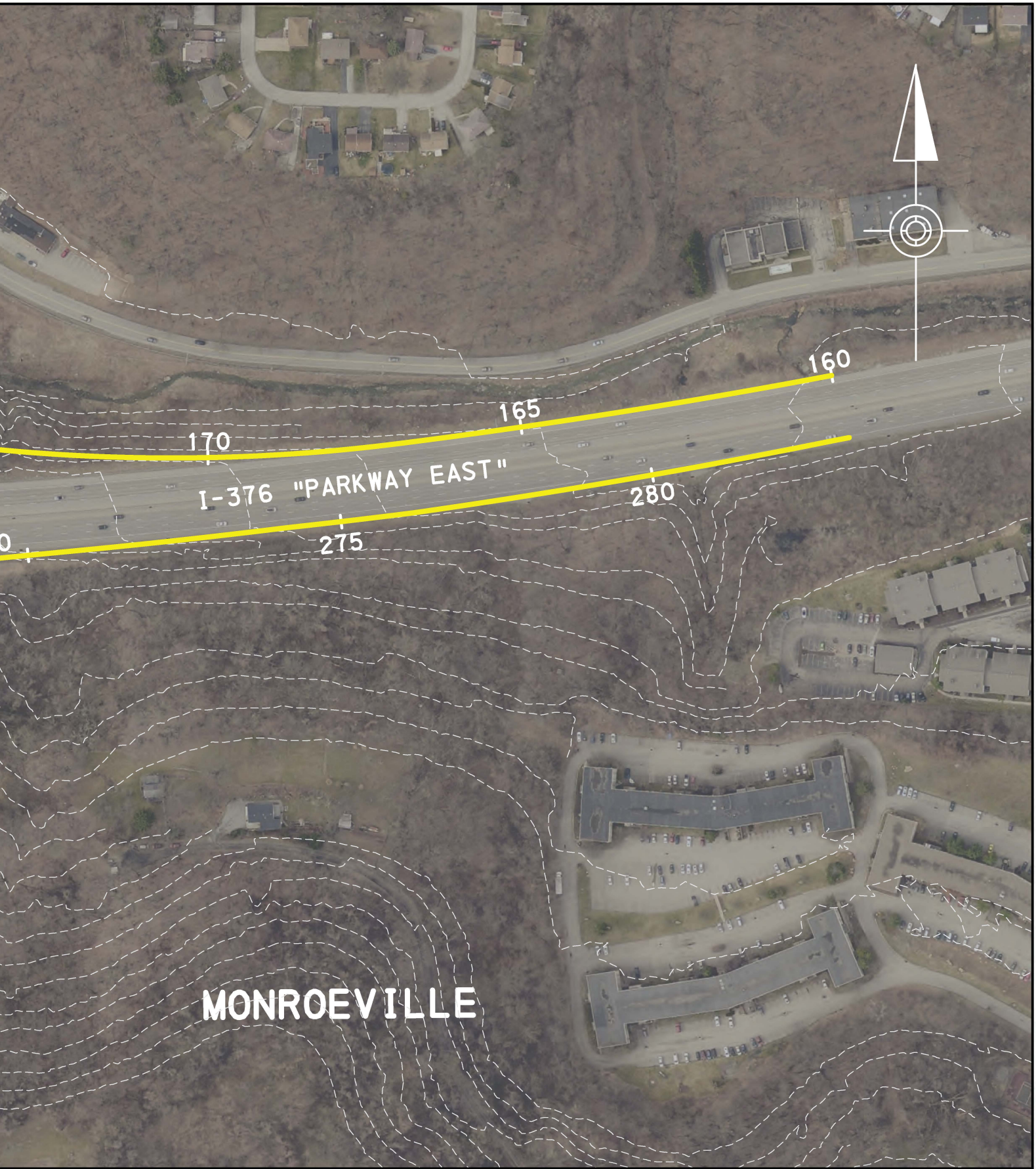

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FEASIBILITY STUDY
SWISSVALE TO MONROEVILLE

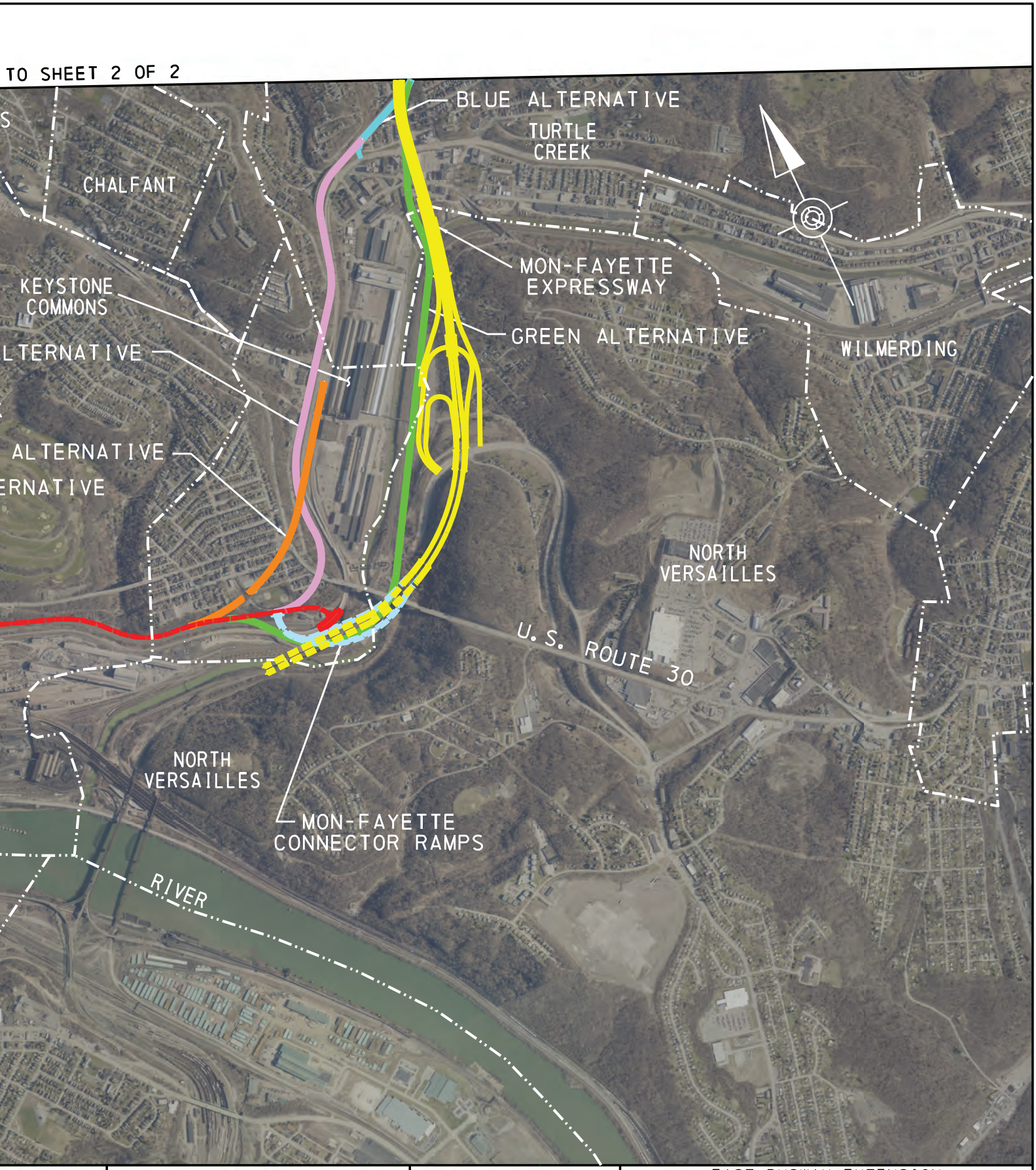
JUNE 2016

SCALE IN FEET
100′ 0 100′ 200′

PLATE 19 OF 19

Alternatives Considered - 1" = 1600' Scale Engineering Plates

ALTERNATIVE/ALIGNMENTS CONSIDERED



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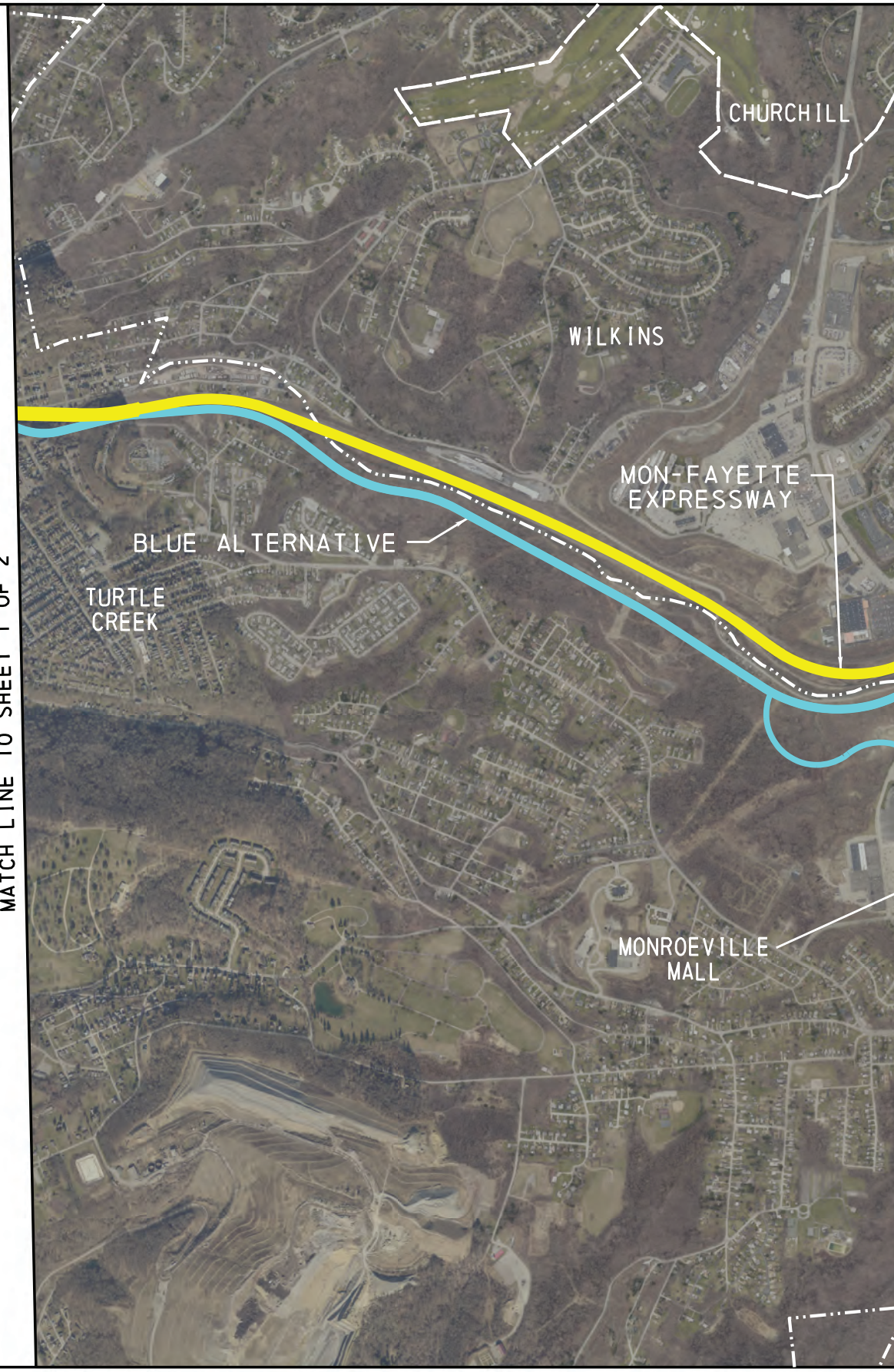
EAST BUSWAY EXTENSION
FEASIBILITY STUDY
SWISSVALE TO MONROEVILLE

JUNE 2016

SCALE IN FEET
800' 0 800' 1600'

SHEET 1 OF 2



ALTERNATIVE/ALIGNMENTS CONSIDERED

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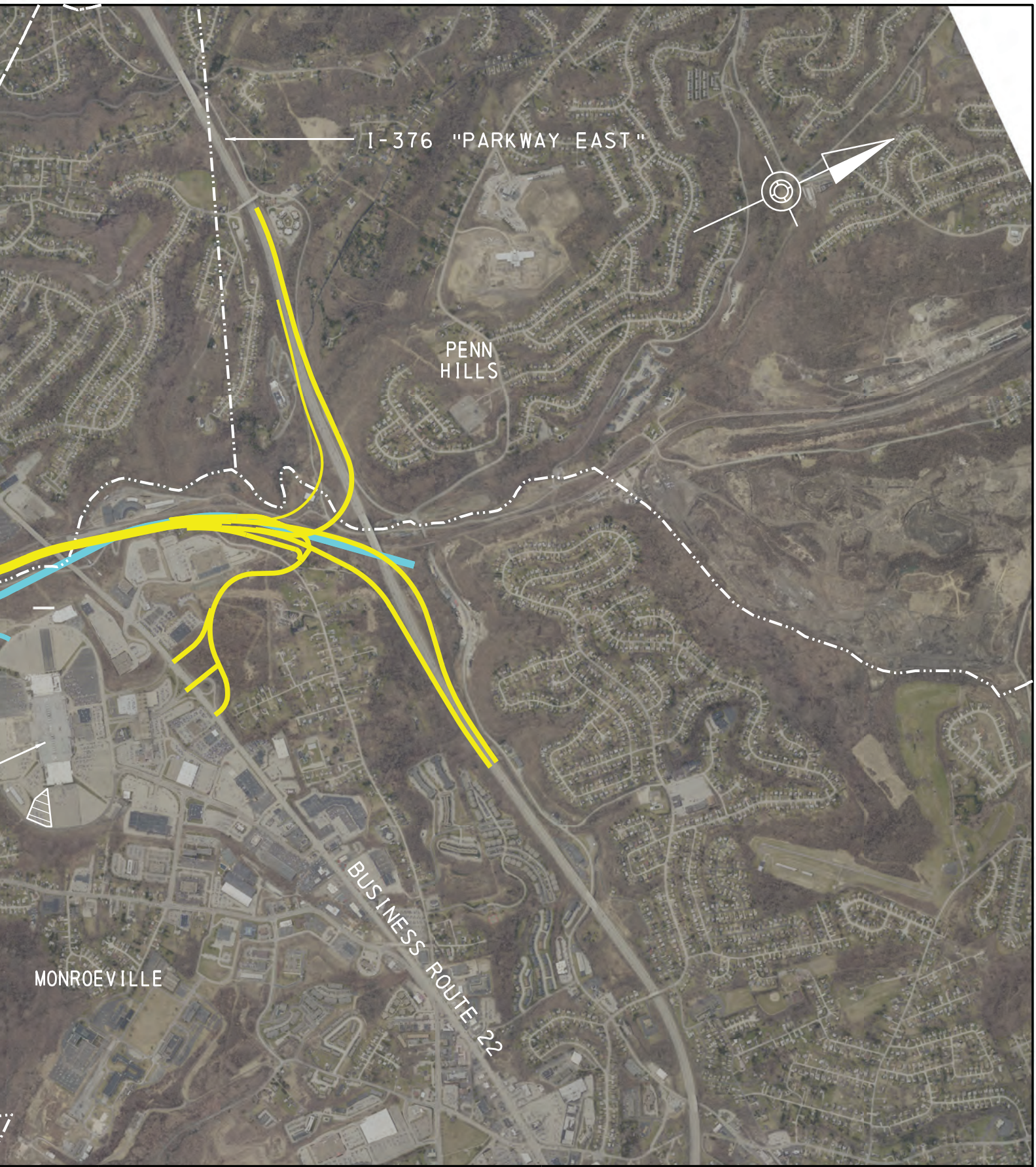

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EAST BUSWAY EXTENSION
FEASIBILITY STUDY
SWISSVALE TO MONROEVILLE

JUNE 2016

SCALE IN FEET
800' 0 800' 1600'

SHEET 2 OF 2

Alternatives Considered - 1" = 400' Scale Plans

Appendix B

Environmental Investigation

Introduction

This summary report presents the methodology and results of the environmental investigations conducted for the Port Authority of Allegheny County's (PAAC) East Pittsburgh Busway Extension project located in Allegheny County, Pennsylvania. Currently, the PAAC is in the planning stages of extending the Martin Luther King, Jr. East Busway from the existing station at Swissvale to Monroeville. The specific alignment investigated for this study begins at the existing Swissvale Station, continues east through the boroughs of Braddock, North Braddock, and East Pittsburgh (paralleling the existing Norfolk Southern Railroad), then utilizing the proposed Mon Fayette Transportation PA Route 51 to I-376 project corridor beginning just east of the U.S. Steel Edgar Thomson Works and proceeding north to Turtle Creek and then to Monroeville. The overall goal of this study was to identify resources and environmental issues that may require significant cost to mitigate and/or may require significant agency and public input. The project study corridor investigated for this project is depicted on the Environmental Features Map which has been prepared for the project.

Methodology

Identification of the project area resources was completed by reviewing secondary resources and conducting a brief field reconnaissance of the project area. Secondary resources utilized for this project included United States Geographic Survey (USGS), 7.5 minute topographic quadrangles of Braddock and East Pittsburgh, PA; United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) on-line database; Pennsylvania Natural Heritage Program (PNHP) Pennsylvania Natural Diversity Inventory (PNDI) on-line environmental review tool; Pennsylvania Historic Bridge Survey; Pennsylvania State Historic Preservation Office (SHPO's) Cultural Resources Geographic Information System (CRGIS); Pennsylvania Archaeological Site Survey (PASS) forms; PennDOT's Historic Bridge Survey database; Federal Emergency Management Agency (FEMA) website; Pennsylvania Department of Environmental Protection (PADEP) eMapPA website and the Pennsylvania Turnpike Commission (PTC) Mon Fayette Transportation Project, PA Route 51 to I-376 environmental plates.

Results

Streams & Wetlands

A review of the Braddock and East Pittsburgh USGS 7.5 minute topographic quadrangles and Pennsylvania Department of Environmental Protection (PADEP's) eMapPA website identified several named watercourses within and adjacent to the project study corridor. The named watercourses identified included Chalfant Run, Leak Run, Thompson Run, and Turtle Creek. According to PADEP Chapter 93, all of the named streams are managed for Warm Water Fishes (WWF). The only stream listed by the Pennsylvania Fish and Boat Commission (PFBC) as an "Approved Trout Water" is Turtle Creek. However, the defined downstream stocking limits are greater than one mile upstream of the proposed East Busway crossing over Turtle Creek and in-stream construction restrictions would likely not apply. A review of secondary resources and a brief field reconnaissance also confirmed that unnamed tributaries to the Monongahela River, Thompson Run and Turtle Creek were present within the project study corridor as well. If the project would impact any of these resources, coordination efforts with the PADEP and the United State Army Corps of Engineers (USACOE) would be required to determine the potential level of mitigation and permitting requirements.

The United States Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) on-line data base was reviewed to determine if there were any NWI wetlands located within the project study corridor. The on-line database indicated that the only NWI wetland located within the project area was Turtle Creek. Turtle Creek is classified as a Riverine, upper perennial, unconsolidated bottom, permanently flooded (R3UBH) wetland. In addition to utilizing the NWI on-line database, the environmental plates associated with the Mon Fayette Transportation Project (for the proposed PA Route 51 to I-376 section) were evaluated to determine if additional wetland resources were located within the study corridor. Review of the environmental plates indicate that wetlands previously delineated during the survey of the Mon Fayette Expressway exist within the Turtle Creek and Thompson Run stream corridors. If the project would impact any of these resources, coordination efforts with the PADEP and the USACOE would be required to determine the level of

mitigation and permitting requirements. The location of the delineated wetlands are depicted on the Environmental Features Map.

In addition, it is important to note that a section of the proposed Busway Extension (from the existing Swissvale Station to the U.S. Steel Edgar Thomson Works) and the proposed parking areas have not been evaluated for streams and wetlands. Therefore, detailed stream and wetland investigations would be required to confirm the absence/presence of these resources in these areas.

Floodplains

Review of the PADEP's eMapPA website and the Federal Emergency Management Agency (FEMA) database indicate that defined 100-year floodplains (Zone AE) are located along the stream corridors of Leak Run, Thompson Run, and Turtle Creek within the project study corridor. Any proposed work activities within the floodplain boundaries will need to be evaluated to determine if they will have an effect on the defined floodplains associated with these watercourses.

Threatened and Endangered Plants and Animals

An online database search of the Pennsylvania Natural Diversity Inventory (PNDI) website was conducted and identified there are potential project conflicts with species of concern under the jurisdiction of the Pennsylvania Game Commission (PGC) and the Pennsylvania Fish and Boat Commission (PFBC). The species under jurisdiction of the PGC is identified as *Falco peregrinus* (Peregrine Falcon) which carries a current status of "endangered". The species under jurisdiction of the PFBC are identified as *Chaenobryttus gulosus* (Warmouth), *Toxolasma parvus* (Lilliput) and an unidentified sensitive species. The Warmouth (freshwater fish) and the unidentified sensitive species carry a current status of "endangered" and the Lilliput (freshwater mussel) carries a current status of "Special Concern Species". Additional coordination efforts would be required with the PFBC and PGC to determine what impacts the project would have on these resources.

Historic Resources – See Tables 1 and 2

A review was conducted of the Pennsylvania State Historic Preservation Office (SHPO's) Cultural Resources Geographic Information System (CRGIS), which identifies all previously recorded cultural resources in Pennsylvania, including above ground historic resources. Other sources of previously recorded information that were examined during this initial review included PennDOT's Historic Bridge Survey database, as well as the environmental plates for the Mon Fayette Expressway, which included the historic resources recorded during the surveys for that project. The information from these sources were then pulled and added to the Environmental Features Map; however, only the historic resources that were previously determined listed or eligible for the National Register of Historic Places (NRHP) were included on the map. Moreover, NRHP-Listed and eligible resources were not identified separately since under Section 106 law, effects to listed and eligible resources are treated the same way.

It is relevant to note that neither National Historic Landmarks (NHL) nor Historic Civil Engineering Landmarks are present within the project study area. The Braddock Carnegie Library, a NHL property, is located along Library Street adjacent to the project, but is located outside of the study area. While the proposed route does not impact NHL or Historic Civil Engineering Landmark properties, it does parallel two NRHP-eligible linear historic districts, the Pennsylvania RR and the Union RR. This includes their contributing resources, such as bridges and underpasses. In addition, some proposed parking locations are located on or adjacent to Listed or eligible resources. Other notable resources include the NRHP-eligible Edgar Thomson Works parallel to the alignment, as well as the NRHP-Listed George Westinghouse Memorial Bridge. These two resources are included on lists provided by regional historic preservation groups, such as the Pittsburgh History and Landmarks Foundation (PHLF). The project will require the solicitation and involvement of consulting parties (CPs) throughout the Section 106 process, which will include the PA SHPO, but the PHLF will also likely be one of many additional CPs who will illustrate a demonstrated interest. Another potential CP is the Rivers of Steel Heritage Corporation. Finally, a field reconnaissance confirmed that the proposed busway extension is almost entirely located within communities over 45 years old, much of which was never evaluated for NRHP-eligibility. A historic resources survey will be needed in these areas to identify NRHP-eligible historic resources, and when necessary, assess effect. If any Listed or eligible properties

cannot be avoided, then mitigation will be required for these properties that are Adversely Affected.

Archaeological Resources

It is first and foremost important to note that there are currently no known archaeological "show-stoppers." The PASS forms were reviewed on CRGIS, as well as existing records from archaeological surveys conducted for the Mon Fayette Expressway. The Mon Fayette Expressway archaeological surveys recorded a large number and collection of historic archaeological sites, which are indicated on the mapping to be aware of their presence and location. The eligibility of these archaeological sites are not indicated on the Environmental Features Map since when the Mon Fayette Expressway project was halted, concurrence from PA SHPO was often not received, is inaccurate, or is incomplete. Coordination with the PA SHPO may be necessary if any of these sites are impacted by the proposed Busway project, and if any of these sites are determined to be NRHP-eligible resulting from the renewed 2016 consultation for the Mon Fayette Expressway project. Historic communities along portions of the proposed busway route were never surveyed archaeologically, and therefore strips of property within the study area will require some limited testing. However, it is anticipated that a Phase I testing plan can be coordinated with PA SHPO to minimize the extent of testing. Finally, if impacted, the floodplains in the study area located along Turtle Creek and sections of Thompson Run will require geomorphological testing with a backhoe, the intent of which is to minimize overall project effort and cost, as well as to determine depth of potential archaeological testing.

