CONTENTS
1.0 INTRODUCTION ..........................................................6
2.0 BASELINE CONDITIONS ANALYSIS ..........................................................8
  2.1 EXISTING CONDITIONS ..........................................................8
      2.1.1 POPULATION & EMPLOYMENT ..............................................8
      2.1.2 LAND USE ..........................................................8
      2.1.3 TRANSPORTATION FACILITIES ........................................8
  2.2 FUTURE CONDITIONS ..........................................................8
      2.2.1 POPULATION & EMPLOYMENT GROWTH ................................8
      2.2.2 LAND USE CHANGES/PROPOSED NEW DEVELOPMENT ..........14
      2.2.3 PROGRAMMED/PLANNED TRANSPORTATION IMPROVEMENTS ...14
3.0 INITIAL SCREENING ANALYSIS .........................................................14
  3.1 EVALUATION METHODOLOGY .......................................................14
  3.2 STUDY ALTERNATIVES ..............................................................14
  3.3 BUILD ALTERNATIVES DEFINITION .............................................15
      3.3.1 BUILD ALTERNATIVE 1, LOCAL FIXED ROUTE .........................18
      3.3.2 BUILD ALTERNATIVE 2, BRT ...........................................18
4.0 IMPACT ON RED LINE CORRIDOR ....................................................19
  4.1 CAPITAL AND OPERATING COSTS ...............................................19
      4.1.1 CAPITAL COSTS .........................................................19
      4.1.2 OPERATING COSTS ....................................................20
  4.2 ADDED RIDERSHIP ...............................................................20
  4.3 PER CAPITA TRIP COSTS ..........................................................22
5.0 AGENCY AND PUBLIC INVOLVEMENT ..........................................22
  5.1 AGENCY COORDINATION .........................................................22
  5.2 PUBLIC INVOLVEMENT ............................................................23
6.0 SUMMARY OF RESULTS .............................................................23

LIST OF FIGURES
Figure 1-1. Westfield Connection Study Area Base Map ........................................7
Figure 2-1. 2010 Population Density ..............................................................9
Figure 2-2. 2010 Employment Density ..........................................................10
Figure 2-3. Existing Land Use .................................................................11
Figure 2-4. 2040 Population Density ..........................................................12
Figure 2-5. 2040 Employment Density .......................................................13
Figure 3-1. Recommended Alignment .........................................................16
Figure 3-2. Route Alternatives .................................................................17
Figure 4-1. Ridership Profile - No Build ...................................................21
Figure 4-2. Ridership Profile - Alternative 2 ...............................................22

LIST OF TABLES
Table 3-1. Station Locations ...............................................................15
Table 4-1. Capital Cost Estimate for Westfield Connection Alternatives ..........19
Table 4-2. Operating Characteristics and Cost Estimates ...........................20
Table 4-3. Ridership Estimates (Per Average Weekday) .............................21
Table 4-4. Per Capita Trip Costs ............................................................22
Table 6-1. Evaluation Measures ............................................................23
Throughout 2013, the Indianapolis Metropolitan Planning Organization (MPO) in cooperation with the Indianapolis Public Transportation Corporation (IPTC, or locally recognized as IndyGo) and the Central Indiana Regional Transportation Authority (CIRTA), conducted a study to determine a preferred alignment and mode for a proposed rapid transit service that would connect Greenwood, Indiana (Johnson County) to Carmel, Indiana (Hamilton County) by way of downtown Indianapolis (Marion County). This study was dubbed the Red Line Alternatives Analysis (AA) and was concluded in December of that year with a recommended alternative of Bus Rapid Transit along a selected set of streets.

Since the conclusion of that study, the City of Westfield (Hamilton County) has experienced growth and development that suggest a connection of the Red Line further north warrants further analysis. The Indianapolis MPO has therefore undertaken this study, which analyzes options for coordinating transit service to Westfield in cooperation with the Red Line.