Hazardous and Residual Wastes – See Table 3

An on-line review of PADEP's eMapPA website, evaluation of the Mon Fayette Expressway environmental plates and a field reconnaissance identified potential waste facilities and areas of environmental concern within the project area. Potential waste facilities within the project study corridor consisted of automotive dealerships, businesses, industrial sites, service stations, abandoned and active gas wells, railroad corridors and remnants of miscellaneous fill material. Overall, due to these potential waste facilities being located within the project study area, additional field investigations and a Phase I Environmental Site Assessment (ESA) would have to be performed to determine if any additional waste management activities would be required for the project. Potential waste facilities within the project study corridor are depicted on the Environmental Features Map.

Environmental Justice Areas

According to the PADEP eMapPA website, a significant portion of the project area (boroughs of Braddock, North Braddock, East Pittsburgh and North Versailles Township) is located within an Environmental Justice Area. Environmental Justice analyses would be required for the project to assess if the proposed work activities would have an impact on Environmental Justice Populations (minority and low-income populations). To assess if the project would result in substantial impacts towards minority and low-income populations, evaluations conducted in accordance with PennDOT's *Publication No. 746, Project Level Environmental Justice Guidance* along with public involvement/outreach would be required during the design phase of the project. Overall, the main goals of the Environmental Justice evaluation will be to determine whether the project would have disproportionate effects on minority and/or low-income groups and to identify positive and adverse impacts to the minority and/or low-income groups.

Parks & Recreational Areas – See Table 4

An on-line review of PADEP's eMapPA website and a field reconnaissance confirmed that several park and recreational facilities are located within or adjacent to the project study corridor. In accordance with PennDOT *Publication No. 349, The Transportation Project Development Process, Section 4(f) Handbook* indicates that three out of the four properties identified would be classified as Section 4(f) properties. Coordination efforts with the Federal Highway Administration (FHWA) would be required if the project would result in temporary or permanent impacts towards these resources.

Public Facilities – See Tables 5 and 6

Public facilities (churches, emergency service providers, fire departments, hospitals and schools) are located within and adjacent to the project study corridor. Based upon the current busway alignment, it appears that the majority of these facilities would not be impacted by the project. Public facilities within the project study corridor are depicted on the Environmental Features Map.

Table 1 - NRHP Listed & Eligible Historic Resources

ID	Name
1	Pennsylvania Railroad
1A	Ajax Way Underpass
1B	Sixth Street Underpass
1C	Library Street Underpass
1D	Frazier Street Footbridge
1E	Bridge over Turtle Creek
2	Ladies of the Grand Army of the Republic Home
3	Hawkins Village
4	Edgar Thomson Works
5	Union Railroad
5A	Bridge over Turtle Creek
5B	Bridge over Pennsylvania Railroad
5C	Bridge over Borough of Turtle Creek
5D	Bridge over Thomson Run
5E	Thompson Run Road Underpass
5F	Old William Penn Highway Underpass
6	George Westinghouse Memorial Bridge
7	Westinghouse Corporation Hydro Electric Plant
8	East Pittsburgh Division of the Westinghouse Corporation (Keystone Works)
9	St. Colman's Catholic Church & School
10	McMasters ME Church
11	United Presbyterian Church of Turtle Creek
12	Linhart Works (Anker Industries)
13	Union Railroad Roundhouse/Hall's Locomotive Shop
14	Braddock Carnegie Library

Table 2 - Other Significant Resources

ID	Name
1	Braddock's Battlefield History Center
2	Braddock's Field Monument

Table 3 - Potential Waste Sites

ID	Name
1	Marsh Laboratory
2	Culgan Towing & Junk Yard
3	Venturella's Auto Service
4	Storage Garage & Misc Debris
5	Bridge
6	Old House foundation and debris

Table 3 - Potential Waste Sites (Continued)

ID	Name
7	Closed Service Station
8	Bridge
9	McClure Johnston (Building supplies) Hazardous Generator Captive
10	Concrete Block Storage Yard
11	Sovereign Sanitation (Hazardous Generator Captive) Empty Lot
12	Bridge
13	Potentially contaminated site (MFE)
14	Potentially contaminated site (MFE)
15	Industrial Storage Tank
16	US Steel
17	Vertical Well (Exco Resources)
18	Vacant Building & Lot (Miscellaneous Debris)
19	Weber Construction
20	Bridge
21	Bridge
22	Gas well
23	Bridge
24	Gas well
25	Abandoned gas well
26	Abandoned gas well
27	Abandoned gas well
28	Keystone Commons
29	Abandoned gas well
30	Abandoned gas well
31	Abandoned gas well
32	Gas Well
33	Vacant lot with remnant of fill materials
34	Abandoned gas well
35	Potentially contaminated site (MFE) Turtle Creek Savings Loan
36	Potentially contaminated site (MFE) Sam's Service Center
37	Samdoz Inc (Westinghouse Electric) Hazardous Generator Captive
38	Fill Material (Unknown)
39	Trucking/storage Facility
40	Potentially contaminated (MFE) Agate Auto Outlet
41	Romanellis Enterprises (Hazardous Generator Captive)
42	Peoples Natural Gas Facility
43	Service Station
44	Westrum Land Dev (Brubacher) E&S Control
45	Anker Industries

Table 3 - Potential Waste Sites (Continued)

ID	Name
46	Monroeville storm sew sys (Pollution Control)
47	Union RR (Hazardous Generator Captive)
48	Abandoned gas well
49	Davis Saw Company
50	Vertical Gas Well
51	Gas Valve
52	Bridge
53	Gas Valve
54	Mine Drainage Seep
55	Round House RR
56	Vertical Gas Well
57	Abandoned Gas Well
58	Gas Well
59	Junked Cars
60	Robert P. Erzeu Associate (Floor Equipment)
61	Abandoned Gas Well
62	Vertical Gas Well
63	Impacted Water Source (AMD Discharge)
64	Abandoned Gas Well
65	Gas Well
66	Abandoned Gas Well
67	Monroeville Storm Sewer System Discharge Point
68	Naccaratic Contracting
69	Unidentified Resource
70	Gas Well
71	Abandoned Gas Well
72	Gas Well
73	Miscellaneous Debris
74	Vertical Gas Well
75	Chrysler Dealer
76	Impacted Water Source (AMD Discharge)
77	Biondi Motor (Hazardous Generator Captive)
78	Day Ford (Hazardous Generator Captive)
79	Vertical Gas Well
80	Storage Yard (Scrap Metal and Vehicles)

Table 4 - Parks & Recreation

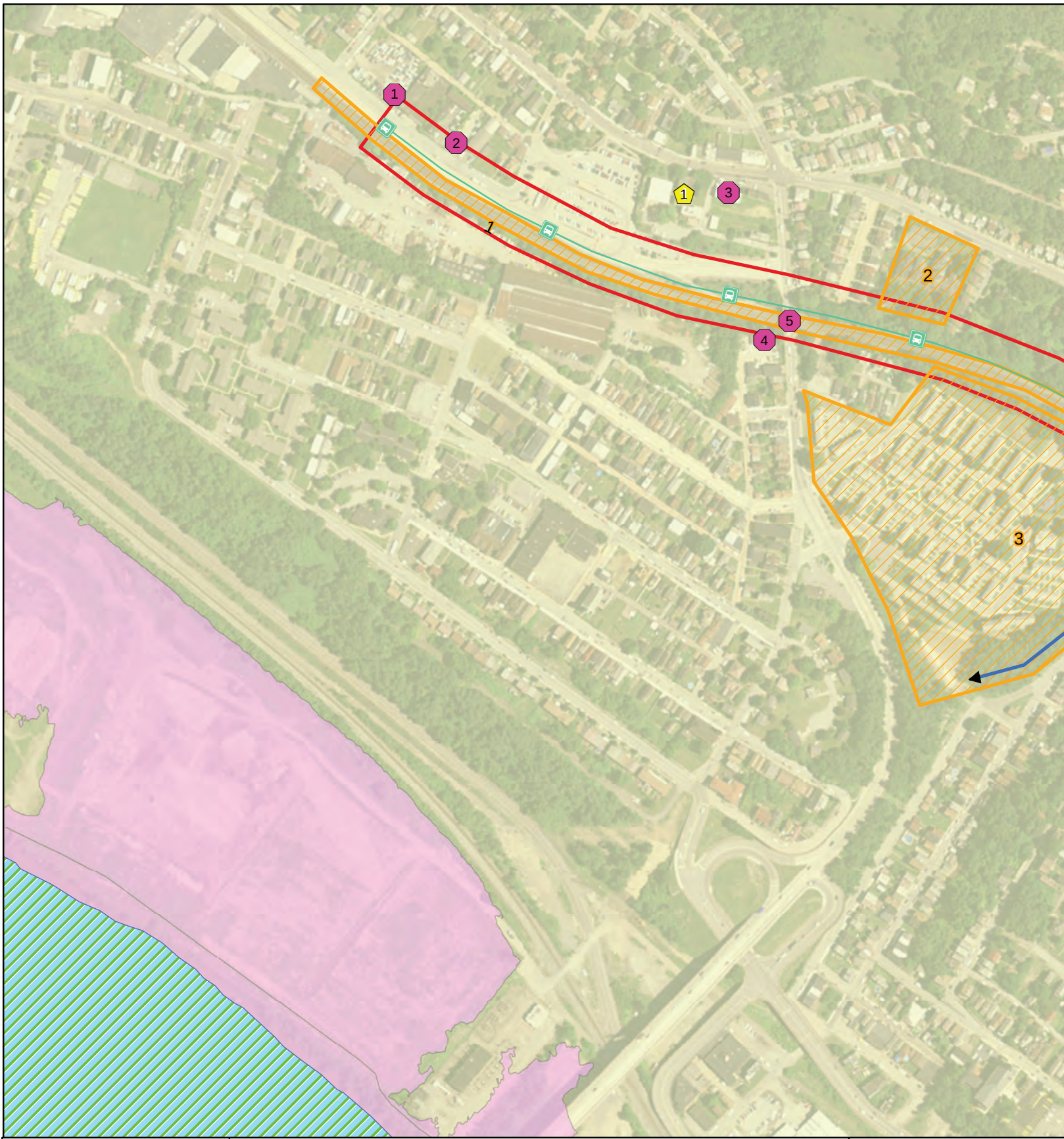
ID	Name
1	Library Street Basketball Courts (Borough of Braddock) 4(f) Resource
2	Borough of North Braddock Park Facility 4(f) Resource
3	Quarry Ballfield
4	Dixon Playground Facility 4(f) Resource

Table 5 -Schools & Churches

ID	Name
1	Word of God Parish
2	Woodland Hills School Facility & Athletic Fields
3	Good Shepard School
4	Good Shepard Church
5	Kingdom Hall of Jehovah's Witnesses
6	Westinghouse Valley Human Service Center
7	Ekklessa Church
8	St. Colman's Church & School
9	McMasters United Methodist Church
10	First Christian Church
11	Turtle Creek United Presbyterian Church
12	SV Temple

Table 6 -Medical/Fire/Police Facility

ID	Name
1	Priority One Emergency Medical Services
2	N. Braddock Municipal Building & Vol Fire Department Station 2
3	R.G. Medical Associates
4	Children's UPMC General Internal



East Busway Extension Project

Port Authority of Allegheny County
Allegheny County, Pennsylvania
USGS East Pittsburgh and Braddock Quadrangle Mapping
Environmental Features Map Sheet 1 of 10

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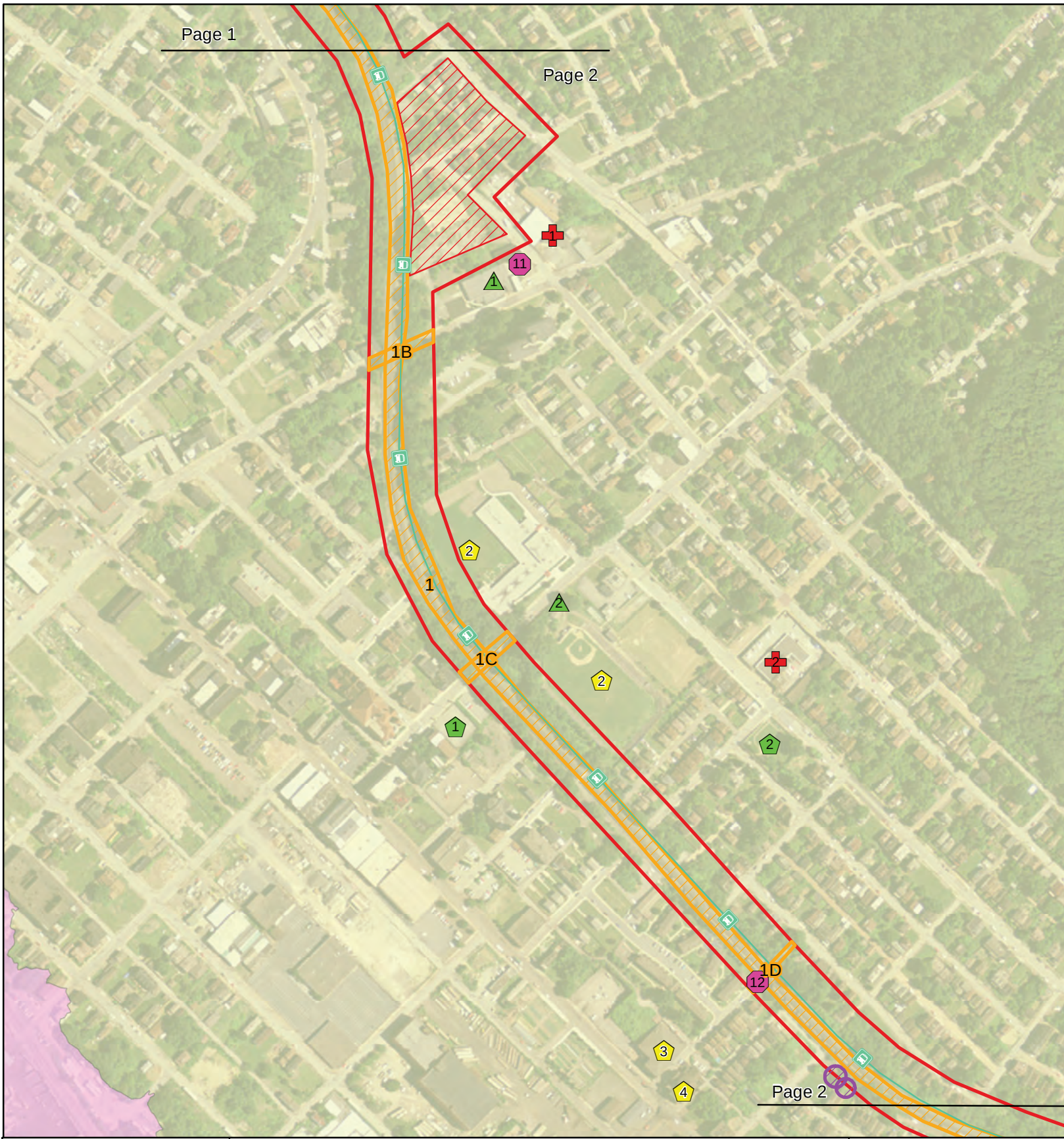

East Busway Extension Project

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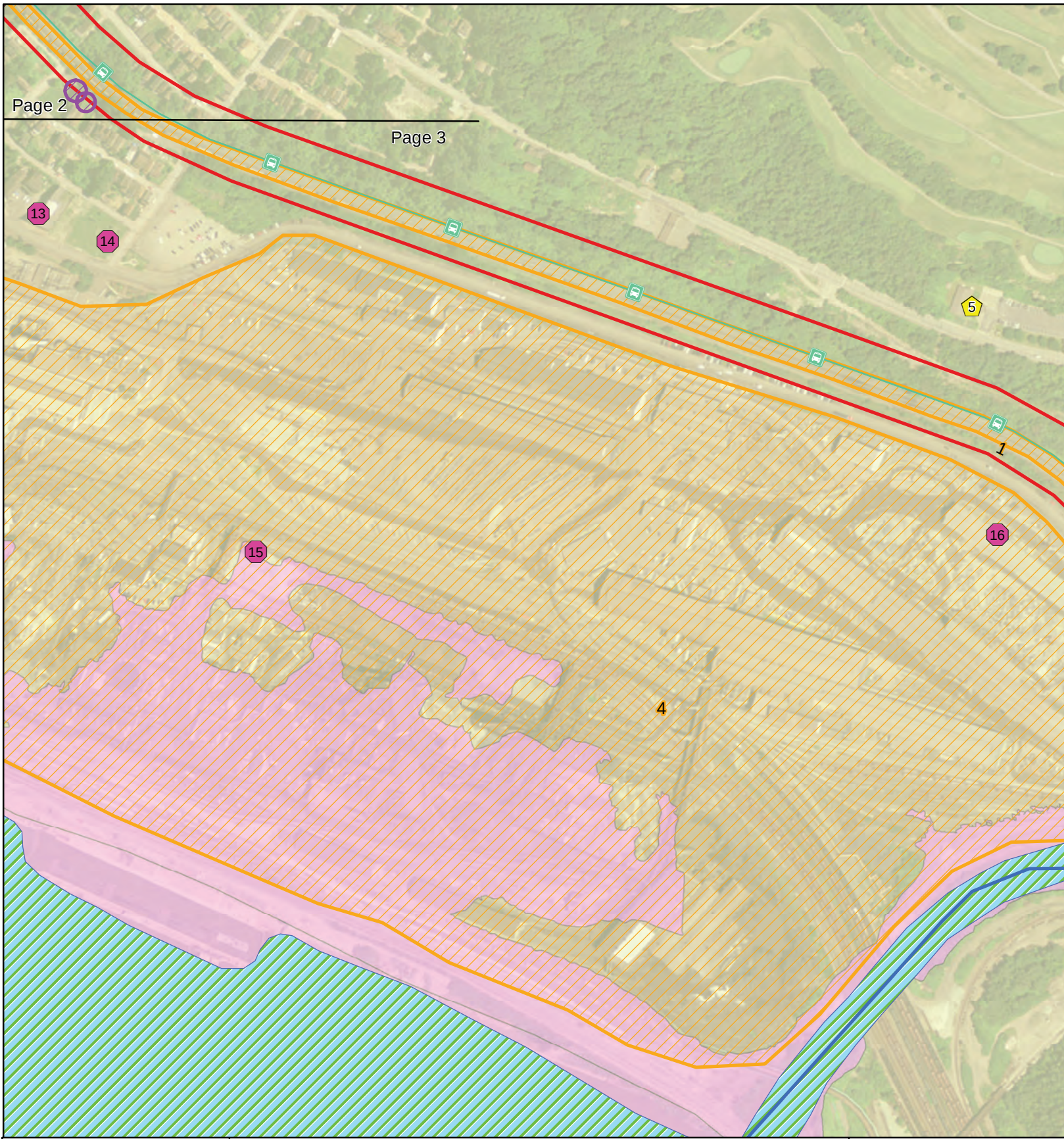

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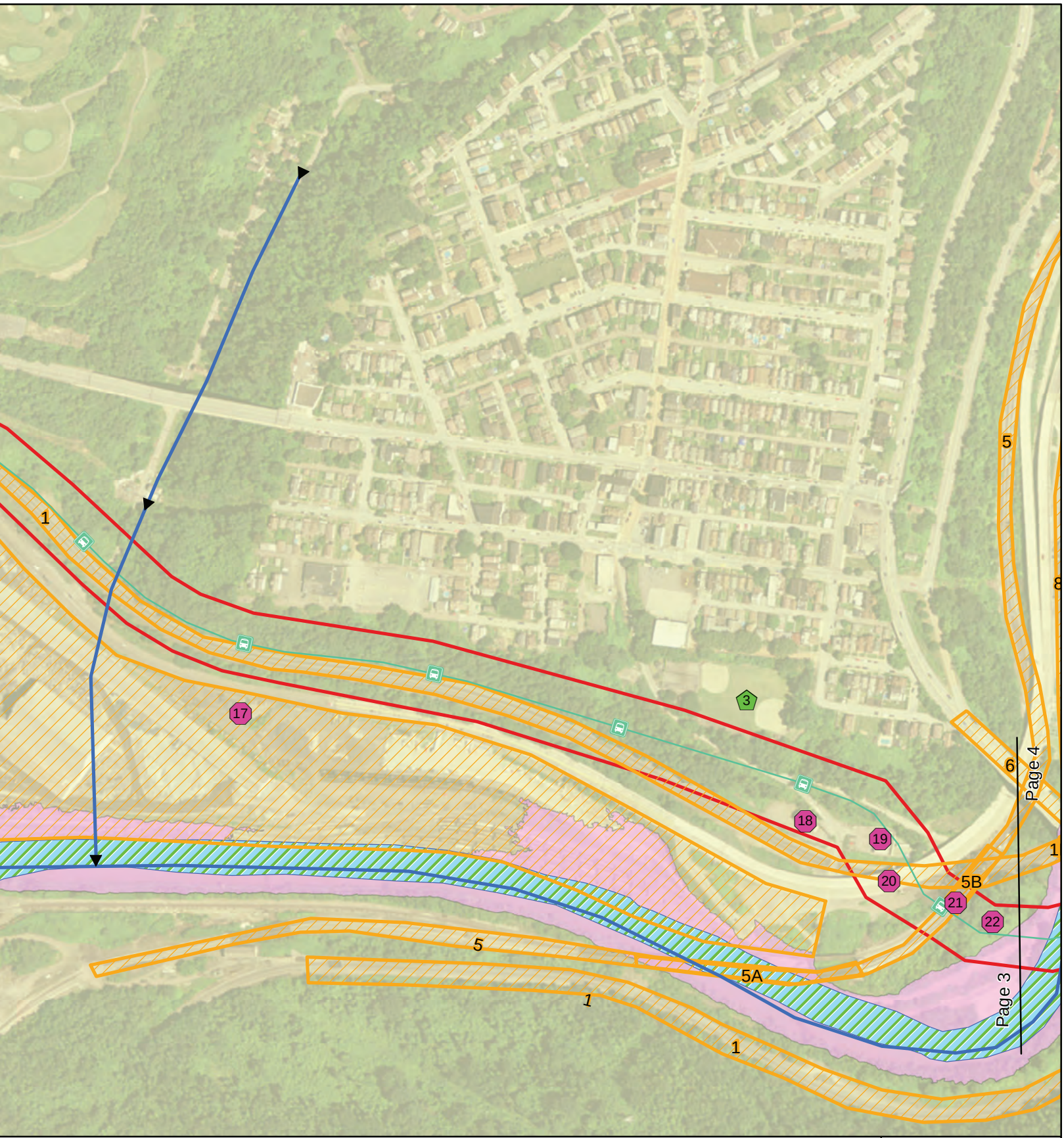

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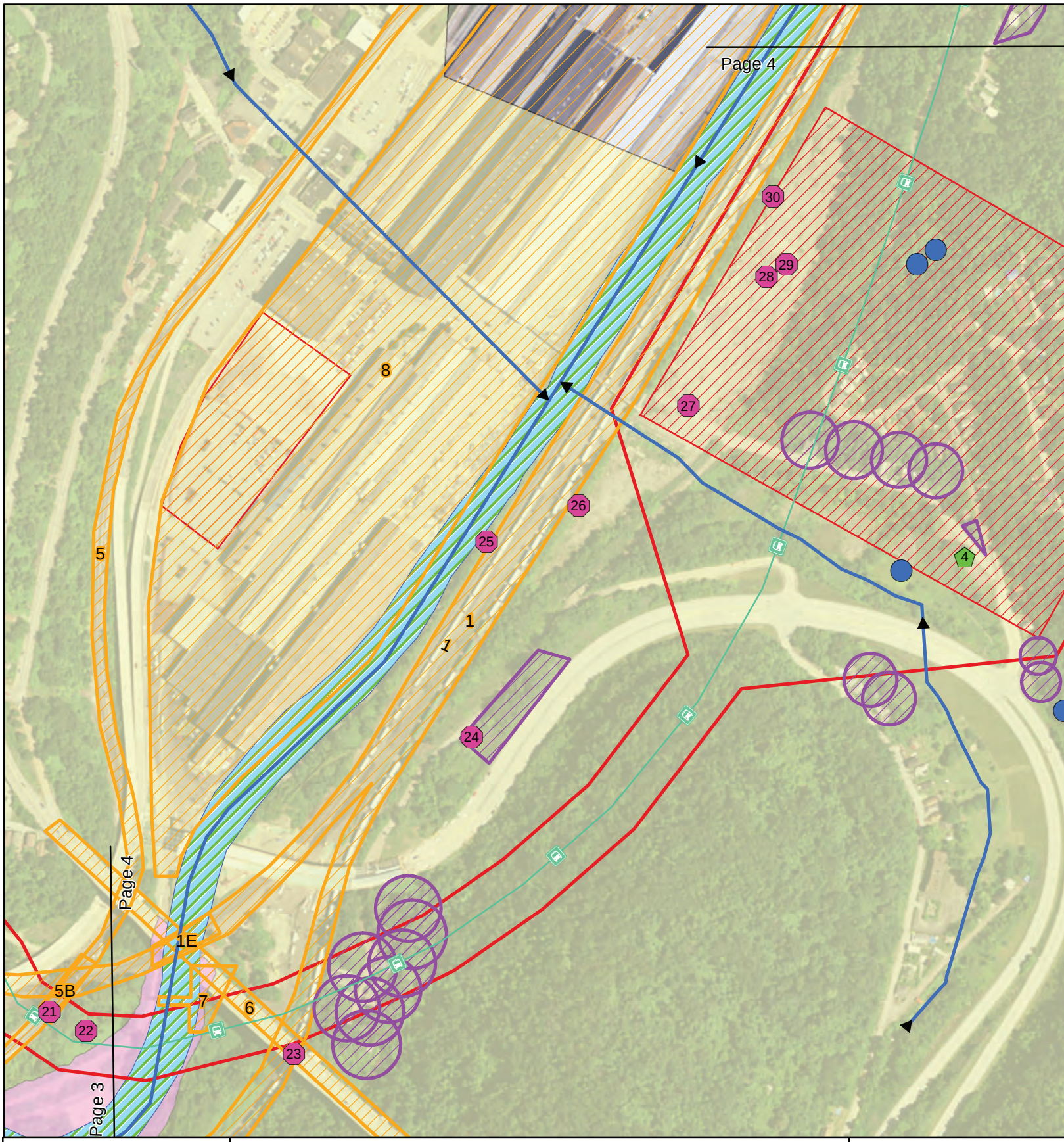

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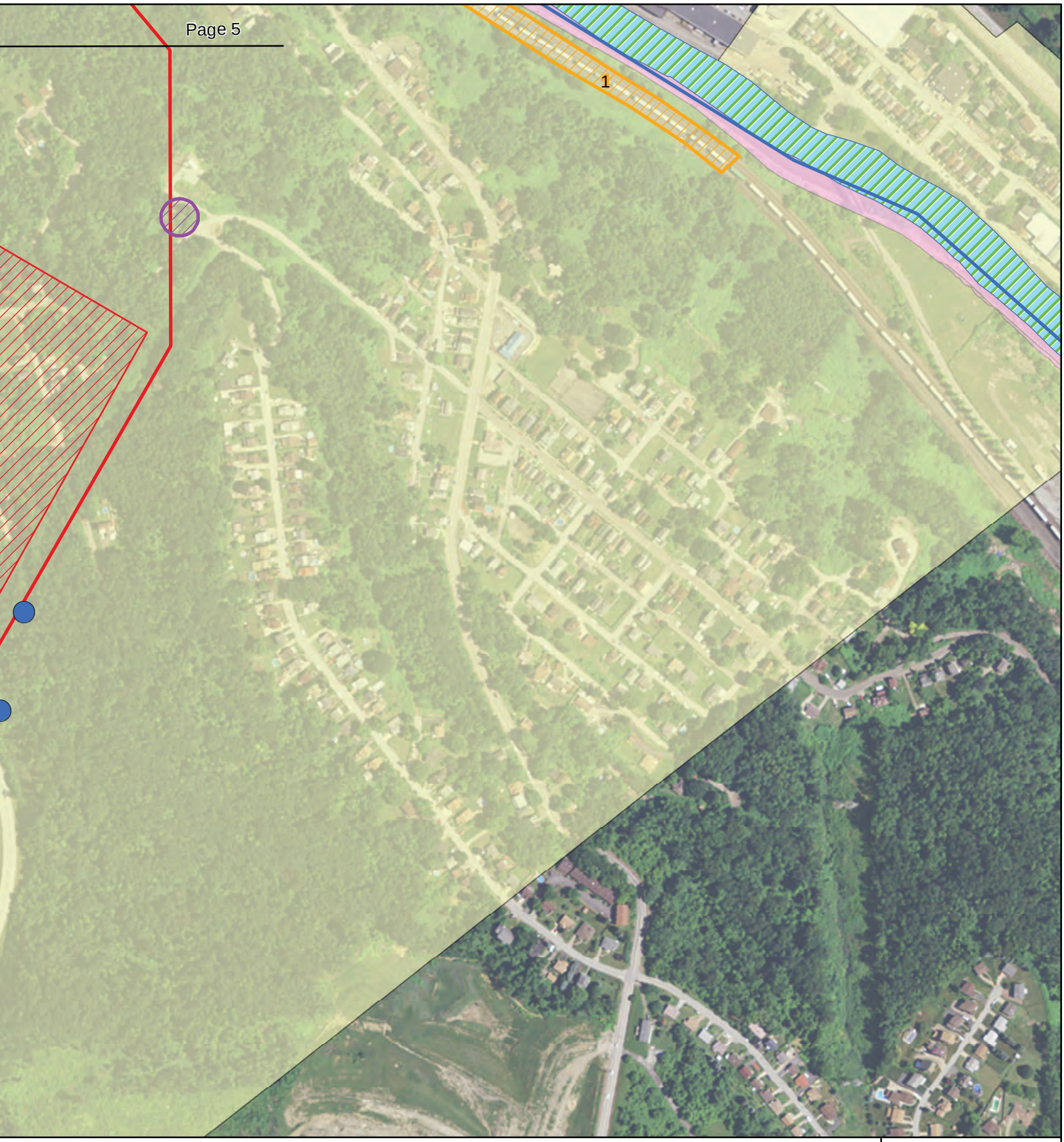

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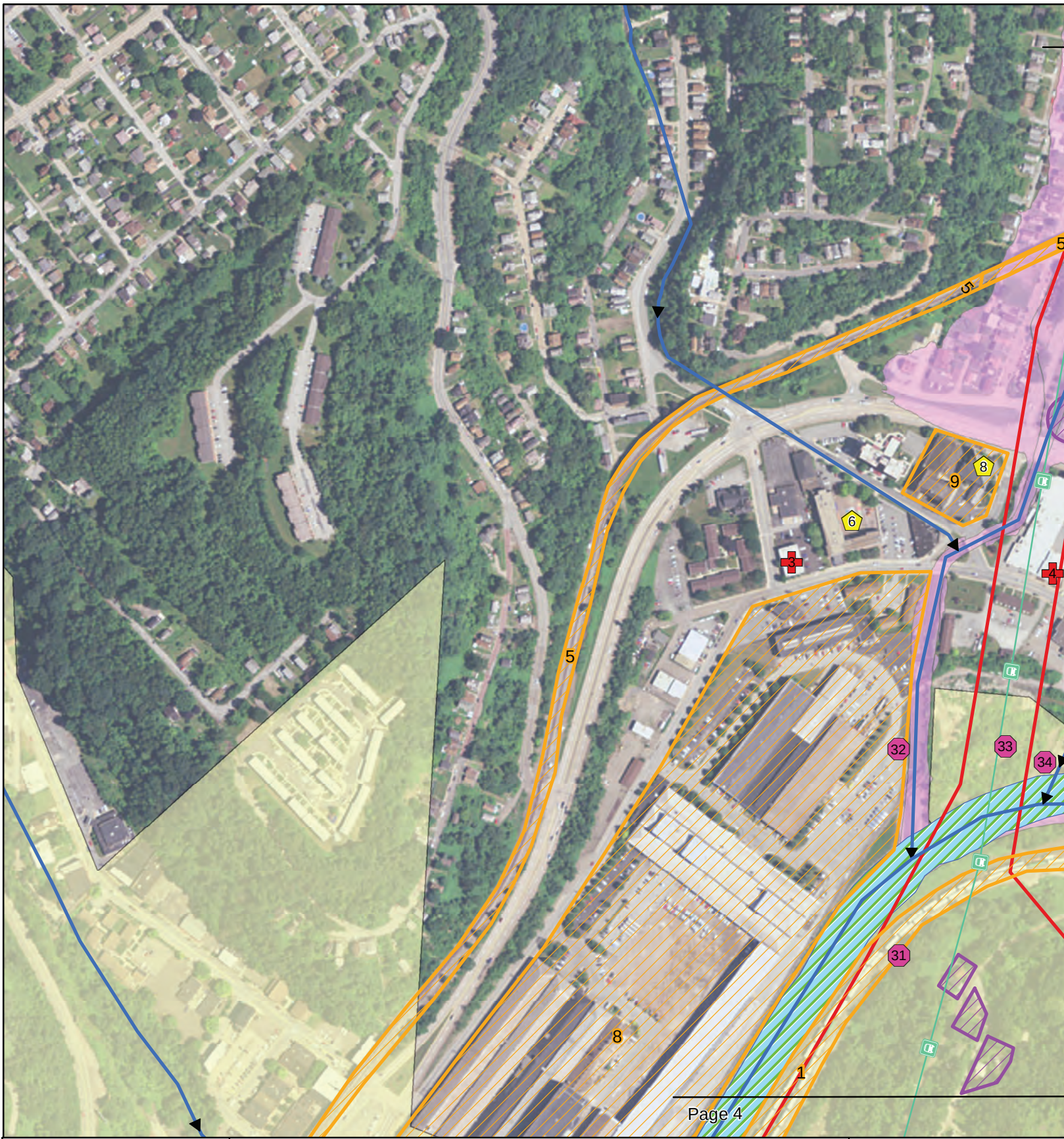

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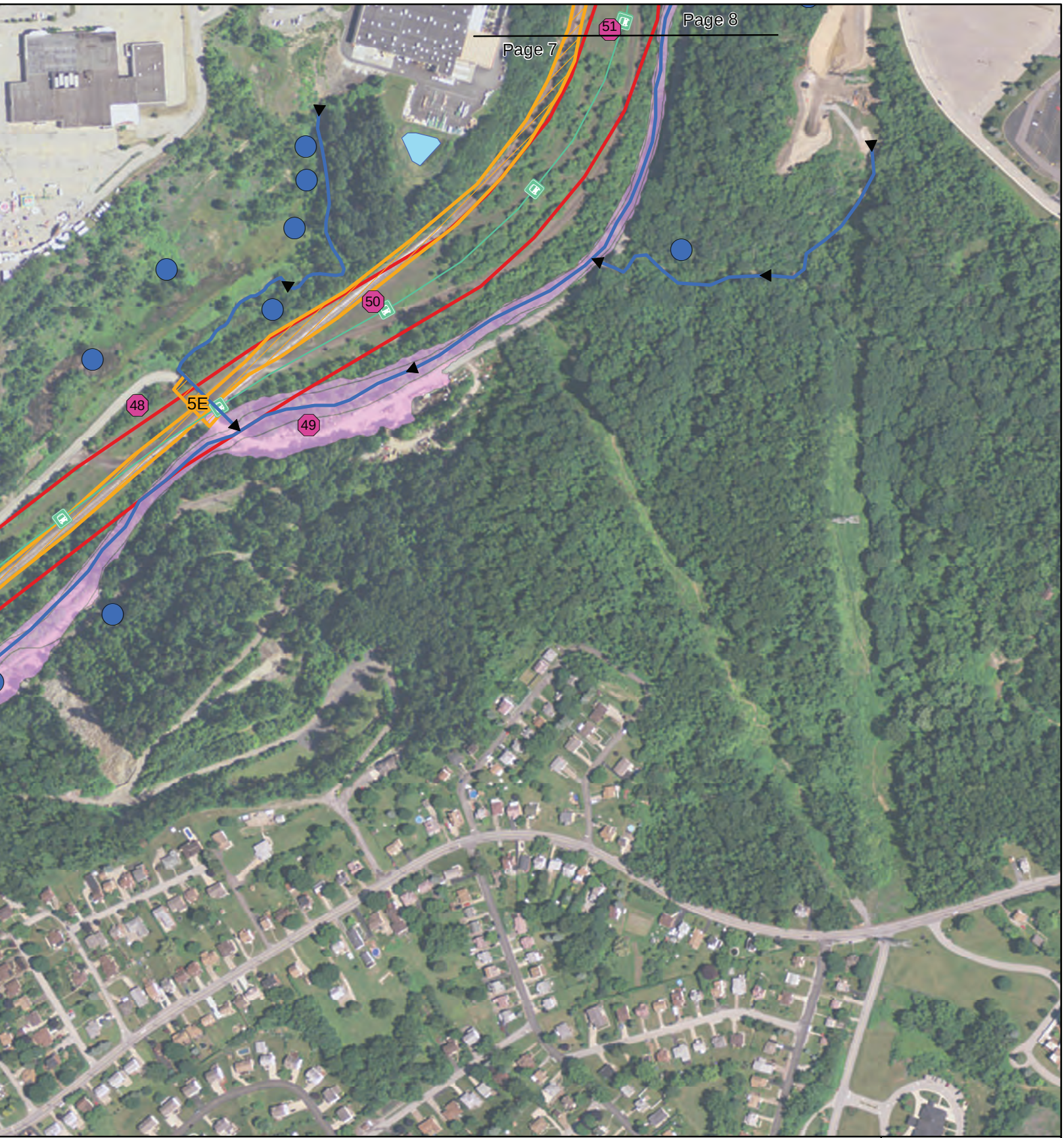

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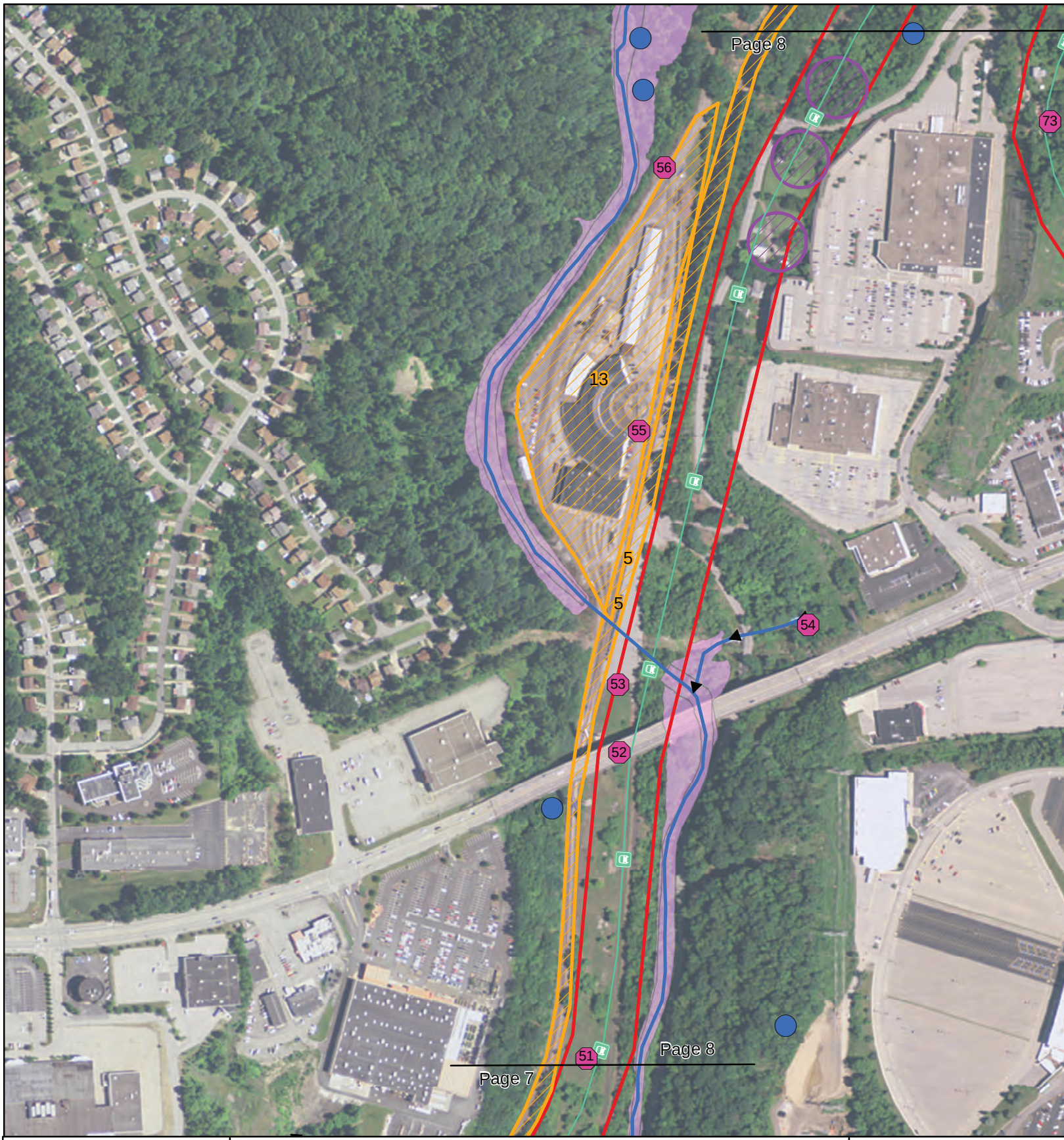

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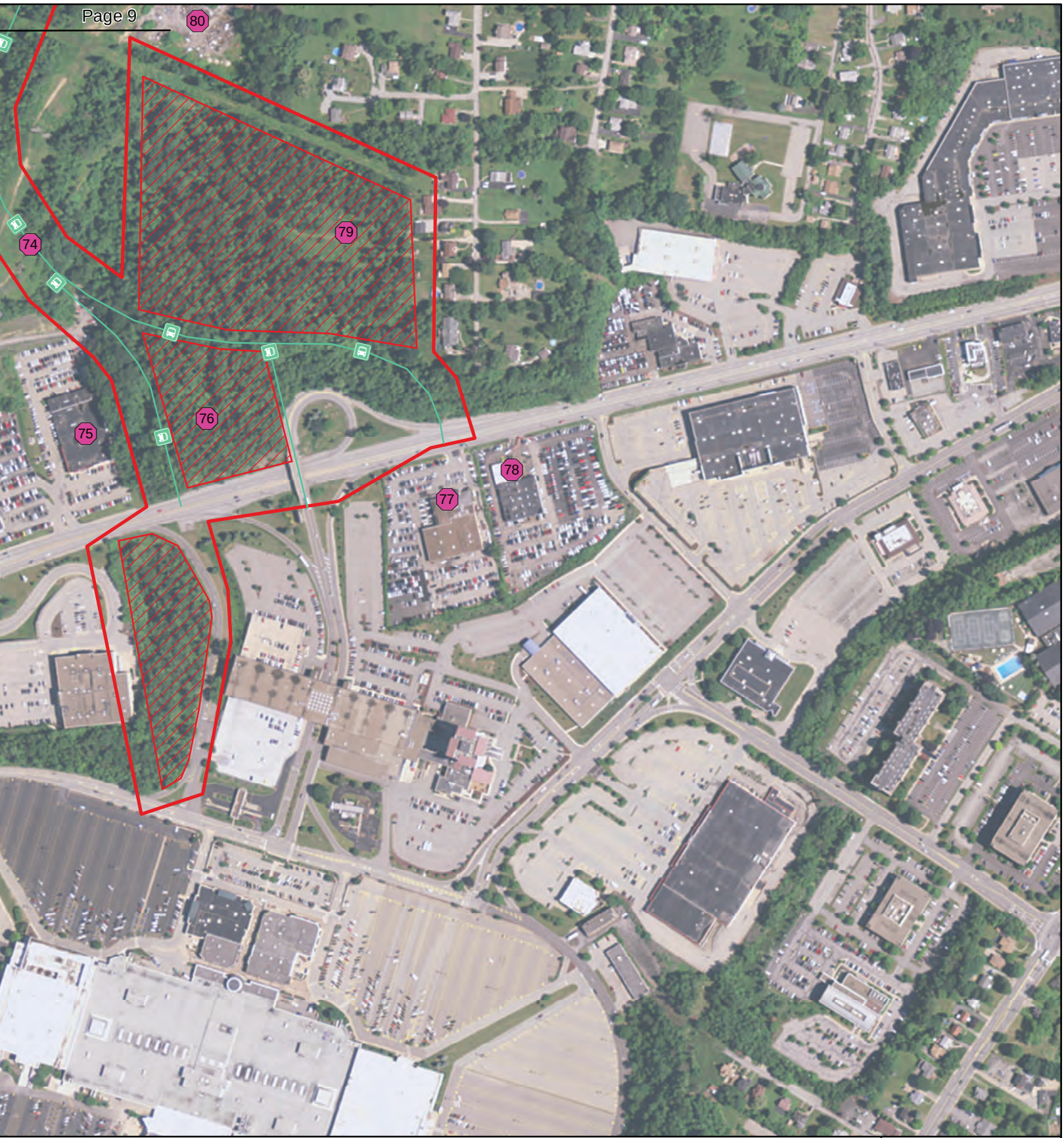

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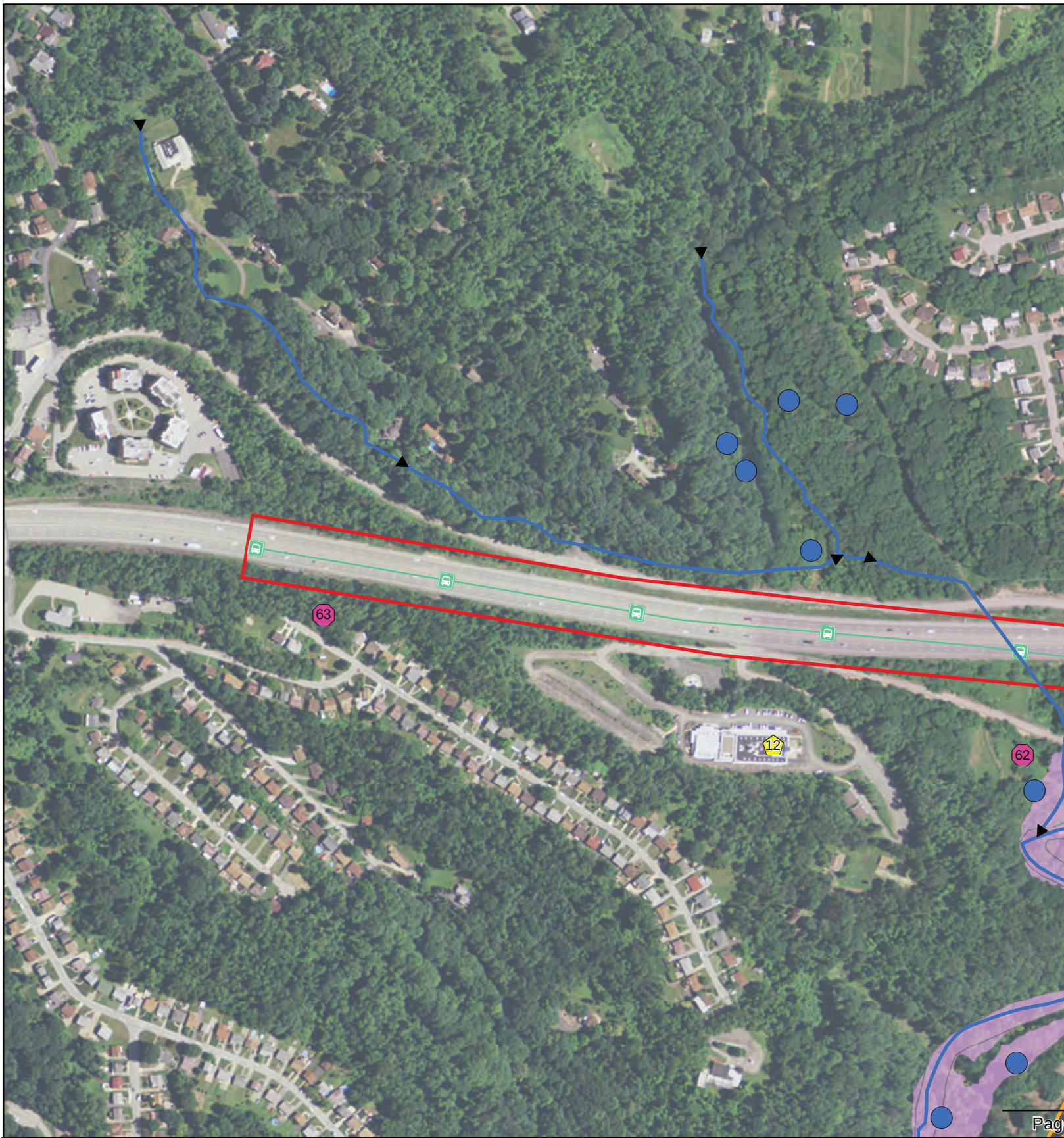