The study area for this analysis lies between the original AA’s north terminus, Carmel’s City Center, on the south and 206th Street in Westfield on the north. North-south connections between these two points generally included US 31 and roads within approximately two miles of US 31, both east and west.

Figure 1-1 shows the study area relative to the prior Red Line corridor study area, and the alignment/connection under examination. The study area consists of traffic analysis zones (TAZ's) that extend north from the prior Red Line study corridor (136th Street) to 206th Street/Sheridan Avenue on the north side of Westfield, and is approximately 30 square miles in area (relative to the 125 square miles of the original Red Line AA study area, or about a 24% increase in overall study area).

Figure 1-1 also shows the route alignment that serves as the preferred route alignment for the Red Line from Greenwood to Carmel, as well as from Carmel north to Westfield. North of Carmel, the alignment is 7.8 miles in length, an increase of 29% over the 27 mile length of the base Red Line alignment (Greenwood to Carmel).

North of Carmel’s City Center, five station nodes were considered for this connection, based on input from the MPO, the City of Westfield, and the City of Carmel. Within Westfield, two destinations were identified as possible termini for the connection:

- Grand Park ([http://www.grandpark.org/](http://www.grandpark.org/)) lies west of US 31 between 186th and 191st Streets. Over 400 acres, Grand Park contains 31 multi-purpose athletic fields, 26 outdoor diamonds, 2 indoor facilities and many miles of paved trails. Grand Park is still under development, but is expected to host over 1.5 Million visitors each year at full buildout.

- Grand Junction is currently in the planning and initial investment stages. It is a vision for a downtown space surrounding the interchange of U.S. 31 and S.R. 32 / Main Street and to its south and east. The implementation plan for the area ([http://issuu.com/cityofwestfield/docs/grand_junction_implementation_plan/1?e=7036538/4816627](http://issuu.com/cityofwestfield/docs/grand_junction_implementation_plan/1?e=7036538/4816627)) shows a mix of retail, residential, and office uses. Trails, parks, civic buildings, and other public spaces will be a key component of the development.

Existing and projected transportation, land use and socioeconomic conditions in the study area are considered in this analysis as a means for evaluating specific route and service alternatives, along with projected ridership and costs, both capital and operating/maintenance.

The Red Line BRT project will be proceeding into the National Environmental Policy Act (NEPA) environmental documentation phase of study in early 2015. The intent of the analysis contained herein is to aid decision makers in evaluating the most effective way to provide transit connectivity to Westfield. The result of that evaluation will have implications on both the NEPA process and the design of the Red Line.
Figure 1-1. Westfield Connection Study Area Base Map

Sources:
Indianapolis Metropolitan Area Geographic Infrastructure System (IMAGIS): Base map data
Indianapolis Metropolitan Planning Organization: Transportation network data
2.0 BASELINE CONDITIONS ANALYSIS

2.1 EXISTING CONDITIONS

2.1.1 POPULATION & EMPLOYMENT

In 2012, the population of the study area was estimated to be 40,603 persons, which equated to 14,513 households, or an average household size of 2.8 persons. Total employment in this same period was estimated to be 15,830. The average household within the study area had 2.4 automobiles.

Figures 2-1 and 2-2, respectively, show year 2010 population and employment densities for the study area relative to the Red Line corridor. Residential densities are modest, typical of a suburban area with predominately single-family residential homes. Employment density is light overall, with concentrations of retail and service employment along the 146th Corridor and, to a lesser extent, along S.R. 32 in Westfield.

2.1.2 LAND USE

Figure 2-3 shows that existing land uses are predominately residential, with spines of commercial activities along U.S. 31 and S.R. 32 and adjacent light industrial development. Data sources show considerably less detail on land uses north of 146th Street and thus cannot be relied upon for acreage calculations.

2.1.3 TRANSPORTATION FACILITIES

U.S. 31 is a state highway that bisects the Westfield Connection study area in a north-south direction. In 2012, traffic volumes on U.S. 31 were approximately 27,000 vehicles per day on the segment between S.R. 32 and 146th Street. This facility is currently under construction. It is being upgraded to limited access (grade separated crossings) through Hamilton County from State Road 38 on the northern end to Interstate 465 on the southern end. Construction is expected to be complete in Fall 2015. Delays along US 31 are considerable, particularly in the peak hour, and predate the capacity expansion project in progress. The current project is expected to conclude late in 2015, and the resulting limited access is expected to greatly improve north-south mobility in the US 31 corridor.

S.R. 32 is an east-west state highway with at-grade intersections and traffic volumes of approximately 20,000 vehicles per day near its intersection with US 31.

146th Street is a local arterial that serves as the boundary between the cities of Carmel and Westfield. Traffic volumes on 146th Street at US 31 are approximately 16,000 vehicles per day.

No fixed-route transit service currently exists in the study area. The closest transit service was the Express Bus from Carmel to Downtown Indianapolis, but this has been discontinued due to lack of funds. A fixed-route circulator has been planned for Carmel, but has not yet been designed or implemented. Janus Services operates an on-demand transit service throughout Hamilton County called the Hamilton County Express which is available to meet the transportation needs of individuals with disabilities as well as the general public. More information on this service can be found at the following website:

http://www.janus-inc.org/programs-services/hamilton-county-express

2.2 FUTURE CONDITIONS

2.2.1 POPULATION & EMPLOYMENT GROWTH

Figures 2-4 and 2-5 show projected population and employment densities, respectively, for the study area. By the Year 2040, population within the study area is projected to grow 75% to 71,193 persons, or about 2.7% per year. Average household size is expected to have declined slightly in this same period, to 2.7 persons. Much of the population growth will occur in the western portions of the study area and, to a lesser extent, the southeastern portions of the study area. Employment is expected to nearly double from 2010 levels, to 29,455 employees (an 86% increase, or about 3% per year). Employment growth is expected to occur within and around currently existing employment centers, specially along 146th Street and S.R. 32.
WESTFIELD CONNECTION
2010 POPULATION MAP

- STUDY AREA
- RED LINE PROJECT AREA
- RED LINE ROUTE (NO BUILD)
- ROUTE CONNECTION (ALT. 1 & 2)

POPULATION PER SQUARE MILE

< 500
500-1,000
1,001-5,000
5,001-10,000
> 10,000

Sources:
Indianapolis Metropolitan Area Geographic Infrastructure System (IMAGIS): Base map data
Indianapolis Metropolitan Planning Organization: Transportation network & Sociodemographic data

Figure 2-1. 2010 Population Density
WESTFIELD CONNECTION ANALYSIS: RED LINE

2010 EMPLOYMENT MAP

- STUDY AREA
- RED LINE PROJECT AREA
- RED LINE ROUTE (NO BUILD)
- ROUTE CONNECTION (ALT. 1 & 2)

EMPLOYMENT PER SQUARE MILE

- < 1,000
- 1,000 - 2,500
- 2,501 - 10,000
- 10,001 - 50,000
- > 50,000

Sources:
Indianapolis Metropolitan Area Geographic Infrastructure System (IMAGIS): Base map data
Indianapolis Metropolitan Planning Organization: Transportation network & Sociodemographic data

Figure 2-2. 2010 Employment Density
WESTFIELD CONNECTION
EXISTING LAND USE

- STUDY AREA
- RED LINE PROJECT AREA
- RED LINE ROUTE (NO BUILD)
- ROUTE CONNECTION (ALT. 1 & 2)

AGRICULTURE
RURAL RESIDENTIAL
VERY LOW DENSITY RESIDENTIAL
LOW DENSITY RESIDENTIAL
MEDIUM-LOW DENSITY RESIDENTIAL
MEDIUM DENSITY RESIDENTIAL
MEDIUM-HIGH DENSITY RESIDENTIAL
HIGH DENSITY RESIDENTIAL
NEIGHBORHOOD COMMERCIAL
COMMUNITY COMMERCIAL
REGIONAL COMMERCIAL
HEAVY COMMERCIAL