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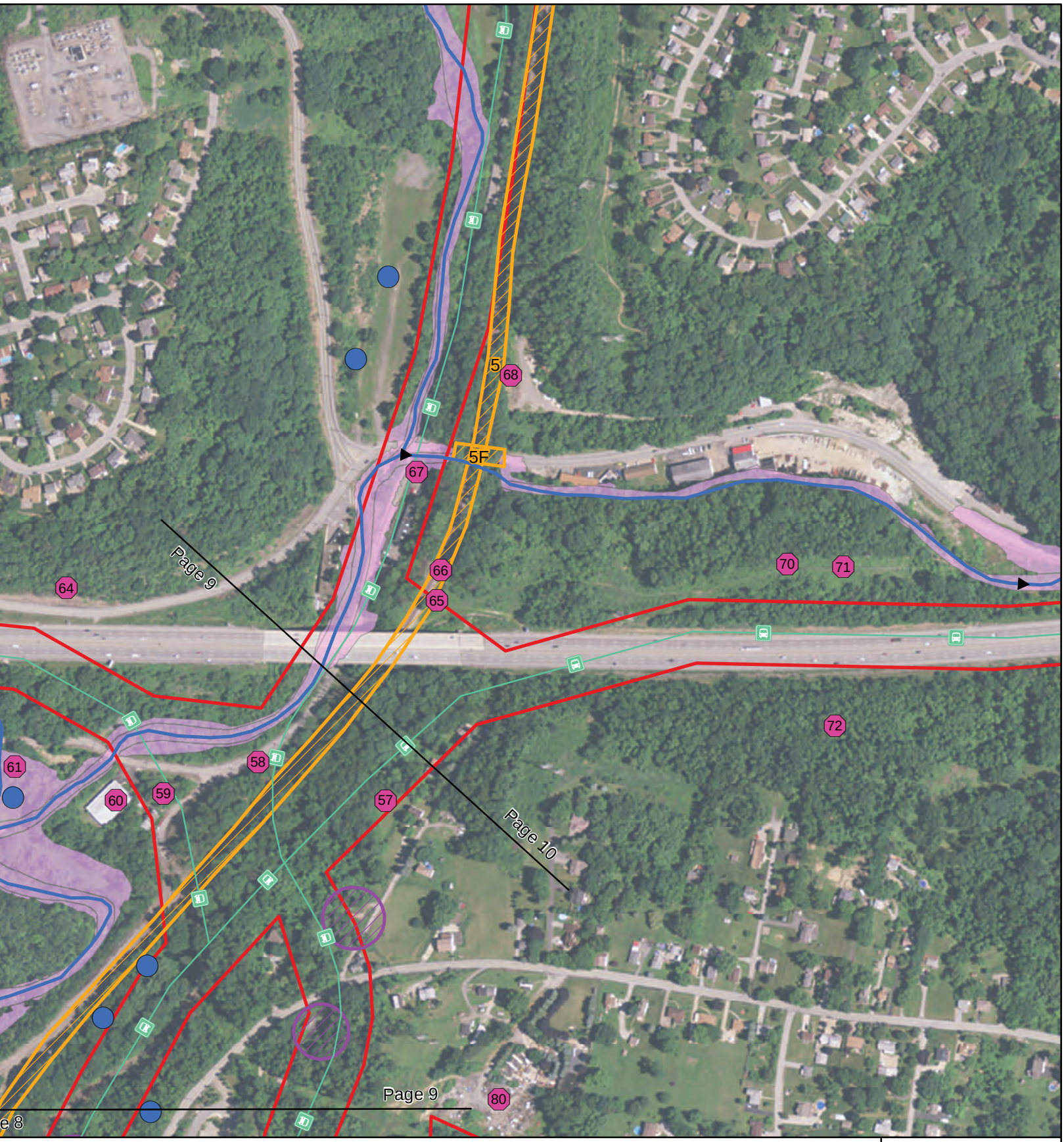

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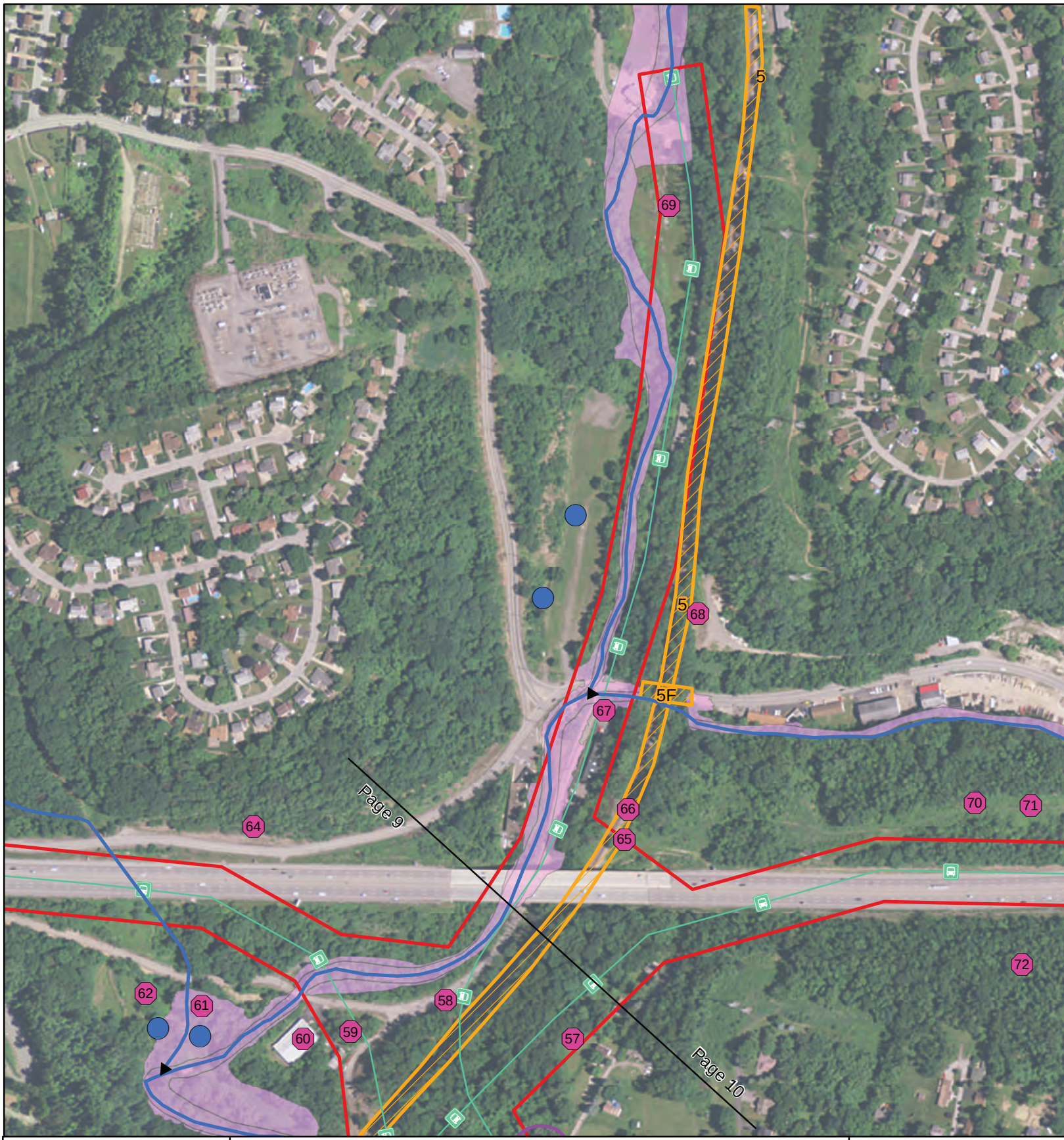

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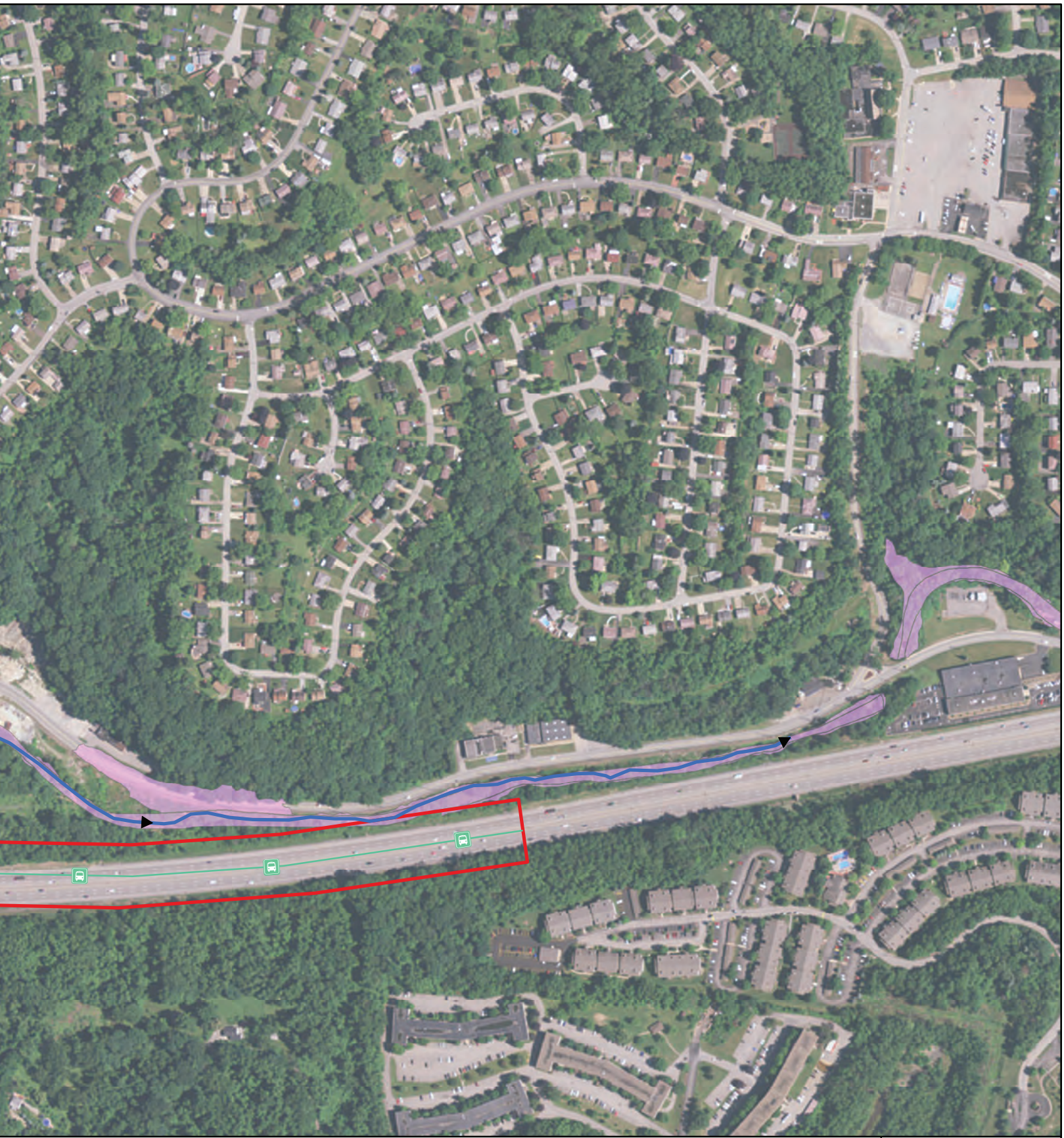

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Appendix C

Capital Cost

Red Alternative

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
EAST BUSWAY EXTENSION
For All Alternaives
SECTION: Swissvale/Rankin to North Braddock Station

ITEM	UNIT	QUANTITY	UNIT COST	COST
Class 1 Excavation	CY	5,000	$25.00	$125,000
Borrow Excavation	CY	80,000	$25.00	$2,000,000
Pavement Base Drain	LF	11,000	$15.00	$165,000
Concrete Pavement	SY	18,500	$100.00	$1,850,000
Subbase	SY	18,500	$20.00	$370,000
Sideroad Adjustments/Paving	SY	2,500	$80.00	$200,000
Railroad Construction Crossings	EA	3	$250,000.00	$750,000
Railroad Relocation	LF	--	$600.00	
Bridges (3)	SF	16,000	$350.00	$5,600,000
Retaining Walls	SF	85,000	$150.00	$12,750,000
Noise Walls	SF	52,800	$75.00	$3,960,000
Demolition (Buildings)	EA	20	$20,000	$400,000
North Braddock Station/Parking (included with stations)	LS	--	$0	$0
Mobilization	LS	--	$2,300,000	$2,300,000
Clearing & Grubbing	LS	--	$500,000	$500,000
Field Office	LS	--	$250,000	$250,000
Roadside Development	LS	--	$100,000	$100,000
Roadway Drainage	LS	--	$3,500,000	$3,500,000
Railroad Cross Drainage	EA	5	$50,000	$250,000
Culvert Upgrades	EA	2	$250,000	$500,000
Erosion Control	LS	--	$500,000	$500,000
Stormwater Management	LS	--	$750,000	$750,000
Maintenance & Protection of Traffic	LS	--	$2,000,000	$2,000,000
Pavement Markings	LS	--	$30,000	$30,000
Signing	LS	--	$50,000	$50,000
Slope Stabilization - Minor	EA	2	$1,500,000	$3,000,000
Slope Stabilization - Major	EA	1	$5,000,000	$5,000,000
Disposal of Contaminated Material	LS	--	$2,000,000	$2,000,000
Roadway Lighting	LS	--	$500,000	$500,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)				$49,400,000
Overhead/Profit on Const Cost 5%				$2,500,000
TOTAL CONSTRUCTION COST (2016 Dollars)				$51,900,000
RIGHT-OF-WAY (Railroad)	LS	--	$5,000,000	$5,000,000
RIGHT-OF-WAY (Private)	LS	--	$2,500,000	$2,500,000
UTILITIES	LS	--	$10,000,000	$10,000,000
ENVIRONMENTAL DOCUMENT / CLEARANCE	LS	--	$3,000,000	$3,000,000
ENGINEERING 10%				$5,200,000
CONSTRUCTION MANAGEMENT 10%				$5,200,000
CONST COST + RW + Util + Env + Eng + CM				$82,800,000
CONTINGENCY 35%				$29,000,000
TOTAL COST (2016 Dollars)				$111,800,000
TOTAL COST (2026 Dollars - 4% per year inflation)				$165,491,311
CALL				$166,000,000

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
EAST BUSWAY EXTENSION
Red Alternative
SECTION: North Braddock Station to East Pittsburgh

ITEM	UNIT	QUANTITY	UNIT COST	COST
Class 1 Excavation	CY	35,000	$25.00	$875,000
Borrow Excavation	CY	75,000	$25.00	$1,875,000
Pavement Base Drain	LF	19,200	$15.00	$288,000
Concrete Pavement	SY	32,000	$100.00	$3,200,000
Subbase	SY	32,000	$20.00	$640,000
Sideroad Adjustments/Paving	SY	3,500	$80.00	$280,000
Railroad Construction Crossings	EA	6	$250,000.00	$1,500,000
Railroad Relocation	LF	--	$600.00	
Bridges (6)	SF	51,500	$350.00	$18,025,000
Reconstruct Two Spans of S.R. 1030 Existing Bridge	SF	21,000	$500.00	$10,500,000
Retaining Walls	SF	200,000	$150.00	$30,000,000
Noise Walls	SF	26,400	$75.00	$1,980,000
Rockfall Protection	SF	52,800	$50.00	$2,640,000
Demolition (Buildings)	EA	25	$20,000	$500,000
~~Keystone Commons Station/Parking~~	LS	--	$0	$0
Mobilization	LS	--	$4,400,000	$4,400,000
Clearing & Grubbing	LS	--	$1,000,000	$1,000,000
Field Office	LS	--	$500,000	$500,000
Roadside Development	LS	--	$175,000	$175,000
Roadway Drainage	LS	--	$7,000,000	$7,000,000
Railroad Cross Drainage	EA	10	$50,000	$500,000
Culvert Upgrades	EA	4	$250,000	$1,000,000
Erosion Control	LS	--	$1,000,000	$1,000,000
Stormwater Management	LS	--	$1,500,000	$1,500,000
Maintenance & Protection of Traffic	LS	--	$4,000,000	$4,000,000
Pavement Markings	LS	--	$60,000	$60,000
Signing	LS	--	$100,000	$100,000
Slope Stabilization - Minor	EA	3	$1,500,000	$4,500,000
Slope Stabilization - Major	EA	1	$5,000,000	$5,000,000
Disposal of Contaminated Material	LS	--	$3,000,000	$3,000,000
Roadway Lighting	LS	--	$1,000,000	$1,000,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)				$107,038,000
Overhead/Profit on Const Cost 5%				$5,400,000
TOTAL CONSTRUCTION COST (2016 Dollars)				$112,438,000
RIGHT-OF-WAY (Railroad)	LS	--	$10,000,000	$10,000,000
RIGHT-OF-WAY (Private)	LS	--	$5,000,000	$5,000,000
UTILITIES	LS	--	$15,000,000	$15,000,000
ENVIRONMENTAL DOCUMENT / CLEARANCE	LS	--	$6,000,000	$6,000,000
ENGINEERING 10%				$11,300,000
CONSTRUCTION MANAGEMENT 10%				$11,300,000
CONST COST + RW + Util + Env + Eng + CM				$171,038,000
CONTINGENCY 35%				$59,900,000
TOTAL COST (2016 Dollars)				$230,938,000
TOTAL COST (2026 Dollars - 4% per year inflation)				$341,844,655
CALL				$342,000,000

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
Red Alternative
Stations for Keystone Commons, Mon-Fayette, Braddock, Monroeville and Pitcairn

ITEM		UNIT	QUANTIT	UNIT COST	COST	Call 2016	Call 2026
Stations/Park and Ride							
Keystone Commons		LS	--	$10,000,000	$10,000,000	$18,000,000	$27,000,000
Mon-Fayette Interchange		LS	--	$10,000,000	$10,000,000	$18,000,000	$27,000,000
Braddock		LS	--	$5,000,000	$5,000,000	$10,000,000	$14,000,000
Pitcairn		LS	--	$5,000,000	$5,000,000	$10,000,000	$14,000,000
Monroeville		LS	--	$5,000,000	$5,000,000	$10,000,000	$14,000,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)					$35,000,000		
Overhead and Profit on Const Cost	5%				$1,800,000		
TOTAL CONSTRUCTION COST (2016 Dollars)					$36,800,000		
RIGHT-OF-WAY (Private)		LS	3	$1,000,000	$3,000,000		
CONSTRUCTION MANAGEMENT	10%				$3,700,000		
ENGINEERING	10%				$3,700,000		
CONST COST + RW + Eng + CM					$47,200,000		
CONTINGENCY	35%				$16,500,000		
TOTAL COST (2016 Dollars) - Stations					$63,700,000	$66,000,000	
SUBTOTAL (2026 Dollars - 4% per year inflation)					$94,291,561		
CALL for Stations					$95,000,000		$96,000,000

Orange Alternative

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
EAST BUSWAY EXTENSION
For All Alternaives
SECTION: Swissvale/Rankin to North Braddock Station

ITEM	UNIT	QUANTITY	UNIT COST	COST
Class 1 Excavation	CY	5,000	$25.00	$125,000
Borrow Excavation	CY	80,000	$25.00	$2,000,000
Pavement Base Drain	LF	11,000	$15.00	$165,000
Concrete Pavement	SY	18,500	$100.00	$1,850,000
Subbase	SY	18,500	$20.00	$370,000
Sideroad Adjustments/Paving	SY	2,500	$80.00	$200,000
Railroad Construction Crossings	EA	3	$250,000.00	$750,000
Railroad Relocation	LF	--	$600.00	
Bridges (3)	SF	16,000	$350.00	$5,600,000
Retaining Walls	SF	85,000	$150.00	$12,750,000
Noise Walls	SF	52,800	$75.00	$3,960,000
Demolition (Buildings)	EA	20	$20,000	$400,000
North Braddock Station/Parking (included with stations)	LS	--	$0	$0
Mobilization	LS	--	$2,300,000	$2,300,000
Clearing & Grubbing	LS	--	$500,000	$500,000
Field Office	LS	--	$250,000	$250,000
Roadside Development	LS	--	$100,000	$100,000
Roadway Drainage	LS	--	$3,500,000	$3,500,000
Railroad Cross Drainage	EA	5	$50,000	$250,000
Culvert Upgrades	EA	2	$250,000	$500,000
Erosion Control	LS	--	$500,000	$500,000
Stormwater Management	LS	--	$750,000	$750,000
Maintenance & Protection of Traffic	LS	--	$2,000,000	$2,000,000
Pavement Markings	LS	--	$30,000	$30,000
Signing	LS	--	$50,000	$50,000
Slope Stabilization - Minor	EA	2	$1,500,000	$3,000,000
Slope Stabilization - Major	EA	1	$5,000,000	$5,000,000
Disposal of Contaminated Material	LS	--	$2,000,000	$2,000,000
Roadway Lighting	LS	--	$500,000	$500,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)				$49,400,000
Overhead/Profit on Const Cost 5%				$2,500,000
TOTAL CONSTRUCTION COST (2016 Dollars)				$51,900,000
RIGHT-OF-WAY (Railroad)	LS	--	$5,000,000	$5,000,000
RIGHT-OF-WAY (Private)	LS	--	$2,500,000	$2,500,000
UTILITIES	LS	--	$10,000,000	$10,000,000
ENVIRONMENTAL DOCUMENT / CLEARANCE	LS	--	$3,000,000	$3,000,000
ENGINEERING 10%				$5,200,000
CONSTRUCTION MANAGEMENT 10%				$5,200,000
CONST COST + RW + Util + Env + Eng + CM				$82,800,000
CONTINGENCY 35%				$29,000,000
TOTAL COST (2016 Dollars)				$111,800,000
TOTAL COST (2026 Dollars - 4% per year inflation)				$165,491,311
CALL				$166,000,000

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
EAST BUSWAY EXTENSION
Orange Alternative

SECTION: North Braddock Station to East Pittsburgh

ITEM	UNIT	QUANTITY	UNIT COST	COST
Class 1 Excavation	CY	35,000	$25.00	$875,000
Borrow Excavation	CY	75,000	$25.00	$1,875,000
Pavement Base Drain	LF	19,200	$15.00	$288,000
Concrete Pavement	SY	32,000	$100.00	$3,200,000
Subbase	SY	32,000	$20.00	$640,000
Sideroad Adjustments/Paving	SY	3,500	$80.00	$280,000
Railroad Construction Crossings	EA	6	$250,000.00	$1,500,000
Railroad Relocation	LF	--	$600.00	
Bridges (6)	SF	51,500	$350.00	$18,025,000
~~Reconstruct Two Spans of S.R. 1030 Existing Bridge~~	SF	0	$500.00	$0
Retaining Walls	SF	200,000	$150.00	$30,000,000
Noise Walls	SF	26,400	$75.00	$1,980,000
Rockfall Protection	SF	52,800	$50.00	$2,640,000
Demolition (Buildings)	EA	25	$20,000	$500,000
~~Keystone Commons Station/Parking~~	LS	--	$0	$0
Mobilization	LS	--	$4,400,000	$4,400,000
Clearing & Grubbing	LS	--	$1,000,000	$1,000,000
Field Office	LS	--	$500,000	$500,000
Roadside Development	LS	--	$175,000	$175,000
Roadway Drainage	LS	--	$7,000,000	$7,000,000
Railroad Cross Drainage	EA	10	$50,000	$500,000
Culvert Upgrades	EA	4	$250,000	$1,000,000
Erosion Control	LS	--	$1,000,000	$1,000,000
Stormwater Management	LS	--	$1,500,000	$1,500,000
Maintenance & Protection of Traffic	LS	--	$4,000,000	$4,000,000
Pavement Markings	LS	--	$60,000	$60,000
Signing	LS	--	$100,000	$100,000
Slope Stabilization - Minor	EA	3	$1,500,000	$4,500,000
Slope Stabilization - Major	EA	1	$5,000,000	$5,000,000
Disposal of Contaminated Material	LS	--	$3,000,000	$3,000,000
Roadway Lighting	LS	--	$1,000,000	$1,000,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)				$96,538,000
Overhead/Profit on Const Cost 5%				$4,800,000
TOTAL CONSTRUCTION COST (2016 Dollars)				$101,338,000
RIGHT-OF-WAY (Railroad)	LS	--	$10,000,000	$10,000,000
RIGHT-OF-WAY (Private)	LS	--	$5,000,000	$5,000,000
UTILITIES	LS	--	$15,000,000	$15,000,000
ENVIRONMENTAL DOCUMENT / CLEARANCE	LS	--	$6,000,000	$6,000,000
ENGINEERING 10%				$10,200,000
CONSTRUCTION MANAGEMENT 10%				$10,200,000
CONST COST + RW + Util + Env + Eng + CM				$157,738,000
CONTINGENCY 35%				$55,200,000
TOTAL COST (2016 Dollars)				$212,938,000
TOTAL COST (2026 Dollars - 4% per year inflation)				$315,200,258
CALL				$316,000,000

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
EAST BUSWAY EXTENSION
Orange Alternative

SECTION: East Pittsburgh to Keystone Commons

ITEM	UNIT	QUANTITY	UNIT COST	COST
Tunnel	LF	2,000	$44,000.00	$88,000,000
Structure Keystone Commons Approach	SF	34,000	$500.00	$17,000,000
Pavement Base Drain	LF	500	$15.00	$7,500
Concrete Pavement	SY	2,000	$100.00	$200,000
Subbase	SY	2,000	$20.00	$40,000
Sideroad Adjustments/Paving	SY	3,500	$80.00	$280,000
Railroad Construction Crossings	EA	0	$250,000.00	$0
Railroad Relocation	LF	1,000	$600.00	$600,000
~~Bridges (6)~~	SF	0	$350.00	$0
~~Reconstruct Two Spans of S.R. 1030 Existing Bridge~~	SF	0	$500.00	$0
Retaining Walls	SF	50,000	$150.00	$7,500,000
Noise Walls	SF	0	$75.00	$0
Rockfall Protection	SF	10,000	$50.00	$500,000
Demolition (Buildings)	EA	0	$20,000	$0
Keystone Commons Station/Parking	LS	--	$0	$0
Mobilization	LS	--	$6,000,000	$6,000,000
Clearing & Grubbing	LS	--	$1,000,000	$1,000,000
Field Office	LS	--	$500,000	$500,000
Roadside Development	LS	--	$175,000	$175,000
Roadway Drainage	LS	--	$3,000,000	$3,000,000
Railroad Cross Drainage	EA	0	$50,000	$0
Culvert Upgrades	EA	4	$250,000	$1,000,000
Erosion Control	LS	--	$1,000,000	$1,000,000
Stormwater Management	LS	--	$1,500,000	$1,500,000
Maintenance & Protection of Traffic	LS	--	$2,000,000	$2,000,000
Pavement Markings	LS	--	$60,000	$60,000
Signing	LS	--	$100,000	$100,000
Slope Stabilization - Minor	EA	1	$1,500,000	$1,500,000
Slope Stabilization - Major	EA	0	$5,000,000	$0
Disposal of Contaminated Material	LS	--	$1,000,000	$1,000,000
Roadway Lighting	LS	--	$1,000,000	$1,000,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)				$133,962,500
Overhead/Profit on Const Cost 5%				$6,700,000
TOTAL CONSTRUCTION COST (2016 Dollars)				$140,662,500
RIGHT-OF-WAY (Railroad)	LS	--	$5,000,000	$5,000,000
RIGHT-OF-WAY (Private)	LS	--	$5,000,000	$5,000,000
UTILITIES	LS	--	$5,000,000	$5,000,000
ENVIRONMENTAL DOCUMENT / CLEARANCE	LS	--	$2,000,000	$2,000,000
ENGINEERING 10%				$14,100,000
CONSTRUCTION MANAGEMENT 10%				$14,100,000
CONST COST + RW + Util + Env + Eng + CM				$185,862,500
CONTINGENCY 35%				$65,100,000
TOTAL COST (2016 Dollars)				$250,962,500
TOTAL COST (2026 Dollars - 4% per year inflation)				$371,485,806
CALL				$372,000,000

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
Orange Alternative
Stations for Keystone Commons, Mon-Fayette, Braddock, Monroeville and Pitcairn

ITEM		UNIT	QUANTIT	UNIT COST	COST	Call 2016	Call 2026
Stations/Park and Ride							
Keystone Commons		LS	--	$10,000,000	$10,000,000	$18,000,000	$27,000,000
Mon-Fayette Interchange		LS	--	$10,000,000	$10,000,000	$18,000,000	$27,000,000
Braddock		LS	--	$5,000,000	$5,000,000	$10,000,000	$14,000,000
Pitcairn		LS	--	$5,000,000	$5,000,000	$10,000,000	$14,000,000
Monroeville		LS	--	$5,000,000	$5,000,000	$10,000,000	$14,000,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)					$35,000,000		
Overhead and Profit on Const Cost	5%				$1,800,000		
TOTAL CONSTRUCTION COST (2016 Dollars)					$36,800,000		
RIGHT-OF-WAY (Private)		LS	3	$1,000,000	$3,000,000		
CONSTRUCTION MANAGEMENT	10%				$3,700,000		
ENGINEERING	10%				$3,700,000		
CONST COST + RW + Eng + CM					$47,200,000		
CONTINGENCY	35%				$16,500,000		
TOTAL COST (2016 Dollars) - Stations					$63,700,000	$66,000,000	
SUBTOTAL (2026 Dollars - 4% per year inflation)					$94,291,561		
CALL for Stations					$95,000,000		$96,000,000

Green Alternative

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
EAST BUSWAY EXTENSION
For All Alternaives
SECTION: Swissvale/Rankin to North Braddock Station

ITEM	UNIT	QUANTITY	UNIT COST	COST
Class 1 Excavation	CY	5,000	$25.00	$125,000
Borrow Excavation	CY	80,000	$25.00	$2,000,000
Pavement Base Drain	LF	11,000	$15.00	$165,000
Concrete Pavement	SY	18,500	$100.00	$1,850,000
Subbase	SY	18,500	$20.00	$370,000
Sideroad Adjustments/Paving	SY	2,500	$80.00	$200,000
Railroad Construction Crossings	EA	3	$250,000.00	$750,000
Railroad Relocation	LF	--	$600.00	
Bridges (3)	SF	16,000	$350.00	$5,600,000
Retaining Walls	SF	85,000	$150.00	$12,750,000
Noise Walls	SF	52,800	$75.00	$3,960,000
Demolition (Buildings)	EA	20	$20,000	$400,000
North Braddock Station/Parking (included with stations)	LS	--	$0	$0
Mobilization	LS	--	$2,300,000	$2,300,000
Clearing & Grubbing	LS	--	$500,000	$500,000
Field Office	LS	--	$250,000	$250,000
Roadside Development	LS	--	$100,000	$100,000
Roadway Drainage	LS	--	$3,500,000	$3,500,000
Railroad Cross Drainage	EA	5	$50,000	$250,000
Culvert Upgrades	EA	2	$250,000	$500,000
Erosion Control	LS	--	$500,000	$500,000
Stormwater Management	LS	--	$750,000	$750,000
Maintenance & Protection of Traffic	LS	--	$2,000,000	$2,000,000
Pavement Markings	LS	--	$30,000	$30,000
Signing	LS	--	$50,000	$50,000
Slope Stabilization - Minor	EA	2	$1,500,000	$3,000,000
Slope Stabilization - Major	EA	1	$5,000,000	$5,000,000
Disposal of Contaminated Material	LS	--	$2,000,000	$2,000,000
Roadway Lighting	LS	--	$500,000	$500,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)				$49,400,000
Overhead/Profit on Const Cost 5%				$2,500,000
TOTAL CONSTRUCTION COST (2016 Dollars)				$51,900,000
RIGHT-OF-WAY (Railroad)	LS	--	$5,000,000	$5,000,000
RIGHT-OF-WAY (Private)	LS	--	$2,500,000	$2,500,000
UTILITIES	LS	--	$10,000,000	$10,000,000
ENVIRONMENTAL DOCUMENT / CLEARANCE	LS	--	$3,000,000	$3,000,000
ENGINEERING 10%				$5,200,000
CONSTRUCTION MANAGEMENT 10%				$5,200,000
CONST COST + RW + Util + Env + Eng + CM				$82,800,000
CONTINGENCY 35%				$29,000,000
TOTAL COST (2016 Dollars)				$111,800,000
TOTAL COST (2026 Dollars - 4% per year inflation)				$165,491,311
CALL				$166,000,000

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
EAST BUSWAY EXTENSION
Green Alternative

SECTION: North Braddock Station to East Pittsburgh

ITEM	UNIT	QUANTITY	UNIT COST	COST
Class 1 Excavation	CY	35,000	$25.00	$875,000
Borrow Excavation	CY	75,000	$25.00	$1,875,000
Pavement Base Drain	LF	19,200	$15.00	$288,000
Concrete Pavement	SY	32,000	$100.00	$3,200,000
Subbase	SY	32,000	$20.00	$640,000
Sideroad Adjustments/Paving	SY	3,500	$80.00	$280,000
Railroad Construction Crossings	EA	6	$250,000.00	$1,500,000
Railroad Relocation	LF	--	$600.00	
Bridges (6)	SF	51,500	$350.00	$18,025,000
~~Reconstruct Two Spans of S.R. 1030 Existing Bridge~~	SF	0	$500.00	$0
Retaining Walls	SF	200,000	$150.00	$30,000,000
Noise Walls	SF	26,400	$75.00	$1,980,000
Rockfall Protection	SF	52,800	$50.00	$2,640,000
Demolition (Buildings)	EA	25	$20,000	$500,000
~~Keystone Commons Station/Parking~~	LS	--	$0	$0
Mobilization	LS	--	$4,400,000	$4,400,000
Clearing & Grubbing	LS	--	$1,000,000	$1,000,000
Field Office	LS	--	$500,000	$500,000
Roadside Development	LS	--	$175,000	$175,000
Roadway Drainage	LS	--	$7,000,000	$7,000,000
Railroad Cross Drainage	EA	10	$50,000	$500,000
Culvert Upgrades	EA	4	$250,000	$1,000,000
Erosion Control	LS	--	$1,000,000	$1,000,000
Stormwater Management	LS	--	$1,500,000	$1,500,000
Maintenance & Protection of Traffic	LS	--	$4,000,000	$4,000,000
Pavement Markings	LS	--	$60,000	$60,000
Signing	LS	--	$100,000	$100,000
Slope Stabilization - Minor	EA	3	$1,500,000	$4,500,000
Slope Stabilization - Major	EA	1	$5,000,000	$5,000,000
Disposal of Contaminated Material	LS	--	$3,000,000	$3,000,000
Roadway Lighting	LS	--	$1,000,000	$1,000,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)				$96,538,000
Overhead/Profit on Const Cost 5%				$4,800,000
TOTAL CONSTRUCTION COST (2016 Dollars)				$101,338,000
RIGHT-OF-WAY (Railroad)	LS	--	$10,000,000	$10,000,000
RIGHT-OF-WAY (Private)	LS	--	$5,000,000	$5,000,000
UTILITIES	LS	--	$15,000,000	$15,000,000
ENVIRONMENTAL DOCUMENT / CLEARANCE	LS	--	$6,000,000	$6,000,000
ENGINEERING 10%				$10,200,000
CONSTRUCTION MANAGEMENT 10%				$10,200,000
CONST COST + RW + Util + Env + Eng + CM				$157,738,000
CONTINGENCY 35%				$55,200,000
TOTAL COST (2016 Dollars)				$212,938,000
TOTAL COST (2026 Dollars - 4% per year inflation)				$315,200,258
CALL				$316,000,000

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
EAST BUSWAY EXTENSION
Green Alternative
SECTION: East Pittsburgh to Turtle Creek

ITEM	UNIT	QUANTITY	UNIT COST	COST
Class 1 Excavation	CY	5,000	$25.00	$125,000
Borrow Excavation	CY	5,000	$25.00	$125,000
Pavement Base Drain	LF	6,000	$15.00	$90,000
Concrete Pavement	SY	15,000	$100.00	$1,500,000
Subbase	SY	15,000	$20.00	$300,000
Sideroad Adjustments/Paving	SY	50,000	$80.00	$4,000,000
Railroad Construction Crossings	EA	4	$250,000.00	$1,000,000
Railroad Relocation	LF	5,000	$600.00	$3,000,000
Bridges 2,500 LF dual structure - 22' width x 2	SF	110,000	$400.00	$44,000,000
Bridge sta 1222+50 to 1250+50, 2,800 - 44' width	SF	123,200	$400.00	$49,280,000
Bridge 1250+50 to 1265+50, 1,500 - 44' width (to end point)	SF	66,000	$400.00	$26,400,000
Retaining Walls	SF	100,000	$150.00	$15,000,000
Demolition (Buildings)	EA	5	$20,000	$100,000
Mobilization	LS	--	$4,500,000	$4,500,000
Clearing & Grubbing	LS	--	$100,000	$100,000
Field Office	LS	--	$250,000	$250,000
Roadside Development	LS	--	$175,000	$175,000
Roadway Drainage	LS	--	$4,000,000	$4,000,000
Railroad Cross Drainage	EA	4	$50,000	$200,000
Culvert Upgrades	EA	2	$250,000	$500,000
Erosion Control	LS	--	$1,000,000	$1,000,000
Stormwater Management	LS	--	$1,000,000	$1,000,000
Maintenance & Protection of Traffic	LS	--	$3,000,000	$3,000,000
Pavement Markings	LS	--	$75,000	$75,000
Signing	LS	--	$100,000	$100,000
Disposal of Contaminated Material	LS	--	$2,000,000	$2,000,000
Roadway Lighting	LS	--	$500,000	$500,000
Terminal Site at Turtle Creek	LS	--	$18,000,000	$18,000,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)				$180,320,000
Overhead and Profit on Const Cost 5%				$9,000,000
TOTAL CONSTRUCTION COST (2016 Dollars)				$189,320,000
RIGHT-OF-WAY (Railroad)	LS	--	$10,000,000	$10,000,000
RIGHT-OF-WAY (Private)	LS	--	$5,000,000	$5,000,000
UTILITIES	LS	--	$15,000,000	$15,000,000
ENVIRONMENTAL DOCUMENT / CLEARANCE	LS	--	$3,000,000	$3,000,000
ENGINEERING 10%				$19,000,000
CONSTRUCTION MANAGEMENT 10%				$19,000,000
CONST COST + RW + Util + Env + Eng + CM				$260,320,000
CONTINGENCY 35%				$91,100,000
TOTAL COST (2016 Dollars)				$351,420,000
TOTAL COST (2026 Dollars - 4% per year inflation)				$520,187,447
CALL				$521,000,000

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
Green Alternative
Stations for Keystone Commons, Mon-Fayette, Braddock, Monroeville and Pitcairn

ITEM		UNIT	QUANTIT	UNIT COST	COST	Call 2016	Call 2026
Stations/Park and Ride							
Keystone Commons		LS	--	$10,000,000	$10,000,000	$14,000,000	$27,000,000
Mon-Fayette Interchange		LS	--	$0	$0	$0	$0
Braddock		LS	--	$5,000,000	$5,000,000	$10,000,000	$14,000,000
Pitcairn		LS	--	$5,000,000	$5,000,000	$10,000,000	$14,000,000
Monroeville		LS	--	$5,000,000	$5,000,000	$10,000,000	$14,000,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)					$25,000,000		
Overhead and Profit on Const Cost	5%				$1,300,000		
TOTAL CONSTRUCTION COST (2016 Dollars)					$26,300,000		
RIGHT-OF-WAY (Private)		LS	3	$1,000,000	$3,000,000		
CONSTRUCTION MANAGEMENT	10%				$2,700,000		
ENGINEERING	10%				$2,700,000		
CONST COST + RW + Eng + CM					$34,700,000		
CONTINGENCY	35%				$12,100,000		
TOTAL COST (2016 Dollars) - Stations					$46,800,000	$44,000,000	
SUBTOTAL (2026 Dollars - 4% per year inflation)					$69,275,433		
CALL for Stations					$70,000,000		$69,000,000

Pink Alternative

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
EAST BUSWAY EXTENSION
For All Alternaives
SECTION: Swissvale/Rankin to North Braddock Station

ITEM	UNIT	QUANTITY	UNIT COST	COST
Class 1 Excavation	CY	5,000	$25.00	$125,000
Borrow Excavation	CY	80,000	$25.00	$2,000,000
Pavement Base Drain	LF	11,000	$15.00	$165,000
Concrete Pavement	SY	18,500	$100.00	$1,850,000
Subbase	SY	18,500	$20.00	$370,000
Sideroad Adjustments/Paving	SY	2,500	$80.00	$200,000
Railroad Construction Crossings	EA	3	$250,000.00	$750,000
Railroad Relocation	LF	--	$600.00	
Bridges (3)	SF	16,000	$350.00	$5,600,000
Retaining Walls	SF	85,000	$150.00	$12,750,000
Noise Walls	SF	52,800	$75.00	$3,960,000
Demolition (Buildings)	EA	20	$20,000	$400,000
North Braddock Station/Parking (included with stations)	LS	--	$0	$0
Mobilization	LS	--	$2,300,000	$2,300,000
Clearing & Grubbing	LS	--	$500,000	$500,000
Field Office	LS	--	$250,000	$250,000
Roadside Development	LS	--	$100,000	$100,000
Roadway Drainage	LS	--	$3,500,000	$3,500,000
Railroad Cross Drainage	EA	5	$50,000	$250,000
Culvert Upgrades	EA	2	$250,000	$500,000
Erosion Control	LS	--	$500,000	$500,000
Stormwater Management	LS	--	$750,000	$750,000
Maintenance & Protection of Traffic	LS	--	$2,000,000	$2,000,000
Pavement Markings	LS	--	$30,000	$30,000
Signing	LS	--	$50,000	$50,000
Slope Stabilization - Minor	EA	2	$1,500,000	$3,000,000
Slope Stabilization - Major	EA	1	$5,000,000	$5,000,000
Disposal of Contaminated Material	LS	--	$2,000,000	$2,000,000
Roadway Lighting	LS	--	$500,000	$500,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)				$49,400,000
Overhead/Profit on Const Cost 5%				$2,500,000
TOTAL CONSTRUCTION COST (2016 Dollars)				$51,900,000
RIGHT-OF-WAY (Railroad)	LS	--	$5,000,000	$5,000,000
RIGHT-OF-WAY (Private)	LS	--	$2,500,000	$2,500,000
UTILITIES	LS	--	$10,000,000	$10,000,000
ENVIRONMENTAL DOCUMENT / CLEARANCE	LS	--	$3,000,000	$3,000,000
ENGINEERING 10%				$5,200,000
CONSTRUCTION MANAGEMENT 10%				$5,200,000
CONST COST + RW + Util + Env + Eng + CM				$82,800,000
CONTINGENCY 35%				$29,000,000
TOTAL COST (2016 Dollars)				$111,800,000
TOTAL COST (2026 Dollars - 4% per year inflation)				$165,491,311
CALL				$166,000,000

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
EAST BUSWAY EXTENSION
Pink Alternative

SECTION: North Braddock Station to East Pittsburgh

ITEM	UNIT	QUANTITY	UNIT COST	COST
Class 1 Excavation	CY	35,000	$25.00	$875,000
Borrow Excavation	CY	75,000	$25.00	$1,875,000
Pavement Base Drain	LF	19,200	$15.00	$288,000
Concrete Pavement	SY	32,000	$100.00	$3,200,000
Subbase	SY	32,000	$20.00	$640,000
Sideroad Adjustments/Paving	SY	3,500	$80.00	$280,000
Railroad Construction Crossings	EA	6	$250,000.00	$1,500,000
Railroad Relocation	LF	--	$600.00	
Bridges (6)	SF	51,500	$350.00	$18,025,000
~~Reconstruct Two Spans of S.R. 1030 Existing Bridge~~	SF	0	$500.00	$0
Retaining Walls	SF	200,000	$150.00	$30,000,000
Noise Walls	SF	26,400	$75.00	$1,980,000
Rockfall Protection	SF	52,800	$50.00	$2,640,000
Demolition (Buildings)	EA	25	$20,000	$500,000
~~Keystone Commons Station/Parking~~	LS	--	$0	$0
Mobilization	LS	--	$4,400,000	$4,400,000
Clearing & Grubbing	LS	--	$1,000,000	$1,000,000
Field Office	LS	--	$500,000	$500,000
Roadside Development	LS	--	$175,000	$175,000
Roadway Drainage	LS	--	$7,000,000	$7,000,000
Railroad Cross Drainage	EA	10	$50,000	$500,000
Culvert Upgrades	EA	4	$250,000	$1,000,000
Erosion Control	LS	--	$1,000,000	$1,000,000
Stormwater Management	LS	--	$1,500,000	$1,500,000
Maintenance & Protection of Traffic	LS	--	$4,000,000	$4,000,000
Pavement Markings	LS	--	$60,000	$60,000
Signing	LS	--	$100,000	$100,000
Slope Stabilization - Minor	EA	3	$1,500,000	$4,500,000
Slope Stabilization - Major	EA	1	$5,000,000	$5,000,000
Disposal of Contaminated Material	LS	--	$3,000,000	$3,000,000
Roadway Lighting	LS	--	$1,000,000	$1,000,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)				$96,538,000
Overhead/Profit on Const Cost 5%				$4,800,000
TOTAL CONSTRUCTION COST (2016 Dollars)				$101,338,000
RIGHT-OF-WAY (Railroad)	LS	--	$10,000,000	$10,000,000
RIGHT-OF-WAY (Private)	LS	--	$5,000,000	$5,000,000
UTILITIES	LS	--	$15,000,000	$15,000,000
ENVIRONMENTAL DOCUMENT / CLEARANCE	LS	--	$6,000,000	$6,000,000
ENGINEERING 10%				$10,200,000
CONSTRUCTION MANAGEMENT 10%				$10,200,000
CONST COST + RW + Util + Env + Eng + CM				$157,738,000
CONTINGENCY 35%				$55,200,000
TOTAL COST (2016 Dollars)				$212,938,000
TOTAL COST (2026 Dollars - 4% per year inflation)				$315,200,258
CALL				$316,000,000

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
EAST BUSWAY EXTENSION
Pink Alternative

SECTION: East Pittsburgh to Turtle Creek

ITEM	UNIT	QUANTITY	UNIT COST	COST
Tunnel	LF	2,000	$44,000.00	$88,000,000
Structure Along Union RR - 4,000 LF, 44' width	SF	176,000	$500.00	$88,000,000
Pavement Base Drain	LF	3,000	$15.00	$45,000
Concrete Pavement	SY	7,500	$100.00	$750,000
Subbase	SY	7,500	$20.00	$150,000
Sideroad Adjustments/Paving	SY	50,000	$80.00	$4,000,000
Railroad Construction Crossings	EA	1	$250,000.00	$250,000
Railroad Relocation	LF	2,500	$600.00	$1,500,000
~~Bridges (6)~~	SF	0	$350.00	$0
~~Reconstruct Two Spans of S.R. 1030 Existing Bridge~~	SF	0	$500.00	$0
Retaining Walls	SF	30,000	$150.00	$4,500,000
Noise Walls	SF	0	$75.00	$0
Rockfall Protection	SF	15,000	$50.00	$750,000
Demolition (Buildings)	EA	20	$20,000	$400,000
~~Keystone Commons Station/Parking~~	LS	--	$0	$0
Mobilization	LS	--	$8,000,000	$8,000,000
Clearing & Grubbing	LS	--	$1,000,000	$1,000,000
Field Office	LS	--	$500,000	$500,000
Roadside Development	LS	--	$175,000	$175,000
Roadway Drainage	LS	--	$3,000,000	$3,000,000
Railroad Cross Drainage	EA	0	$50,000	$0
Culvert Upgrades	EA	0	$250,000	$0
Erosion Control	LS	--	$1,000,000	$1,000,000
Stormwater Management	LS	--	$1,500,000	$1,500,000
Maintenance & Protection of Traffic	LS	--	$4,000,000	$4,000,000
Pavement Markings	LS	--	$60,000	$60,000
Signing	LS	--	$100,000	$100,000
Slope Stabilization - Minor	EA	2	$1,500,000	$3,000,000
Slope Stabilization - Major	EA	1	$5,000,000	$5,000,000
Disposal of Contaminated Material	LS	--	$1,000,000	$1,000,000
Roadway Lighting	LS	--	$1,000,000	$1,000,000
End Terminal Structure 1500 long by 44' wide	SF	66,000	$400.00	$26,400,000
End Station at Turtle Creek	LS	--	$18,000,000	$18,000,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)				$262,080,000
Overhead/Profit on Const Cost 5%				$13,100,000
TOTAL CONSTRUCTION COST (2016 Dollars)				$275,180,000
RIGHT-OF-WAY (Railroad)	LS	--	$10,000,000	$10,000,000
RIGHT-OF-WAY (Private)	LS	--	$5,000,000	$5,000,000
UTILITIES	LS	--	$15,000,000	$15,000,000
ENVIRONMENTAL DOCUMENT / CLEARANCE	LS	--	$3,000,000	$3,000,000
ENGINEERING 10%				$27,600,000
CONSTRUCTION MANAGEMENT 10%				$27,600,000
CONST COST + RW + Util + Env + Eng + CM				$363,380,000
CONTINGENCY 35%				$127,200,000
TOTAL COST (2016 Dollars)				$490,580,000
TOTAL COST (2026 Dollars - 4% per year inflation)				$726,178,241
CALL				$727,000,000