OFFICE
INSTITUTIONAL
LIGHT INDUSTRIAL
GENERAL INDUSTRIAL
HEAVY INDUSTRIAL
GENERAL MIXED USE
COMMERCIAL MIXED USE
OFFICE MIXED USE
ARTERIAL MIXED USE
INTERCHANGE MIXED USE
URBAN MIXED USE
TOWN CENTER
MIXED USE VILLAGE
AIRPORT MIXED USE
AIRPORT CLEAR ZONE
PUD / OTHER
LANDFILL
CONSERVATION
PARK

Sources:
Indianapolis Metropolitan Area Geographic Infrastructure System (IMAGIS):
Base map data and land use classifications
Indianapolis Metropolitan Planning Organization: Transportation network data

Figure 2-3. Existing Land Use
Figure 2-4. 2040 Population Density
WESTFIELD CONNECTION ANALYSIS

2040 EMPLOYMENT MAP

- STUDY AREA
- RED LINE PROJECT AREA
- RED LINE ROUTE (NO BUILD)
- ROUTE CONNECTION (ALT. 1 & 2)

EMPLOYMENT PER SQUARE MILE

- < 1,000
- 1,000 - 2,500
- 2,501 - 10,000
- 10,001 - 50,000
- > 50,000

Sources:
Indianapolis Metropolitan Area Geographic Infrastructure System (IMAGIS): Base map data
Indianapolis Metropolitan Planning Organization: Transportation network & Sododemographic data

Figure 2-5. 2040 Employment Density
2.2.2 LAND USE CHANGES/PROPOSED NEW DEVELOPMENT

The City of Westfield's comprehensive plan (http://www.westfield.in.gov/egov/documents/1376577220_98148.pdf) was adopted in 2007 and updated several times since. The Plan balances the need to accommodate residential growth with maintaining the character and densities of its historic town center, located to the east of the intersection of SR 32 and US 31. A transit circulation plan is called out as a recommendation, although such a study has not yet been conducted.

Special attention is paid to “Grand Junction” in the historic center of town, the centerpiece of which includes the creation of a public gathering space at Grand Junction Plaza. Key public investment opportunities are also identified for this location.

Recognizing the importance to the community of the S.R. 32 and U.S. 31 interchange, a signature bridge structure has been proposed there as a gateway to downtown Westfield. Since the bridge would span S.R. 32, it is important that bridge enhancements be visible from U.S. 31. It is contemplated that large towers, resembling torches, would anchor at least two of the corners of the bridge.

Located in the northwest quadrant of U.S. 31 and S.R. 32, Grand Park is the economic development area surrounding the Grand Park Sports Campus, which opened June 22, 2014 and could become a significant anchor for high-capacity transit. With a development focus on tourism, hospitality, life science, research and development, and distribution, the Plan anticipates a significant amount of growth in this area. It is anticipated that the majority of the tourism and hospitality businesses will consist of national or regional chains that will be easily recognizable to the estimated 1.5 million visitors per year at the Grand Park Sports Campus.

2.2.3 PROGRAMMED/PLANNED TRANSPORTATION IMPROVEMENTS

The aforementioned U.S. 31 limited access improvements project is anticipated to fully open in 2015, and will greatly facilitate north-south traffic movements, connecting I-465 to the south to destinations within and north of the study area. No other roadway capacity projects within the study area are listed in the MPO’s Long-Range Transportation Plan; being listed in the Plan is a requirement for a project to receive federal transportation funds. The City continues to implement other projects to enhance local mobility with its own funds, including finalizing the connection along Westfield Boulevard/Union Street from the east side of US 31 at 161st Street to the west side of US 31 at 151st Street. The alignment being studied assumes the completion of this project and is planned to utilized that infrastructure. A proposal for upgrading SR 37 in Noblesville, a north-south facility located to the east of the study area that feeds into I-69 and subsequently into I-465, to limited access is under discussion but has not yet been programmed.

3.0 INITIAL SCREENING ANALYSIS

3.1 EVALUATION METHODOLOGY

The process for evaluating each of the alternatives consisted of one stage of screening, using evaluation measures that contained a sub-set of the measures that were developed for the initial Red Line Alternatives Analysis.

The measures that were used for this evaluation were selected based upon availability of data and with the understanding that an extended alignment would be more thoroughly assessed in the NEPA phase of the Red Line project. Meetings with representatives from the planning and economic development staffs of the Cities of Carmel and Westfield confirmed the use of this method and the selected measures as appropriate for meeting their goals and objectives.

Screening measures included population and employment, projected ridership, and cost per rider (cost effectiveness). Both qualitative and quantitative methods of evaluation were employed in the screening of potential alternatives.

3.2 STUDY ALTERNATIVES

Three service alternatives were analyzed in this study; the No Build and two Build alternatives. The No Build alternative consists of the Red Line Alternative that was recommended and approved by the Indianapolis Regional Transportation Council in December 2013 at the conclusion of the Red Line AA study and addenda to the study completed throughout 2014. In the No Build alternative, BRT service would be provided from Greenwood (Johnson County) to the south, extending north through downtown Indianapolis (Marion County) and ending at Carmel’s City Center in Carmel (Hamilton County). No service would be
provided north of City Center (126th and Range Line Road) in this Alternative.

Build Alternative 1 -- “Alt 1 (Shuttle)” -- is considered to be the local fixed route option. In this alternative, a local shuttle would circulate between the Carmel City Center and points north in Westfield, including Grand Junction and Grand Park. This alternative would utilize the Red Line BRT south of Carmel’s City Center, with riders transferring to the local shuttle for destinations north of City Center.

Build Alternative 2 -- “Alt 2 (BRT)” -- is considered the Bus Rapid Transit (BRT) option. In this alternative, the Red Line BRT service would extend north of Carmel’s City Center into Westfield to access Grand Junction, Grand Park, and other stations without the need for a transfer.

Multiple alignment alternatives were also considered, but were eliminated from further consideration early in the process as shown in figure 3-2. These included a “loop” option which would provide circulation through a greater area of Westfield and an option that traversed along U.S. 31 instead of along Westfield Boulevard and Union Street. The “loop” option was eliminated because of cost and service inefficiencies inherent to one-way service. The U.S. 31 option was eliminated because of the inability to provide stations and thus serve riders along this long portion of limited access highway. Other alignment variations were eliminated based on input from the City of Westfield and the City of Carmel.

Given the elimination of the aforementioned variations, a single route alignment was therefore selected for both of the service alternatives. This alignment is shown in Figure 1-1. From the original Red Line north termini (116th and Rangeline Road), the route would follow Rangeline Road north through the Clay Terrace shopping area, then east on 146th Street, and north on the U.S. 31 collector-distributor (CD) system to access 151st Street. From the 151st Street / U.S. 31 intersection, the route would travel west on 151st Street and then north on Westfield Boulevard (which becomes S. Union Street) to Grand Junction. It should be noted that the connection from 151st Street along Westfield Boulevard/Union Street to S.R. 32 is planned but not yet constructed. Construction is anticipated for completion in 2016 and therefore assumed to be completed for the purposes of this analysis. The route would then continue west along S.R. 32, then north on Wheeler Road and into Grand Park, where it would terminate.

### 3.3 BUILD ALTERNATIVES DEFINITION

The selected alignment for both Build Alternatives is the same and is shown in Figure 3-1 with five proposed station nodes identified. The Build Alternatives assume stops at the following locations:

<table>
<thead>
<tr>
<th>STATION NODE</th>
<th>INTERSECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carmel Arts District</td>
<td>Range Line Road &amp; Main Street</td>
</tr>
<tr>
<td>Clay Terrace</td>
<td>Clay Terrace Boulevard at Clay Terrace Mall</td>
</tr>
<tr>
<td>Greyhound Plaza / Village Park Plaza</td>
<td>US 31 Collector-Distributor (CD) Roads &amp; 151st Street</td>
</tr>
<tr>
<td>Grand Junction</td>
<td>Union Street &amp; S.R. 32</td>
</tr>
<tr>
<td>Grand Park</td>
<td>Grand Park Boulevard &amp; 186th Street</td>
</tr>
</tbody>
</table>

It should be noted that Alt 1 (Shuttle) assumes 9 actual stop/platform locations, including a northbound and southbound stop at all the station nodes listed above, except for the Grand Park station node which would have a single terminus stop.