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
Pink Alternative
Stations for Keystone Commons, Mon-Fayette, Braddock, Monroeville and Pitcairn

ITEM		UNIT	QUANTIT	UNIT COST	COST	Call 2016	Call 2026
Stations/Park and Ride							
Keystone Commons		LS	--	$10,000,000	$10,000,000	$14,000,000	$27,000,000
Mon-Fayette Interchange		LS	--	$10,000,000	$0	$0	$0
Braddock		LS	--	$5,000,000	$5,000,000	$10,000,000	$14,000,000
Pitcairn		LS	--	$5,000,000	$5,000,000	$10,000,000	$14,000,000
Monroeville		LS	--	$5,000,000	$5,000,000	$10,000,000	$14,000,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)					$25,000,000		
Overhead and Profit on Const Cost	5%				$1,300,000		
TOTAL CONSTRUCTION COST (2016 Dollars)					$26,300,000		
RIGHT-OF-WAY (Private)		LS	3	$1,000,000	$3,000,000		
CONSTRUCTION MANAGEMENT	10%				$2,700,000		
ENGINEERING	10%				$2,700,000		
CONST COST + RW + Eng + CM					$34,700,000		
CONTINGENCY	35%				$12,100,000		
TOTAL COST (2016 Dollars) - Stations					$46,800,000	$44,000,000	
SUBTOTAL (2026 Dollars - 4% per year inflation)					$69,275,433		
CALL for Stations					$70,000,000		$69,000,000

Green-Blue Alternative

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
EAST BUSWAY EXTENSION
For All Alternaives
SECTION: Swissvale/Rankin to North Braddock Station

ITEM	UNIT	QUANTITY	UNIT COST	COST
Class 1 Excavation	CY	5,000	$25.00	$125,000
Borrow Excavation	CY	80,000	$25.00	$2,000,000
Pavement Base Drain	LF	11,000	$15.00	$165,000
Concrete Pavement	SY	18,500	$100.00	$1,850,000
Subbase	SY	18,500	$20.00	$370,000
Sideroad Adjustments/Paving	SY	2,500	$80.00	$200,000
Railroad Construction Crossings	EA	3	$250,000.00	$750,000
Railroad Relocation	LF	--	$600.00	
Bridges (3)	SF	16,000	$350.00	$5,600,000
Retaining Walls	SF	85,000	$150.00	$12,750,000
Noise Walls	SF	52,800	$75.00	$3,960,000
Demolition (Buildings)	EA	20	$20,000	$400,000
North Braddock Station/Parking (included with stations)	LS	--	$0	$0
Mobilization	LS	--	$2,300,000	$2,300,000
Clearing & Grubbing	LS	--	$500,000	$500,000
Field Office	LS	--	$250,000	$250,000
Roadside Development	LS	--	$100,000	$100,000
Roadway Drainage	LS	--	$3,500,000	$3,500,000
Railroad Cross Drainage	EA	5	$50,000	$250,000
Culvert Upgrades	EA	2	$250,000	$500,000
Erosion Control	LS	--	$500,000	$500,000
Stormwater Management	LS	--	$750,000	$750,000
Maintenance & Protection of Traffic	LS	--	$2,000,000	$2,000,000
Pavement Markings	LS	--	$30,000	$30,000
Signing	LS	--	$50,000	$50,000
Slope Stabilization - Minor	EA	2	$1,500,000	$3,000,000
Slope Stabilization - Major	EA	1	$5,000,000	$5,000,000
Disposal of Contaminated Material	LS	--	$2,000,000	$2,000,000
Roadway Lighting	LS	--	$500,000	$500,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)				$49,400,000
Overhead/Profit on Const Cost 5%				$2,500,000
TOTAL CONSTRUCTION COST (2016 Dollars)				$51,900,000
RIGHT-OF-WAY (Railroad)	LS	--	$5,000,000	$5,000,000
RIGHT-OF-WAY (Private)	LS	--	$2,500,000	$2,500,000
UTILITIES	LS	--	$10,000,000	$10,000,000
ENVIRONMENTAL DOCUMENT / CLEARANCE	LS	--	$3,000,000	$3,000,000
ENGINEERING 10%				$5,200,000
CONSTRUCTION MANAGEMENT 10%				$5,200,000
CONST COST + RW + Util + Env + Eng + CM				$82,800,000
CONTINGENCY 35%				$29,000,000
TOTAL COST (2016 Dollars)				$111,800,000
TOTAL COST (2026 Dollars - 4% per year inflation)				$165,491,311
CALL				$166,000,000

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
EAST BUSWAY EXTENSION
Green - Blue Alternative
SECTION: North Braddock Station to East Pittsburgh

ITEM	UNIT	QUANTITY	UNIT COST	COST
Class 1 Excavation	CY	35,000	$25.00	$875,000
Borrow Excavation	CY	75,000	$25.00	$1,875,000
Pavement Base Drain	LF	19,200	$15.00	$288,000
Concrete Pavement	SY	32,000	$100.00	$3,200,000
Subbase	SY	32,000	$20.00	$640,000
Sideroad Adjustments/Paving	SY	3,500	$80.00	$280,000
Railroad Construction Crossings	EA	6	$250,000.00	$1,500,000
Railroad Relocation	LF	--	$600.00	
Bridges (6)	SF	51,500	$350.00	$18,025,000
~~Reconstruct Two Spans of S.R. 1030 Existing Bridge~~	SF	0	$500.00	$0
Retaining Walls	SF	200,000	$150.00	$30,000,000
Noise Walls	SF	26,400	$75.00	$1,980,000
Rockfall Protection	SF	52,800	$50.00	$2,640,000
Demolition (Buildings)	EA	25	$20,000	$500,000
~~Keystone Commons Station/Parking~~	LS	--	$0	$0
Mobilization	LS	--	$4,400,000	$4,400,000
Clearing & Grubbing	LS	--	$1,000,000	$1,000,000
Field Office	LS	--	$500,000	$500,000
Roadside Development	LS	--	$175,000	$175,000
Roadway Drainage	LS	--	$7,000,000	$7,000,000
Railroad Cross Drainage	EA	10	$50,000	$500,000
Culvert Upgrades	EA	4	$250,000	$1,000,000
Erosion Control	LS	--	$1,000,000	$1,000,000
Stormwater Management	LS	--	$1,500,000	$1,500,000
Maintenance & Protection of Traffic	LS	--	$4,000,000	$4,000,000
Pavement Markings	LS	--	$60,000	$60,000
Signing	LS	--	$100,000	$100,000
Slope Stabilization - Minor	EA	3	$1,500,000	$4,500,000
Slope Stabilization - Major	EA	1	$5,000,000	$5,000,000
Disposal of Contaminated Material	LS	--	$3,000,000	$3,000,000
Roadway Lighting	LS	--	$1,000,000	$1,000,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)				$96,538,000
Overhead/Profit on Const Cost 5%				$4,800,000
TOTAL CONSTRUCTION COST (2016 Dollars)				$101,338,000
RIGHT-OF-WAY (Railroad)	LS	--	$10,000,000	$10,000,000
RIGHT-OF-WAY (Private)	LS	--	$5,000,000	$5,000,000
UTILITIES	LS	--	$15,000,000	$15,000,000
ENVIRONMENTAL DOCUMENT / CLEARANCE	LS	--	$6,000,000	$6,000,000
ENGINEERING 10%				$10,200,000
CONSTRUCTION MANAGEMENT 10%				$10,200,000
CONST COST + RW + Util + Env + Eng + CM				$157,738,000
CONTINGENCY 35%				$55,200,000
TOTAL COST (2016 Dollars)				$212,938,000
TOTAL COST (2026 Dollars - 4% per year inflation)				$315,200,258
CALL				$316,000,000

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
EAST BUSWAY EXTENSION
Green - Blue Alternative
SECTION: East Pittsburgh to Turtle Creek

ITEM	UNIT	QUANTITY	UNIT COST	COST
Class 1 Excavation	CY	5,000	$25.00	$125,000
Borrow Excavation	CY	5,000	$25.00	$125,000
Pavement Base Drain	LF	6,000	$15.00	$90,000
Concrete Pavement	SY	15,000	$100.00	$1,500,000
Subbase	SY	15,000	$20.00	$300,000
Sideroad Adjustments/Paving	SY	5,000	$80.00	$400,000
Railroad Construction Crossings	EA	4	$250,000.00	$1,000,000
Railroad Relocation	LF	5,000	$600.00	$3,000,000
Bridges 2,500 LF dual structure - 22' width x 2	SF	110,000	$400.00	$44,000,000
Bridge sta 1222+50 to 1260+50, 3,800 - 44' width	SF	167,200	$400.00	$66,880,000
Retaining Walls	SF	100,000	$150.00	$15,000,000
Demolition (Buildings)	EA	5	$20,000	$100,000
Mobilization	LS	--	$4,500,000	$4,500,000
Clearing & Grubbing	LS	--	$100,000	$100,000
Field Office	LS	--	$250,000	$250,000
Roadside Development	LS	--	$175,000	$175,000
Roadway Drainage	LS	--	$4,000,000	$4,000,000
Railroad Cross Drainage	EA	4	$50,000	$200,000
Culvert Upgrades	EA	2	$250,000	$500,000
Erosion Control	LS	--	$1,000,000	$1,000,000
Stormwater Management	LS	--	$1,000,000	$1,000,000
Maintenance & Protection of Traffic	LS	--	$3,000,000	$3,000,000
Pavement Markings	LS	--	$75,000	$75,000
Signing	LS	--	$100,000	$100,000
Disposal of Contaminated Material	LS	--	$2,000,000	$2,000,000
Roadway Lighting	LS	--	$500,000	$500,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)				$149,920,000
Overhead and Profit on Const Cost 5%				$7,500,000
TOTAL CONSTRUCTION COST (2016 Dollars)				$157,420,000
RIGHT-OF-WAY (Railroad)	LS	--	$10,000,000	$10,000,000
RIGHT-OF-WAY (Private)	LS	--	$5,000,000	$5,000,000
UTILITIES	LS	--	$15,000,000	$15,000,000
ENVIRONMENTAL DOCUMENT / CLEARANCE	LS	--	$3,000,000	$3,000,000
ENGINEERING 10%				$15,800,000
CONSTRUCTION MANAGEMENT 10%				$15,800,000
CONST COST + RW + Util + Env + Eng + CM				$222,020,000
CONTINGENCY 35%				$77,700,000
TOTAL COST (2016 Dollars)				$299,720,000
TOTAL COST (2026 Dollars - 4% per year inflation)				$443,658,817
CALL				$444,000,000

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
EAST BUSWAY EXTENSION
Green - BlueAlternative

SECTION: Turtle Creek to Monroeville

ITEM	UNIT	QUANTITY	UNIT COST	COST
Ramps at I376 3,000 LF x 22' width	SF	66,000	$400.00	$26,400,000
	SF	0	$500.00	$0
Pavement Base Drain	LF	520,000	$15.00	$7,800,000
ML Concrete Pavement - 125,000 LF	SY	610,000	$100.00	$61,000,000
ML Subbase	SY	610,000	$20.00	$12,200,000
Ramps Conc Pvt 30,000 LF 18' width x 5 x 90% roadway	SY	270,000	$100.00	$27,000,000
Ramps Subbase	SY	270,000	$20.00	$5,400,000
Sideroad Adjustments/Paving	SY	20,000	$80.00	$1,600,000
Railroad Construction Crossings	EA	4	$250,000.00	$1,000,000
Railroad Relocation	LF	4,000	$600.00	$2,400,000
Bridges (4) 200LF x 44' each	SF	35,200	$350.00	$12,320,000
~~Reconstruct Two Spans of S.R. 1030 Existing Bridge~~	SF	0	$500.00	$0
Retaining Walls 10,000 LF x 15' height	SF	150,000	$150.00	$22,500,000
Noise Walls 10,000 LF x 15' height	SF	150,000	$75.00	$11,250,000
Rockfall Protection	SF	75,000	$50.00	$3,750,000
Demolition (Buildings)	EA	20	$20,000	$400,000
Keystone Commons Station/Parking	LS	--	$0	$0
Mobilization	LS	--	$9,600,000	$9,600,000
Clearing & Grubbing	LS	--	$1,000,000	$1,000,000
Field Office	LS	--	$500,000	$500,000
Roadside Development	LS	--	$175,000	$175,000
Roadway Drainage	LS	--	$3,000,000	$3,000,000
Railroad Cross Drainage	EA	4	$50,000	$200,000
Culvert Upgrades	EA	4	$250,000	$1,000,000
Erosion Control	LS	--	$2,000,000	$2,000,000
Stormwater Management	LS	--	$2,000,000	$2,000,000
Maintenance & Protection of Traffic	LS	--	$5,000,000	$5,000,000
Pavement Markings	LS	--	$150,000	$150,000
Signing	LS	--	$250,000	$250,000
Slope Stabilization - Minor	EA	4	$1,500,000	$6,000,000
Slope Stabilization - Major	EA	1	$5,000,000	$5,000,000
Disposal of Contaminated Material	LS	--	$1,000,000	$1,000,000
Roadway Lighting	LS	--	$2,000,000	$2,000,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)				$233,895,000
Overhead/Profit on Const Cost 5%				$11,700,000
TOTAL CONSTRUCTION COST (2016 Dollars)				$245,595,000
RIGHT-OF-WAY (Railroad)	LS	--	$10,000,000	$10,000,000
RIGHT-OF-WAY (Private)	LS	--	$5,000,000	$5,000,000
UTILITIES	LS	--	$15,000,000	$15,000,000
ENVIRONMENTAL DOCUMENT / CLEARANCE	LS	--	$3,000,000	$3,000,000
ENGINEERING 10%				$24,600,000
CONSTRUCTION MANAGEMENT 10%				$24,600,000
CONST COST + RW + Util + Env + Eng + CM				$327,795,000
CONTINGENCY 35%				$114,700,000
TOTAL COST (2016 Dollars)				$442,495,000
TOTAL COST (2026 Dollars - 4% per year inflation)				$655,000,695
CALL				$656,000,000

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
Green - Blue Alternative
Stations for Keystone Commons, Mon-Fayette, Braddock, Monroeville and Pitcairn

ITEM	UNIT	QUANTIT	UNIT COST	COST	Call 2016	Call 2026
Stations/Park and Ride						
Keystone Commons	**LS**	**--**	**$10,000,000**	**$10,000,000**	**$18,000,000**	**$27,000,000**
Mon-Fayette Interchange	**LS**	**--**	**$0**	**$0**	**$0**	**$0**
Braddock	**LS**	**--**	**$5,000,000**	**$5,000,000**	**$10,000,000**	**$14,000,000**
Pitcairn	LS	--	$5,000,000	**$5,000,000**	**$10,000,000**	**$14,000,000**
Monroeville	LS	--	$5,000,000	**$5,000,000**	**$10,000,000**	**$14,000,000**
SUBTOTAL CONSTRUCTION COST (2016 Dollars)				**$25,000,000**		
Overhead and Profit on Const Cost 5%				**$1,300,000**		
TOTAL CONSTRUCTION COST (2016 Dollars)				**$26,300,000**		
RIGHT-OF-WAY (Private)	LS	3	$1,000,000	**$3,000,000**		
CONSTRUCTION MANAGEMENT 10%				**$2,700,000**		
ENGINEERING 10%				**$2,700,000**		
CONST COST + RW + Eng + CM				**$34,700,000**		
CONTINGENCY 35%				**$12,100,000**		
TOTAL COST (2016 Dollars) - Stations				**$46,800,000**	**$48,000,000**	
SUBTOTAL (2026 Dollars - 4% per year inflation)				**$69,275,433**		
CALL for Stations				**$70,000,000**		**$69,000,000**

Pink-Blue Alternative

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
EAST BUSWAY EXTENSION
For All Alternaives
SECTION: Swissvale/Rankin to North Braddock Station

ITEM	UNIT	QUANTITY	UNIT COST	COST
Class 1 Excavation	CY	5,000	$25.00	$125,000
Borrow Excavation	CY	80,000	$25.00	$2,000,000
Pavement Base Drain	LF	11,000	$15.00	$165,000
Concrete Pavement	SY	18,500	$100.00	$1,850,000
Subbase	SY	18,500	$20.00	$370,000
Sideroad Adjustments/Paving	SY	2,500	$80.00	$200,000
Railroad Construction Crossings	EA	3	$250,000.00	$750,000
Railroad Relocation	LF	--	$600.00	
Bridges (3)	SF	16,000	$350.00	$5,600,000
Retaining Walls	SF	85,000	$150.00	$12,750,000
Noise Walls	SF	52,800	$75.00	$3,960,000
Demolition (Buildings)	EA	20	$20,000	$400,000
North Braddock Station/Parking (included with stations)	LS	--	$0	$0
Mobilization	LS	--	$2,300,000	$2,300,000
Clearing & Grubbing	LS	--	$500,000	$500,000
Field Office	LS	--	$250,000	$250,000
Roadside Development	LS	--	$100,000	$100,000
Roadway Drainage	LS	--	$3,500,000	$3,500,000
Railroad Cross Drainage	EA	5	$50,000	$250,000
Culvert Upgrades	EA	2	$250,000	$500,000
Erosion Control	LS	--	$500,000	$500,000
Stormwater Management	LS	--	$750,000	$750,000
Maintenance & Protection of Traffic	LS	--	$2,000,000	$2,000,000
Pavement Markings	LS	--	$30,000	$30,000
Signing	LS	--	$50,000	$50,000
Slope Stabilization - Minor	EA	2	$1,500,000	$3,000,000
Slope Stabilization - Major	EA	1	$5,000,000	$5,000,000
Disposal of Contaminated Material	LS	--	$2,000,000	$2,000,000
Roadway Lighting	LS	--	$500,000	$500,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)				$49,400,000
Overhead/Profit on Const Cost 5%				$2,500,000
TOTAL CONSTRUCTION COST (2016 Dollars)				$51,900,000
RIGHT-OF-WAY (Railroad)	LS	--	$5,000,000	$5,000,000
RIGHT-OF-WAY (Private)	LS	--	$2,500,000	$2,500,000
UTILITIES	LS	--	$10,000,000	$10,000,000
ENVIRONMENTAL DOCUMENT / CLEARANCE	LS	--	$3,000,000	$3,000,000
ENGINEERING 10%				$5,200,000
CONSTRUCTION MANAGEMENT 10%				$5,200,000
CONST COST + RW + Util + Env + Eng + CM				$82,800,000
CONTINGENCY 35%				$29,000,000
TOTAL COST (2016 Dollars)				$111,800,000
TOTAL COST (2026 Dollars - 4% per year inflation)				$165,491,311
CALL				$166,000,000

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
EAST BUSWAY EXTENSION
Pink- Blue Alternative

SECTION: North Braddock Station to East Pittsburgh

ITEM	UNIT	QUANTITY	UNIT COST	COST
Class 1 Excavation	CY	35,000	$25.00	$875,000
Borrow Excavation	CY	75,000	$25.00	$1,875,000
Pavement Base Drain	LF	19,200	$15.00	$288,000
Concrete Pavement	SY	32,000	$100.00	$3,200,000
Subbase	SY	32,000	$20.00	$640,000
Sideroad Adjustments/Paving	SY	3,500	$80.00	$280,000
Railroad Construction Crossings	EA	6	$250,000.00	$1,500,000
Railroad Relocation	LF	--	$600.00	
Bridges (6)	SF	51,500	$350.00	$18,025,000
~~Reconstruct Two Spans of S.R. 1030 Existing Bridge~~	SF	0	$500.00	$0
Retaining Walls	SF	200,000	$150.00	$30,000,000
Noise Walls	SF	26,400	$75.00	$1,980,000
Rockfall Protection	SF	52,800	$50.00	$2,640,000
Demolition (Buildings)	EA	25	$20,000	$500,000
~~Keystone Commons Station/Parking~~	LS	--	$0	$0
Mobilization	LS	--	$4,400,000	$4,400,000
Clearing & Grubbing	LS	--	$1,000,000	$1,000,000
Field Office	LS	--	$500,000	$500,000
Roadside Development	LS	--	$175,000	$175,000
Roadway Drainage	LS	--	$7,000,000	$7,000,000
Railroad Cross Drainage	EA	10	$50,000	$500,000
Culvert Upgrades	EA	4	$250,000	$1,000,000
Erosion Control	LS	--	$1,000,000	$1,000,000
Stormwater Management	LS	--	$1,500,000	$1,500,000
Maintenance & Protection of Traffic	LS	--	$4,000,000	$4,000,000
Pavement Markings	LS	--	$60,000	$60,000
Signing	LS	--	$100,000	$100,000
Slope Stabilization - Minor	EA	3	$1,500,000	$4,500,000
Slope Stabilization - Major	EA	1	$5,000,000	$5,000,000
Disposal of Contaminated Material	LS	--	$3,000,000	$3,000,000
Roadway Lighting	LS	--	$1,000,000	$1,000,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)				$96,538,000
Overhead/Profit on Const Cost 5%				$4,800,000
TOTAL CONSTRUCTION COST (2016 Dollars)				$101,338,000
RIGHT-OF-WAY (Railroad)	LS	--	$10,000,000	$10,000,000
RIGHT-OF-WAY (Private)	LS	--	$5,000,000	$5,000,000
UTILITIES	LS	--	$15,000,000	$15,000,000
ENVIRONMENTAL DOCUMENT / CLEARANCE	LS	--	$6,000,000	$6,000,000
ENGINEERING 10%				$10,200,000
CONSTRUCTION MANAGEMENT 10%				$10,200,000
CONST COST + RW + Util + Env + Eng + CM				$157,738,000
CONTINGENCY 35%				$55,200,000
TOTAL COST (2016 Dollars)				$212,938,000
TOTAL COST (2026 Dollars - 4% per year inflation)				$315,200,258
CALL				$316,000,000

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
EAST BUSWAY EXTENSION
Pink - BlueAlternative

SECTION: East Pittsburgh to Turtle Creek

ITEM	UNIT	QUANTITY	UNIT COST	COST
Tunnel	LF	2,000	$44,000.00	$88,000,000
Structure Along Union RR -+ TC = 5,000 LF, 44' width	SF	220,000	$500.00	$110,000,000
Pavement Base Drain	LF	3,000	$15.00	$45,000
Concrete Pavement	SY	7,500	$100.00	$750,000
Subbase	SY	7,500	$20.00	$150,000
Sideroad Adjustments/Paving	SY	5,000	$80.00	$400,000
Railroad Construction Crossings	EA	1	$250,000.00	$250,000
Railroad Relocation	LF	2,500	$600.00	$1,500,000
~~Bridges (6)~~	SF	0	$350.00	$0
~~Reconstruct Two Spans of S.R. 1030 Existing Bridge~~	SF	0	$500.00	$0
Retaining Walls	SF	30,000	$150.00	$4,500,000
Noise Walls	SF	0	$75.00	$0
Rockfall Protection	SF	15,000	$50.00	$750,000
Demolition (Buildings)	EA	20	$20,000	$400,000
~~Keystone Commons Station/Parking~~	LS	--	$0	$0
Mobilization	LS	--	$8,000,000	$8,000,000
Clearing & Grubbing	LS	--	$1,000,000	$1,000,000
Field Office	LS	--	$500,000	$500,000
Roadside Development	LS	--	$175,000	$175,000
Roadway Drainage	LS	--	$3,000,000	$3,000,000
Railroad Cross Drainage	EA	0	$50,000	$0
Culvert Upgrades	EA	0	$250,000	$0
Erosion Control	LS	--	$1,000,000	$1,000,000
Stormwater Management	LS	--	$1,500,000	$1,500,000
Maintenance & Protection of Traffic	LS	--	$4,000,000	$4,000,000
Pavement Markings	LS	--	$60,000	$60,000
Signing	LS	--	$100,000	$100,000
Slope Stabilization - Minor	EA	2	$1,500,000	$3,000,000
Slope Stabilization - Major	EA	1	$5,000,000	$5,000,000
Disposal of Contaminated Material	LS	--	$1,000,000	$1,000,000
Roadway Lighting	LS	--	$1,000,000	$1,000,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)				$236,080,000
Overhead/Profit on Const Cost 5%				$11,800,000
TOTAL CONSTRUCTION COST (2016 Dollars)				$247,880,000
RIGHT-OF-WAY (Railroad)	LS	--	$10,000,000	$10,000,000
RIGHT-OF-WAY (Private)	LS	--	$5,000,000	$5,000,000
UTILITIES	LS	--	$15,000,000	$15,000,000
ENVIRONMENTAL DOCUMENT / CLEARANCE	LS	--	$3,000,000	$3,000,000
ENGINEERING 10%				$24,800,000
CONSTRUCTION MANAGEMENT 10%				$24,800,000
CONST COST + RW + Util + Env + Eng + CM				$330,480,000
CONTINGENCY 35%				$115,700,000
TOTAL COST (2016 Dollars)				$446,180,000
TOTAL COST (2026 Dollars - 4% per year inflation)				$660,455,395
CALL				$661,000,000

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
EAST BUSWAY EXTENSION
Pink - BlueAlternative
SECTION: Turtle Creek to Monroeville

ITEM	UNIT	QUANTITY	UNIT COST	COST
Ramps at I376 3,000 LF x 22' width	SF	66,000	$400.00	$26,400,000
	SF	0	$500.00	$0
Pavement Base Drain	LF	520,000	$15.00	$7,800,000
ML Concrete Pavement - 125,000 LF	SY	610,000	$100.00	$61,000,000
ML Subbase	SY	610,000	$20.00	$12,200,000
Ramps Conc Pvt 30,000 LF 18' width x 5 x 90% roadway	SY	270,000	$100.00	$27,000,000
Ramps Subbase	SY	270,000	$20.00	$5,400,000
Sideroad Adjustments/Paving	SY	20,000	$80.00	$1,600,000
Railroad Construction Crossings	EA	4	$250,000.00	$1,000,000
Railroad Relocation	LF	4,000	$600.00	$2,400,000
Bridges (4) 200LF x 44' each	SF	35,200	$350.00	$12,320,000
~~Reconstruct Two Spans of S.R. 1030 Existing Bridge~~	SF	0	$500.00	$0
Retaining Walls 10,000 LF x 15' height	SF	150,000	$150.00	$22,500,000
Noise Walls 10,000 LF x 15' height	SF	150,000	$75.00	$11,250,000
Rockfall Protection	SF	75,000	$50.00	$3,750,000
Demolition (Buildings)	EA	20	$20,000	$400,000
Keystone Commons Station/Parking	LS	--	$0	$0
Mobilization	LS	--	$9,600,000	$9,600,000
Clearing & Grubbing	LS	--	$1,000,000	$1,000,000
Field Office	LS	--	$500,000	$500,000
Roadside Development	LS	--	$175,000	$175,000
Roadway Drainage	LS	--	$3,000,000	$3,000,000
Railroad Cross Drainage	EA	4	$50,000	$200,000
Culvert Upgrades	EA	4	$250,000	$1,000,000
Erosion Control	LS	--	$2,000,000	$2,000,000
Stormwater Management	LS	--	$2,000,000	$2,000,000
Maintenance & Protection of Traffic	LS	--	$5,000,000	$5,000,000
Pavement Markings	LS	--	$150,000	$150,000
Signing	LS	--	$250,000	$250,000
Slope Stabilization - Minor	EA	4	$1,500,000	$6,000,000
Slope Stabilization - Major	EA	1	$5,000,000	$5,000,000
Disposal of Contaminated Material	LS	--	$1,000,000	$1,000,000
Roadway Lighting	LS	--	$2,000,000	$2,000,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)				$233,895,000
Overhead/Profit on Const Cost 5%				$11,700,000
TOTAL CONSTRUCTION COST (2016 Dollars)				$245,595,000
RIGHT-OF-WAY (Railroad)	LS	--	$10,000,000	$10,000,000
RIGHT-OF-WAY (Private)	LS	--	$5,000,000	$5,000,000
UTILITIES	LS	--	$15,000,000	$15,000,000
ENVIRONMENTAL DOCUMENT / CLEARANCE	LS	--	$3,000,000	$3,000,000
ENGINEERING 10%				$24,600,000
CONSTRUCTION MANAGEMENT 10%				$24,600,000
CONST COST + RW + Util + Env + Eng + CM				$327,795,000
CONTINGENCY 35%				$114,700,000
TOTAL COST (2016 Dollars)				$442,495,000
TOTAL COST (2026 Dollars - 4% per year inflation)				$655,000,695
CALL				$656,000,000

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
Pink-Blue Alternative
Stations for Keystone Commons, Mon-Fayette, Braddock, Monroeville and Pitcairn

ITEM		UNIT	QUANTIT	UNIT COST	COST	Call 2016	Call 2026
Stations/Park and Ride							
Keystone Commons		LS	--	$10,000,000	$10,000,000	$18,000,000	$27,000,000
Mon-Fayette Interchange		LS	--	$10,000,000	$0	$0	$0
Braddock		LS	--	$5,000,000	$5,000,000	$10,000,000	$14,000,000
Pitcairn		LS	--	$5,000,000	$5,000,000	$10,000,000	$14,000,000
Monroeville		LS	--	$5,000,000	$5,000,000	$10,000,000	$14,000,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)					$25,000,000		
Overhead and Profit on Const Cost	5%				$1,300,000		
TOTAL CONSTRUCTION COST (2016 Dollars)					$26,300,000		
RIGHT-OF-WAY (Private)		LS	3	$1,000,000	$3,000,000		
CONSTRUCTION MANAGEMENT	10%				$2,700,000		
ENGINEERING	10%				$2,700,000		
CONST COST + RW + Eng + CM					$34,700,000		
CONTINGENCY	35%				$12,100,000		
TOTAL COST (2016 Dollars) - Stations					$46,800,000	$48,000,000	
SUBTOTAL (2026 Dollars - 4% per year inflation)					$69,275,433		
CALL for Stations					$70,000,000		$69,000,000

Yellow Alternative

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
EAST BUSWAY EXTENSION
For All Alternaives
SECTION: Swissvale/Rankin to North Braddock Station

ITEM	UNIT	QUANTITY	UNIT COST	COST
Class 1 Excavation	CY	5,000	$25.00	$125,000
Borrow Excavation	CY	80,000	$25.00	$2,000,000
Pavement Base Drain	LF	11,000	$15.00	$165,000
Concrete Pavement	SY	18,500	$100.00	$1,850,000
Subbase	SY	18,500	$20.00	$370,000
Sideroad Adjustments/Paving	SY	2,500	$80.00	$200,000
Railroad Construction Crossings	EA	3	$250,000.00	$750,000
Railroad Relocation	LF	--	$600.00	
Bridges (3)	SF	16,000	$350.00	$5,600,000
Retaining Walls	SF	85,000	$150.00	$12,750,000
Noise Walls	SF	52,800	$75.00	$3,960,000
Demolition (Buildings)	EA	20	$20,000	$400,000
North Braddock Station/Parking (included with stations)	LS	--	$0	$0
Mobilization	LS	--	$2,300,000	$2,300,000
Clearing & Grubbing	LS	--	$500,000	$500,000
Field Office	LS	--	$250,000	$250,000
Roadside Development	LS	--	$100,000	$100,000
Roadway Drainage	LS	--	$3,500,000	$3,500,000
Railroad Cross Drainage	EA	5	$50,000	$250,000
Culvert Upgrades	EA	2	$250,000	$500,000
Erosion Control	LS	--	$500,000	$500,000
Stormwater Management	LS	--	$750,000	$750,000
Maintenance & Protection of Traffic	LS	--	$2,000,000	$2,000,000
Pavement Markings	LS	--	$30,000	$30,000
Signing	LS	--	$50,000	$50,000
Slope Stabilization - Minor	EA	2	$1,500,000	$3,000,000
Slope Stabilization - Major	EA	1	$5,000,000	$5,000,000
Disposal of Contaminated Material	LS	--	$2,000,000	$2,000,000
Roadway Lighting	LS	--	$500,000	$500,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)				$49,400,000
Overhead/Profit on Const Cost 5%				$2,500,000
TOTAL CONSTRUCTION COST (2016 Dollars)				$51,900,000
RIGHT-OF-WAY (Railroad)	LS	--	$5,000,000	$5,000,000
RIGHT-OF-WAY (Private)	LS	--	$2,500,000	$2,500,000
UTILITIES	LS	--	$10,000,000	$10,000,000
ENVIRONMENTAL DOCUMENT / CLEARANCE	LS	--	$3,000,000	$3,000,000
ENGINEERING 10%				$5,200,000
CONSTRUCTION MANAGEMENT 10%				$5,200,000
CONST COST + RW + Util + Env + Eng + CM				$82,800,000
CONTINGENCY 35%				$29,000,000
TOTAL COST (2016 Dollars)				$111,800,000
TOTAL COST (2026 Dollars - 4% per year inflation)				$165,491,311
CALL				$166,000,000

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
EAST BUSWAY EXTENSION
Yellow Alternative
SECTION: North Braddock Station to East Pittsburgh

ITEM	UNIT	QUANTITY	UNIT COST	COST
Class 1 Excavation	CY	35,000	$25.00	$875,000
Borrow Excavation	CY	75,000	$25.00	$1,875,000
Pavement Base Drain	LF	19,200	$15.00	$288,000
Concrete Pavement	SY	32,000	$100.00	$3,200,000
Subbase	SY	32,000	$20.00	$640,000
Sideroad Adjustments/Paving	SY	3,500	$80.00	$280,000
Railroad Construction Crossings	EA	6	$250,000.00	$1,500,000
Railroad Relocation	LF	--	$600.00	
Bridges (6)	SF	51,500	$350.00	$18,025,000
Reconstruct Two Spans of S.R. 1030 Existing Bridge	SF	21,000	$500.00	$10,500,000
Retaining Walls	SF	200,000	$150.00	$30,000,000
Noise Walls	SF	26,400	$75.00	$1,980,000
Rockfall Protection	SF	52,800	$50.00	$2,640,000
Demolition (Buildings)	EA	25	$20,000	$500,000
Keystone Commons Station/Parking	LS	--	$0	$0
Mobilization	LS	--	$4,400,000	$4,400,000
Clearing & Grubbing	LS	--	$1,000,000	$1,000,000
Field Office	LS	--	$500,000	$500,000
Roadside Development	LS	--	$175,000	$175,000
Roadway Drainage	LS	--	$7,000,000	$7,000,000
Railroad Cross Drainage	EA	10	$50,000	$500,000
Culvert Upgrades	EA	4	$250,000	$1,000,000
Erosion Control	LS	--	$1,000,000	$1,000,000
Stormwater Management	LS	--	$1,500,000	$1,500,000
Maintenance & Protection of Traffic	LS	--	$4,000,000	$4,000,000
Pavement Markings	LS	--	$60,000	$60,000
Signing	LS	--	$100,000	$100,000
Slope Stabilization - Minor	EA	3	$1,500,000	$4,500,000
Slope Stabilization - Major	EA	1	$5,000,000	$5,000,000
Disposal of Contaminated Material	LS	--	$3,000,000	$3,000,000
Roadway Lighting	LS	--	$1,000,000	$1,000,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)				$107,038,000
Overhead/Profit on Const Cost 5%				$5,400,000
TOTAL CONSTRUCTION COST (2016 Dollars)				$112,438,000
RIGHT-OF-WAY (Railroad)	LS	--	$10,000,000	$10,000,000
RIGHT-OF-WAY (Private)	LS	--	$5,000,000	$5,000,000
UTILITIES	LS	--	$15,000,000	$15,000,000
ENVIRONMENTAL DOCUMENT / CLEARANCE	LS	--	$6,000,000	$6,000,000
ENGINEERING 10%				$11,300,000
CONSTRUCTION MANAGEMENT 10%				$11,300,000
CONST COST + RW + Util + Env + Eng + CM				$171,038,000
CONTINGENCY 35%				$59,900,000
TOTAL COST (2016 Dollars)				$230,938,000
TOTAL COST (2026 Dollars - 4% per year inflation)				$341,844,655
CALL				$342,000,000

Yellow Alternative with Direct Connector Ramps

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
EAST BUSWAY EXTENSION

SECTION: Direct Ramps to Mon-Fayette Expressway

ITEM		UNIT	QUANTITY	UNIT COST	COST
Class 1 Excavation		CY	5,000	$25.00	$125,000
Borrow Excavation		CY	5,000	$25.00	$125,000
Pavement Base Drain		LF	500	$15.00	$7,500
Concrete Pavement		SY	800	$100.00	$80,000
Subbase		SY	800	$20.00	$16,000
Sideroad Adjustments/Paving		SY	0	$80.00	$0
Railroad Construction Crossings		EA	1	$250,000.00	$250,000
Railroad Relocation		LF	--	$600.00	
Bridges (2)		SF	97,000	$400.00	$38,800,000
Retaining Walls		SF	20,000	$150.00	$3,000,000
Demolition (Buildings)		EA	1	$20,000	$20,000
Mobilization		LS	--	$1,900,000	$1,900,000
Clearing & Grubbing		LS	--	$100,000	$100,000
Field Office		LS	--	$250,000	$250,000
Roadside Development		LS	--	$75,000	$75,000
Roadway Drainage		LS	--	$200,000	$200,000
Railroad Cross Drainage		EA	1	$50,000	$50,000
Culvert Upgrades		EA	2	$250,000	$500,000
Erosion Control		LS	--	$100,000	$100,000
Stormwater Management		LS	--	$250,000	$250,000
Maintenance & Protection of Traffic		LS	--	$500,000	$500,000
Pavement Markings		LS	--	$10,000	$10,000
Signing		LS	--	$15,000	$15,000
Disposal of Contaminated Material		LS	--	$2,000,000	$2,000,000
Roadway Lighting		LS	--	$250,000	$250,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)					$48,623,500
Overhead and Profit on Const Cost	5%				$2,400,000
TOTAL CONSTRUCTION COST (2016 Dollars)					$51,023,500
RIGHT-OF-WAY (Railroad)		LS	--	$2,000,000	$2,000,000
RIGHT-OF-WAY (Private)		LS	--	$1,000,000	$1,000,000
UTILITIES		LS	--	$5,000,000	$5,000,000
ENVIRONMENTAL DOCUMENT / CLEARANCE		LS	--	$1,000,000	$1,000,000
ENGINEERING	10%				$5,200,000
CONSTRUCTION MANAGEMENT	10%				$5,200,000
CONST COST + RW + Util + Env + Eng + CM					$70,423,500
CONTINGENCY	35%				$24,600,000
TOTAL COST (2016 Dollars)					$95,023,500
TOTAL COST (2026 Dollars - 4% per year inflation)					$140,657,993
CALL					$141,000,000

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
Mon-Fayette Expressway (Additional Cost to Accommodate Dedicated Bus Lane)

SECTION: Sta. 3044+00 to Sta. 3342+00

ITEM		UNIT	QUANTITY	UNIT COST	COST
Dedicated Bus Lanes					
Class 1 Excavation		CY	16,500	$25.00	$412,500
Concrete Pavement		SY	11,000	$100.00	$1,100,000
Subbase		SY	11,000	$20.00	$220,000
Bridges		SF	23,000	$350.00	$8,050,000
Retaining Walls		SF	15,000	$150.00	$2,250,000
Mobilization		LS	--	$525,000	$525,000
Clearing & Grubbing		LS	--	$50,000	$50,000
Roadside Development		LS	--	$50,000	$50,000
Roadway Drainage		LS	--	$200,000	$200,000
Stormwater Management		LS	--	$750,000	$750,000
Signing		LS	--	$25,000	$25,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)					$13,632,500
CONTINGENCY	5%				$700,000
TOTAL CONSTRUCTION COST (2016 Dollars)					$14,332,500
RIGHT-OF-WAY (Private)		LS	--	$1,000,000	$1,000,000
CONSTRUCTION MANAGEMENT	10%				$1,500,000
ENGINEERING REDESIGN (BY PTC)		LS	--	$2,500,000	$2,500,000
CONST COST + RW + Eng + CM					$19,332,500
CONTINGENCY	35%				$6,800,000
TOTAL COST (2016 Dollars) - Dedicated Bus Lanes					$26,132,500
SUBTOTAL (2026 Dollars - 4% per year inflation)					$38,682,484
CALL for Dedicated Bus Lanes					$39,000,000

PRELIMINARY CONSTRUCTION COST ESTIMATE
FOR
Yellow Alternative
Stations for Keystone Commons, Mon-Fayette, Braddock, Monroeville and Pitcairn

ITEM		UNIT	QUANTIT	UNIT COST	COST	Call 2016	Call 2026
Stations/Park and Ride							
Keystone Commons		LS	--	$10,000,000	$10,000,000	$18,000,000	$27,000,000
Mon-Fayette Interchange		LS	--	$10,000,000	$10,000,000	$18,000,000	$27,000,000
Braddock		LS	--	$5,000,000	$5,000,000	$10,000,000	$14,000,000
Pitcairn		LS	--	$5,000,000	$5,000,000	$10,000,000	$14,000,000
Monroeville		LS	--	$5,000,000	$5,000,000	$10,000,000	$14,000,000
SUBTOTAL CONSTRUCTION COST (2016 Dollars)					$25,000,000		
Overhead and Profit on Const Cost	5%				$1,300,000		
TOTAL CONSTRUCTION COST (2016 Dollars)					$26,300,000		
RIGHT-OF-WAY (Private)		LS	3	$1,000,000	$3,000,000		
CONSTRUCTION MANAGEMENT	10%				$2,700,000		
ENGINEERING	10%				$2,700,000		
CONST COST + RW + Eng + CM					$34,700,000		
CONTINGENCY	35%				$12,100,000		
TOTAL COST (2016 Dollars) - Stations					$46,800,000	$66,000,000	
SUBTOTAL (2026 Dollars - 4% per year inflation)					$69,275,433		
CALL for Stations					$70,000,000		$96,000,000

Appendix D

SPC Projections Information

Introduction

The following tables contain the demographic forecasts and ridership forecasting results from the Southwestern Pennsylvania Commission(SPC). This data is referred to in the Existing Conditions and Alternatives section of the report. Below is a description of each table:

2015 and 2035 Forecasts of Total Population and Total Employment, 2010 Census Total and Minority Population, and Land Use Land Cover Area by Traffic Analysis Zone

This table provides demographic data by each Traffic Analysis Zone (TAZ) for each municipality in the study area. Year 2035 projections in each category are from SPC's Cycle 10A forecast (Adopted June 2016).

East Busway Extension: Boardings by Corridor and Change in Boardings

This table summarizes the daily weekday boardings model projections for each alternative modeled by corridors. Each corridor identified is comprised of various PAAC routes. Non-Port Authority routes from other transit agencies area also listed as a separate corridor.

The following key relates the alternative tested to the name identified in the report:

Table Alternative Name	Alternative Name in Report
CAXA	Existing System (Year 2017)
CAXB	No-Build (Year 2035)
CAXC	Red Alternative (Year 2035)
CAXD	Yellow Alternative (Year 2035)
CAXE	Limited Yellow Alternative (Year 2035)

East Busway Extension: Daily Boardings – Selected Routes

This table summarizes the daily weekday boardings model projections for a particular PAAC or Westmoreland County Transit Authority (WCTA) route for each alternative modeled. As with the previous table, the following key relates the alternative tested to the name identified in the report:

Table Alternative Name	Alternative Name in Report
CAXA	Existing System (Year 2017)
CAXB	No-Build (Year 2035)
CAXC	Red Alternative (Year 2035)
CAXD	Yellow Alternative (Year 2035)
CAXE	Limited Yellow Alternative (Year 2035)

East Busway Extension: Daily Boardings – Selected Nodes

This table summarizes the daily weekday boardings model projections for specific PAAC stops in the study area. Daily boardings are broken down by time of day (Peak and Off-Peak) Boardings and by arrival type (Walk / Transfer and Drive). As with the previous table, the following key relates the alternative tested to the name identified in the report:

Table Alternative Name	Alternative Name in Report
CAXA	Existing System (Year 2017)
CAXB	No-Build (Year 2035)
CAXC	Red Alternative (Year 2035)
CAXD	Yellow Alternative (Year 2035)
CAXE	Limited Yellow Alternative (Year 2035)

EAST BUSWAY E

2015 and 2035 Forecasts of Total Population and Total Employment, 2010 C

by Traffic Anal

Table 1.

Municipality	Zone	AREA						Total population		2015 population density (population per square mile)	2015-2035 numeric population change	2015-2035 % population change
		Land in square miles	Water in square miles	Total in square miles	Land in acres	Water in acres	Total in acres	2015	2035			
Braddock Borough	172	0.6	0.1	0.6	358.2	53.0	411.2	2,193	2,177	3,919	-16	-0.7%
Braddock Hills Borough	171	0.4	0.0	0.4	231.0	0.0	231.0	828	889	2,294	61	7.4%
Braddock Hills Borough	175	0.6	0.0	0.6	376.3	5.0	381.3	1,078	1,156	1,834	78	7.2%
Chalfant Borough	177	0.2	0.0	0.2	100.8	0.0	100.8	881	834	5,593	-47	-5.3%
East McKeesport Borough	191	0.4	0.0	0.4	237.0	0.0	237.0	2,214	2,190	5,980	-24	-1.1%
East Pittsburgh Borough	181	0.4	0.0	0.4	246.9	0.0	246.9	1,565	1,583	4,056	18	1.2%
Forest Hills Borough	176	1.0	0.0	1.0	635.2	0.0	635.2	3,430	3,637	3,456	207	6.0%
Forest Hills Borough	977	0.6	0.0	0.6	365.7	0.0	365.7	3,150	3,340	5,513	190	6.0%
Monroeville Municipality	164	1.8	0.0	1.8	1,160.1	0.0	1,160.1	4,683	5,063	2,583	380	8.1%
Monroeville Municipality	165	0.9	0.0	0.9	607.2	0.0	607.2	1,934	2,092	2,039	158	8.2%
Monroeville Municipality	166	4.1	0.0	4.1	2,596.6	0.0	2,596.6	4,416	4,774	1,088	358	8.1%
Monroeville Municipality	167	2.8	0.0	2.8	1,796.4	0.0	1,796.4	2,904	3,129	1,035	225	7.7%
Monroeville Municipality	182	2.7	0.0	2.7	1,720.4	0.0	1,720.4	5,103	5,507	1,898	404	7.9%
Monroeville Municipality	183	2.3	0.0	2.3	1,454.3	3.9	1,458.2	1,570	1,698	691	128	8.2%
Monroeville Municipality	185	2.6	0.0	2.6	1,650.6	0.0	1,650.6	3,465	3,733	1,344	268	7.7%
Monroeville Municipality	186	0.4	0.0	0.4	253.0	0.0	253.0	829	897	2,097	68	8.2%
Monroeville Municipality	187	2.2	0.0	2.2	1,414.6	0.0	1,414.6	3,965	4,288	1,794	323	8.1%
North Braddock Borough	173	0.3	0.1	0.3	163.1	39.2	202.3	0	0	0	0	0.0%
North Braddock Borough	174	1.3	0.0	1.3	823.3	0.0	823.3	4,795	4,741	3,727	-54	-1.1%
North Versailles Township	189	1.2	0.0	1.2	751.3	0.0	751.3	1,755	1,759	1,495	4	0.2%
North Versailles Township	193	1.4	0.2	1.5	870.0	106.0	975.9	1,460	1,462	1,074	2	0.1%
North Versailles Township	194	0.8	0.0	0.8	531.6	0.0	531.6	2,065	2,071	2,486	6	0.3%
North Versailles Township	195	1.0	0.0	1.0	609.5	0.0	609.5	1,587	1,590	1,666	3	0.2%
North Versailles Township	196	1.3	0.0	1.3	827.4	0.0	827.4	2,221	2,226	1,718	5	0.2%
North Versailles Township/Trafford Borough (part)	197	2.6	0.0	2.6	1,656.6	0.0	1,656.6	1,478	1,456	571	-22	-1.5%
Pitcairn Borough	184	0.5	0.0	0.5	333.5	0.0	333.5	3,341	3,392	6,411	51	1.5%
Rankin Borough	170	0.4	0.1	0.5	281.5	42.6	324.0	2,089	2,726	4,750	637	30.5%
Swissvale Borough	168	0.5	0.0	0.5	312.0	27.0	339.0	3,506	3,614	7,191	108	3.1%
Swissvale Borough	169	0.6	0.0	0.6	406.8	0.0	406.8	5,079	5,235	7,991	156	3.1%
Turtle Creek Borough	188	1.0	0.0	1.0	626.1	0.0	626.1	5,173	5,363	5,287	190	3.7%
Wall Borough	192	0.4	0.0	0.4	275.3	0.0	275.3	599	617	1,393	18	3.0%
Wilkins Township	153	0.7	0.0	0.7	464.2	0.0	464.2	1,608	1,741	2,217	133	8.3%
Wilkins Township	179	1.0	0.0	1.0	664.2	0.0	664.2	2,923	3,165	2,816	242	8.3%
Wilkins Township	180	0.9	0.0	0.9	571.6	0.0	571.6	1,350	1,461	1,511	111	8.2%
Wilmerding Borough	190	0.5	0.0	0.5	290.3	0.0	290.3	2,029	2,013	4,474	-16	-0.8%
TOTAL		**40.1**	**0.4**	**40.5**	**25,662.5**	**276.6**	**25,939.1**	**87,266**	**91,619**	**2,176**	**4,353**	**5.0%**

SOURCES: Cycle 10a Forecasts (Population and Employment)
: 2010 Census Redistricting Summary File (Minority Population)
: Southwestern Pennsylvania Commission (Land Use Land Cover Area)

XTENSION

Census Total and Minority Population, and Land Use Land Cover Area

ysis Zone

Total employment		2015 employment density (jobs per acre)	2015-2035 numeric employment change	2015-2035 % employment change	Census 2010			Land use Land Cover Area in Acre									
2015	2035				Total population	Non-white population	% minority	Agricultural/ Pasture	Forest	Water	Grassland/ Open Space	Industrial	Commercial	Residential	Extraction	Transportation	Total
2,145	3,755	6.0	1,610	75.1%	2,125	1,634	76.9%	0.0	0.1	56.5	0.0	89.4	97.9	167.2	0.0	0.0	**411.2**
160	233	0.7	73	45.6%	826	215	26.0%	0.0	72.0	0.0	0.0	0.0	25.9	125.6	0.0	7.5	**231.0**
451	592	1.2	141	31.3%	1,074	374	34.8%	0.0	92.1	0.0	10.0	0.0	35.1	238.9	0.0	5.2	**381.3**
117	337	1.2	220	188.0%	800	113	14.1%	0.0	2.0	0.0	0.0	0.2	4.5	94.1	0.0	0.0	**100.8**
478	662	2.0	184	38.5%	2,071	234	11.3%	0.0	40.7	0.0	0.0	0.0	11.2	185.1	0.0	0.0	**237.0**
1,082	1,867	4.4	785	72.6%	1,687	868	51.5%	0.0	44.2	8.8	0.0	32.4	70.5	83.9	0.0	7.2	**246.9**
1,123	1,298	1.8	175	15.6%	3,388	316	9.3%	0.0	56.7	0.0	6.1	0.0	53.7	518.2	0.0	0.5	**635.2**
1,417	1,631	3.9	214	15.1%	3,110	483	15.5%	0.0	26.8	0.0	0.0	5.2	40.6	293.0	0.0	0.0	**365.7**
1,103	1,136	1.0	33	3.0%	4,603	1,336	29.0%	0.0	333.4	0.0	22.4	0.0	87.6	675.5	0.0	41.1	**1,160.1**
3,035	2,836	5.0	-199	-6.6%	1,901	679	35.7%	0.0	177.9	0.0	1.7	10.4	194.2	216.3	0.0	6.7	**607.2**
6,243	6,128	2.4	-115	-1.8%	4,341	458	10.6%	2.0	1,189.6	0.8	28.9	0.0	403.3	903.7	0.0	68.3	**2,596.6**
4,343	4,226	2.4	-117	-2.7%	2,858	319	11.2%	17.4	987.0	0.1	40.5	0.0	188.5	490.3	0.0	72.7	**1,796.4**
11,323	10,677	6.6	-646	-5.7%	5,020	1,137	22.6%	0.0	577.5	0.0	59.6	0.0	449.5	633.8	0.0	0.0	**1,720.4**
368	371	0.3	3	0.8%	1,543	147	9.5%	0.0	637.1	12.3	17.6	0.0	34.4	460.6	242.2	54.0	**1,458.2**
2,600	2,588	1.6	-12	-0.5%	3,409	878	25.8%	0.0	721.8	11.7	54.8	0.6	159.0	683.2	0.0	19.6	**1,650.6**
3,204	3,118	12.7	-86	-2.7%	815	204	25.0%	0.0	6.9	0.0	0.0	0.0	173.4	53.4	0.0	19.3	**253.0**
502	501	0.4	-1	-0.2%	3,897	658	16.9%	0.0	759.5	0.0	16.3	14.3	1.4	622.4	0.0	0.6	**1,414.6**
0	0	0.0	0	0.0%	0	0	0.0%	0.0	0.0	45.1	0.0	157.2	0.0	0.0	0.0	0.0	**202.3**
612	970	0.7	358	58.5%	5,022	2,441	48.6%	0.0	205.8	0.0	0.0	5.3	16.1	595.3	0.0	0.9	**823.3**
1,092	1,160	1.5	68	6.2%	1,759	396	22.5%	0.0	400.6	4.6	6.5	7.0	135.4	171.6	0.0	25.5	**751.3**
221	259	0.3	38	17.2%	1,461	750	51.3%	0.0	438.1	120.4	7.1	22.4	103.7	187.6	0.0	96.7	**975.9**
190	209	0.4	19	10.0%	2,070	201	9.7%	0.0	234.7	0.0	0.0	0.0	61.2	235.7	0.0	0.0	**531.6**
902	1,024	1.5	122	13.5%	1,590	125	7.9%	0.0	256.0	0.0	6.6	0.0	55.9	291.0	0.0	0.0	**609.5**
1,443	1,539	1.7	96	6.7%	2,126	147	6.9%	0.0	302.0	0.0	2.3	0.0	52.9	470.2	0.0	0.0	**827.4**
1,075	1,282	0.6	207	19.3%	1,320	118	8.9%	0.0	999.3	5.9	0.0	0.0	218.7	341.5	0.0	91.1	**1,656.6**
1,326	1,369	4.0	43	3.2%	3,301	449	13.6%	0.0	107.4	2.1	0.2	0.0	14.3	208.4	0.0	1.1	**333.5**
427	2,014	1.5	1,587	371.7%	2,153	1,767	82.1%	0.0	41.3	44.2	1.9	21.9	90.4	112.5	0.0	11.8	**324.0**
850	1,054	2.7	204	24.0%	3,366	1,309	38.9%	0.0	60.2	27.6	0.0	0.2	52.2	193.6	0.0	5.2	**339.0**
1,486	1,797	3.7	311	20.9%	4,876	2,312	47.4%	0.0	53.2	0.0	7.0	16.5	25.6	301.3	0.0	3.1	**406.8**
1,179	1,719	1.9	540	45.8%	5,353	1,154	21.6%	0.0	110.9	4.2	0.0	8.0	85.5	395.8	0.0	21.8	**626.1**
236	485	0.9	249	105.5%	557	57	10.2%	0.0	193.0	0.0	0.0	0.0	11.4	70.3	0.0	0.6	**275.3**
621	678	1.3	57	9.2%	1,704	269	15.8%	0.0	131.1	0.0	0.0	0.8	69.5	251.5	0.0	11.2	**464.2**
622	713	0.9	91	14.6%	3,098	485	15.7%	0.0	197.2	0.0	0.0	0.0	27.8	439.1	0.0	0.0	**664.2**
3,554	3,858	6.2	304	8.6%	1,431	269	18.8%	0.0	224.4	0.0	34.3	7.0	115.4	190.5	0.0	0.0	**571.6**
1,740	2,992	6.0	1,252	72.0%	2,220	551	24.8%	0.0	77.3	10.0	0.0	37.2	28.3	114.8	0.0	22.6	**290.3**
57,270	**65,078**	**2.2**	**7,808**	**13.6%**	**86,875**	**22,853**	**26.3%**	**19.4**	**9,758.1**	**354.3**	**323.7**	**436.1**	**3,194.9**	**11,016.0**	**242.2**	**594.5**	**25,939.1**

SPC, June 2016

East Busway Extension

CORRIDOR	Boardings by Corridor					Change in Boardings			
	CAXA Assign 2017	CAXB Assign 2035	CAXC Assign 2035	CAXD Assign 2035	CAXE Assign 2035	CAXA to CAXB	CAXB to CAXC	CAXB to CAXD	CAXB to CAXE
ALLEGHENY VALLEY	2,275	2,338	2,332	2,330	2,335	63	-6	-8	-3
NORTH HILLS	18,866	19,609	19,590	19,619	19,589	743	-19	10	-20
HOV LANE EXPRESS	6,593	7,831	7,821	7,808	7,810	1,238	-10	-23	-21
OHIO VALLEY	8,706	8,822	8,808	8,808	8,806	116	-14	-14	-16
TOTAL NORTH HILLS	36,440	38,600	38,551	38,565	38,540	2,160	-49	-35	-60
WEST END - CARNEGIE	12,044	12,198	12,353	12,331	12,422	154	155	133	224
BANKSVILLE - GREENTREE	7,806	6,959	6,802	6,953	6,793	-847	-157	-6	-166
SOUTH HILLS LRV	24,259	27,287	27,436	27,176	27,288	3,028	149	-111	1
AIRPORT SERVICE	3,972	3,913	3,935	4,006	3,976	-59	22	93	63
WEST LIBERTY AVENUE	4,908	6,130	6,130	6,126	6,152	1,222	0	-4	22
MT. WASHINGTON - HILLTOP	227	242	243	244	243	15	1	2	1
SAW MILL RUN - SOUTH BUSWAY	9,307	9,974	9,711	9,893	9,950	667	-263	-81	-24
SOUTHSIDE	9,611	9,008	9,174	9,138	9,097	-603	166	130	89
TOTAL SOUTH HILLS - WEST END	72,134	75,711	75,784	75,867	75,921	3,577	73	156	210
SECOND AVENUE	3,622	3,807	3,785	3,791	3,781	185	-22	-16	-26
MON VALLEY EXPRESS	1,069	1,154	1,102	1,106	1,102	85	-52	-48	-52
HOMESTEAD LOCAL AND EXPRESS	6,554	5,953	5,985	6,004	5,980	-601	32	51	27
MCKEESPORT LOCAL	331	351	354	355	355	20	3	4	4
MONROEVILLE - EAST PITTSBURGH	0	0	0	0	0	0	0	0	0
TOTAL SOUTHEAST	11,576	11,265	11,226	11,256	11,218	-311	-39	-9	-47
FIFTH AVENUE	27,034	29,042	29,022	29,068	29,064	2,008	-20	26	22
FORBES AVENUE - SQUIRREL HILL	15,947	16,978	16,307	16,278	16,277	1,031	-671	-700	-701
EAST SUBURBAN - BLVD OF ALLIES	5,658	5,659	5,062	4,326	4,882	1	-597	-1,333	-777
EAST BUSWAY	25,471	27,404	29,700	30,940	29,973	1,933	2,296	3,536	2,569
BIGELOW BLVD - PENN HILLS	7,815	8,505	8,516	8,483	8,509	690	11	-22	4
HILL DISTRICT - CENTER AVENUE	3,749	3,719	3,720	3,728	3,723	-30	1	9	4
BUTLER STREET - EAST LIBERTY	2,952	3,442	3,438	3,440	3,351	490	-4	-2	-91
HOMEWOOD - PENN / LIBERTY	3,536	3,926	3,917	3,916	4,004	390	-9	-10	78
TOTAL EAST END	92,162	98,675	99,682	100,179	99,783	6,513	1,007	1,504	1,108
INCLINES	1,553	1,661	1,661	1,660	1,661	108	0	-1	0
OTHER PORT AUTHORITY	7,532	8,013	8,063	8,055	8,040	481	50	42	27
TOTAL PORT AUTHORITY SYSTEM	221,397	233,925	234,967	235,582	235,163	12,528	1,042	1,657	1,238
NON-PORT AUTHORITY ROUTES	12,351	12,766	12,782	12,562	12,575	415	16	-204	-191
TOTAL TRANSIT NETWORK	233,748	246,691	247,749	248,144	247,738	12,943	1,058	1,453	1,047

SPC - June 2016

East Busway I

Daily Boardings - S

	CAXA Boards					CAXB Boards						
Route	Peak	Off-Peak	Total	Walk	P-n-R	Peak	Off-Peak	Total	Walk	P-n-R	Peak	Off-Peak
P1	7,992	5,375	**13,367**	10,325	3,042	8,811	5,817	**14,628**	11,339	3,289	10,230	6,594
P2	5,564	0	**5,564**	3,151	2,413	6,107	0	**6,107**	3,481	2,626	5,968	0
P3	4,877	1,663	**6,540**	6,199	341	4,970	1,699	**6,669**	6,315	354	5,117	1,791
AEX	0	0	**0**	0	0	0	0	**0**	0	0	700	0
P1X	0	0	**0**	0	0	0	0	**0**	0	0	0	0
55	271	348	**619**	619	0	295	389	**684**	684	0	298	572
P68	793	0	**793**	793	0	775	0	**775**	775	0	430	0
P69	463	0	**463**	461	2	453	0	**453**	451	2	436	0
P76	1,268	0	**1,268**	1,015	253	1,288	0	**1,288**	1,049	239	390	0
P71	1,144	0	**1,144**	1,021	123	1,285	0	**1,285**	1,149	136	1,154	0
P7	1,069	0	**1,069**	1,069	0	1,154	0	**1,154**	1,154	0	1,102	0
P12	667	0	**667**	227	440	684	0	**684**	235	449	623	0
59	90	609	**699**	698	1	110	665	**775**	774	1	90	538
68	0	670	**670**	670	0	0	664	**664**	664	0	0	652
69	55	204	**259**	259	0	57	202	**259**	259	0	154	194
71	0	163	**163**	163	0	0	212	**212**	212	0	0	214
WCTA-1F	598	0	**598**	589	9	650	0	**650**	642	8	687	0
WCTA-2F	270	0	**270**	270	0	287	0	**287**	287	0	284	0
WCTA-3F	83	0	**83**	83	0	93	0	**93**	93	0	92	0
WCTA-4	4	417	**421**	420	1	4	448	**452**	451	1	2	436
Total - Study	25,208	9,449	**34,657**	28,032	6,625	27,023	10,096	**37,119**	30,014	7,105	27,757	10,991

Change in Daily Boardings - Selected Routes

	Change in Boards - CAXA to CAXB					Change in Boards - CAXB to CAXC					Change in	
Route	Peak	Off-Peak	Total	Walk	P-n-R	Peak	Off-Peak	Total	Walk	P-n-R	Peak	Off-Peak
P1	819	442	**1,261**	1,014	247	1,419	777	**2,196**	1,078	1,118	1,770	1,562
P2	543	0	**543**	330	213	-139	0	**-139**	-91	-48	-147	0
P3	93	36	**129**	116	13	147	92	**239**	163	76	141	210
AEX	0	0	**0**	0	0	700	0	**700**	700	0	833	0
P1X	0	0	**0**	0	0	0	0	**0**	0	0	0	0
55	24	41	**65**	65	0	3	183	**186**	186	0	6	195
P68	-18	0	**-18**	-18	0	-345	0	**-345**	-346	1	-385	0
P69	-10	0	**-10**	-10	0	-17	0	**-17**	-85	68	-15	0
P76	20	0	**20**	34	-14	-898	0	**-898**	-670	-228	-894	0
P71	141	0	**141**	128	13	-131	0	**-131**	3	-134	-129	0
P7	85	0	**85**	85	0	-52	0	**-52**	-52	0	-48	0
P12	17	0	**17**	8	9	-61	0	**-61**	-30	-31	-77	0
59	20	56	**76**	76	0	-20	-127	**-147**	-147	0	-21	-120
68	0	-6	**-6**	-6	0	0	-12	**-12**	-14	2	0	-395
69	2	-2	**0**	0	0	97	-8	**89**	89	0	97	-22
71	0	49	**49**	49	0	0	2	**2**	2	0	0	2
WCTA-1F	52	0	**52**	53	-1	37	0	**37**	38	-1	-195	0
WCTA-2F	17	0	**17**	17	0	-3	0	**-3**	-3	0	63	0
WCTA-3F	10	0	**10**	10	0	-1	0	**-1**	-1	0	-1	0
WCTA-4	0	31	**31**	31	0	-2	-12	**-14**	-14	0	19	-11
Total - Study	1,815	647	**2,462**	1,982	480	734	895	**1,629**	806	823	1,017	1,421

Key to Test Names	
Name	Test Description
CAXA	2017 - Existing
CAXB	2035 - No-Build
CAXC	2035 - Alt 1 - Option 1
CAXD	2035 - Alt 1 - Option 2
CAXE	2035 - Alt 2 - Option 2

Extension

elected Routes

CAXC Boards			CAXD Boards					CAXE Boards				
Total	Walk	P-n-R	Peak	Off-Peak	Total	Walk	P-n-R	Peak	Off-Peak	Total	Walk	P-n-R
16,824	12,417	4,407	10,581	7,379	**17,960**	13,420	4,540	10,215	6,594	**16,809**	12,416	4,393
5,968	3,390	2,578	5,960	0	**5,960**	3,377	2,583	5,948	0	**5,948**	3,367	2,581
6,908	6,478	430	5,111	1,909	**7,020**	6,589	431	5,085	1,791	**6,876**	6,448	428
700	700	0	833	0	**833**	833	0	823	0	**823**	823	0
0	0	0	0	0	**0**	0	0	340	0	**340**	260	80
870	870	0	301	584	**885**	885	0	300	572	**872**	872	0
430	429	1	390	0	**390**	390	0	420	0	**420**	420	0
436	366	70	438	0	**438**	367	71	436	0	**436**	366	70
390	379	11	394	0	**394**	383	11	391	0	**391**	380	11
1,154	1,152	2	1,156	0	**1,156**	1,154	2	1,152	0	**1,152**	1,150	2
1,102	1,102	0	1,106	0	**1,106**	1,106	0	1,102	0	**1,102**	1,102	0
623	205	418	607	0	**607**	185	422	607	0	**607**	186	421
628	627	1	89	545	**634**	633	1	89	538	**627**	626	1
652	650	2	0	269	**269**	269	0	0	652	**652**	650	2
348	348	0	154	180	**334**	334	0	154	194	**348**	348	0
214	214	0	0	214	**214**	214	0	0	214	**214**	214	0
687	680	7	455	0	**455**	449	6	455	0	**455**	449	6
284	284	0	350	0	**350**	350	0	350	0	**350**	350	0
92	92	0	92	0	**92**	92	0	92	0	**92**	92	0
438	437	1	23	437	**460**	459	1	24	436	**460**	459	1
38,748	30,820	7,928	28,040	11,517	**39,557**	31,489	8,068	27,983	10,991	**38,974**	30,978	7,996

SPC - June 2016

Boards - CAXB to CAXD			Change in Boards - CAXB to CAXE				
Total	Walk	P-n-R	Peak	Off-Peak	Total	Walk	P-n-R
3,332	2,081	1,251	1,404	777	**2,181**	1,077	1,104
-147	-104	-43	-159	0	**-159**	-114	-45
351	274	77	115	92	**207**	133	74
833	833	0	823	0	**823**	823	0
0	0	0	340	0	**340**	260	80
201	201	0	5	183	**188**	188	0
-385	-385	0	-355	0	**-355**	-355	0
-15	-84	69	-17	0	**-17**	-85	68
-894	-666	-228	-897	0	**-897**	-669	-228
-129	5	-134	-133	0	**-133**	1	-134
-48	-48	0	-52	0	**-52**	-52	0
-77	-50	-27	-77	0	**-77**	-49	-28
-141	-141	0	-21	-127	**-148**	-148	0
-395	-395	0	0	-12	**-12**	-14	2
75	75	0	97	-8	**89**	89	0
2	2	0	0	2	**2**	2	0
-195	-193	-2	-195	0	**-195**	-193	-2
63	63	0	63	0	**63**	63	0
-1	-1	0	-1	0	**-1**	-1	0
8	8	0	20	-12	**8**	8	0
2,438	1,475	963	960	895	**1,855**	964	891

SPC - June 2016

East Busway

Daily Boardings -

		CAXA Boards					CAXB Boards					
Seq	Name	Peak	Off-Peak	Total	Walk/Xfer	Drive	Peak	Off-Peak	Total	Walk/Xfer	Drive	Peak
1	Wilkinsburg Station	4,274	718	**4,992**	1,441	3,551	4,425	730	**5,155**	1,482	3,673	3,921
2	Hamnet Station	1,045	881	**1,926**	1,926	0	1,068	905	**1,973**	1,973	0	1,076
3	Roslyn Station	853	540	**1,393**	1,393	0	925	594	**1,519**	1,519	0	934
4	Swissvale Station	1,130	641	**1,771**	1,771	0	1,303	746	**2,049**	2,049	0	1,620
5	Braddock Station	0	0	**0**	0	0	0	0	**0**	0	0	630
6	Keystone Commons	330	162	**492**	492	0	320	141	**461**	461	0	1,286
7	MFE Int. East PGH	0	0	**0**	0	0	0	0	**0**	0	0	0
8	Monroeville Mal	261	81	**342**	269	73	254	90	**344**	275	69	248
9	Westinghouse/Forest Hills	369	1	**370**	142	228	368	1	**369**	156	213	0
10	North Versailles	26	0	**26**	0	26	27	0	**27**	0	27	10
11	Alpine Village	114	0	**114**	70	44	119	0	**119**	85	34	118
12	Pitcairn	0	0	**0**	0	0	0	0	**0**	0	0	162

Change in Daily Boardings - Selected Nodes

		Change in Boards - CAXA to CAXB					Change in Boards - CAXB to CAXC					
Seq	Name	Peak	Off-Peak	Total	Walk/Xfer	Drive	Peak	Off-Peak	Total	Walk/Xfer	Drive	Peak
1	Wilkinsburg Station	151	12	**163**	41	122	-504	55	**-449**	-91	-358	-573
2	Hamnet Station	23	24	**47**	47	0	8	33	**41**	41	0	9
3	Roslyn Station	72	54	**126**	126	0	9	32	**41**	41	0	14
4	Swissvale Station	173	105	**278**	278	0	317	130	**447**	447	0	330
5	Braddock Station	0	0	**0**	0	0	630	111	**741**	0	741	628
6	Keystone Commons	-10	-21	**-31**	-31	0	966	483	**1,449**	916	533	992
7	MFE Int. East PGH	0	0	**0**	0	0	0	0	**0**	0	0	4
8	Monroeville Mal	-7	9	**2**	6	-4	-6	-1	**-7**	2	-9	53
9	Westinghouse/Forest Hills	-1	0	**-1**	14	-15	-368	2	**-366**	-153	-213	-368
10	North Versailles	1	0	**1**	0	1	-17	0	**-17**	0	-17	-17
11	Alpine Village	5	0	**5**	15	-10	-1	0	**-1**	1	-2	0
12	Pitcairn	0	0	**0**	0	0	162	0	**162**	92	70	162

Key to Test Names	
Name	Test Description
CAXA	2017 - Existing
CAXB	2035 - No-Build
CAXC	2035 - Alt 1 - Option 1
CAXD	2035 - Alt 1 - Option 2
CAXE	2035 - Alt 2 - Option 2

y Extension

- Selected Nodes

CAXC Boards				CAXD Boards					CAXE Boards				
Off-Peak	Total	Walk/Xfer	Drive	Peak	Off-Peak	Total	Walk/Xfer	Drive	Peak	Off-Peak	Total	Walk/Xfer	Drive
785	**4,706**	1,391	3,315	3,852	936	**4,788**	1,326	3,462	3,844	785	**4,629**	1,322	3,307
938	**2,014**	2,014	0	1,077	971	**2,048**	2,048	0	1,087	938	**2,025**	2,025	0
626	**1,560**	1,560	0	939	647	**1,586**	1,586	0	936	626	**1,562**	1,562	0
876	**2,496**	2,496	0	1,633	900	**2,533**	2,533	0	1,626	876	**2,502**	2,502	0
111	**741**	0	741	628	124	**752**	0	752	685	111	**796**	57	739
624	**1,910**	1,377	533	1,312	531	**1,843**	1,311	532	1,280	624	**1,904**	1,387	517
0	**0**	0	0	4	33	**37**	2	35	18	0	**18**	1	17
89	**337**	277	60	307	358	**665**	587	78	283	89	**372**	308	64
3	**3**	3	0	0	3	**3**	3	0	0	3	**3**	3	0
0	**10**	0	10	10	0	**10**	0	10	10	0	**10**	0	10
0	**118**	86	32	119	0	**119**	85	34	118	0	**118**	85	33
0	**162**	92	70	162	0	**162**	91	71	162	0	**162**	92	70

Change in Boards - CAXB to CAXD				Change in Boards - CAXB to CAXE				
Off-Peak	Total	Walk/Xfer	Drive	Peak	Off-Peak	Total	Walk/Xfer	Drive
206	**-367**	-156	-211	-581	55	**-526**	-160	-366
66	**75**	75	0	19	33	**52**	52	0
53	**67**	67	0	11	32	**43**	43	0
154	**484**	484	0	323	130	**453**	453	0
124	**752**	0	752	685	111	**796**	57	739
390	**1,382**	850	532	960	483	**1,443**	926	517
33	**37**	2	35	18	0	**18**	1	17
268	**321**	312	9	29	-1	**28**	33	-5
2	**-366**	-153	-213	-368	2	**-366**	-153	-213
0	**-17**	0	-17	-17	0	**-17**	0	-17
0	**0**	0	0	-1	0	**-1**	0	-1
0	**162**	91	71	162	0	**162**	92	70