Alt 2 (BRT) assumes the same stop locations as Alt 1 (Shuttle), however it would also include the addition of one BRT stop at Carmel City Center, in addition to the one already planned, so that there would be northbound and southbound service at that location. This yields a total of 10 stops for that alternative.

The added one-way route length to the Red Line for either Alternative would be 7.8 miles, resulting in an 15.6 mile round trip between Carmel City Center and Grand Park.
WESTFIELD CONNECTION ANALYSIS: RED LINE

ALTERNATIVE & STATION CONFIGURATION

Sources:
Indianapolis Metropolitan Area Geographic Infrastructure System (IMAGIS): Base map data
Indianapolis Metropolitan Planning Organization: Transportation network data

Figure 3-1. Recommended Alignment
WESTFIELD CONNECTION ANALYSIS: RED LINE

ROUTE ALTERNATIVES

WESTFIELD STUDY AREA

RED LINE PROJECT AREA

RED LINE ROUTE (NO BUILD)

RECOMMENDED ROUTE (ALT. 1 & 2)

SCREENED OUT

STATIONS

Sources:
Indianapolis Metropolitan Area Geographic Infrastructure System (IMAGIS): Base map data
Indianapolis Metropolitan Planning Organization: Transportation network data

Figure 3-2. Route Alternatives
3.3.1 ALT 1 (SHUTTLE)

The operating parameters for Alt 1 (Shuttle) were assumed to be consistent with the proposed operating plan for the Red Line south of Carmel’s City Center (No Build). This assumption would facilitate its serving as a feeder service to the remainder of the Red Line. Its overall round trip travel time between Carmel City Center and Grand Park is estimated to be 45 minutes, with the assumption of no transit signal priority treatments north of City Center.

Specifically, the proposed span of service for Alt 1 (Shuttle) is 20 hours on weekdays, 18.5 hours on Saturdays and 14.5 hours on Sundays as follows:

- Weekdays: 4:30 AM – 12:30 AM
- Saturdays: 6:00 AM – 12:30 AM
- Sundays: 6:30 AM – 9:00 PM

Headways for Alt 1 (Shuttle) were assumed to be:

- Weekdays: 10 minutes during peak period (6:00 AM – 9:00 AM and 4:00 PM – 7:00 PM); 15 minutes during the off-peak period
- Weekends: 20 minutes daytime, 30 minutes night

Alt 1 (Shuttle) would add approximately 21,200 revenue hours of service to the overall North Red Line (No Build) operation, including layover time at the line’s terminus point.

In the Red Line AA, a classification system was developed for the station areas in order to assist in cost estimating and simplify future design. Each of the nine stops (one in each direction at four proposed station nodes and one at the Grand Park terminus) for Alt 1 (Shuttle) were assumed to be on par with a typical sheltered IndyGo stop. These stations are characterized by a concrete waiting area, a bus shelter, a seating area, the potential for real-time passenger information, and lighting. Off-board fare collection, while identified as a feature for this station type under a BRT operation, was not assumed for this service.

The peak vehicle requirement for Alt 1 (Shuttle) would be six vehicles. Four vehicles would be required during weekday off-peak periods. It is anticipated that 40-ft standard buses would be used.

3.3.2 ALT 2 (BRT)

The operating parameters for Alt 2 (BRT), which extends BRT service north of Carmel into Westfield, were assumed to be consistent with the operating plan for the Red Line south of Carmel City Center (No Build), as documented in the December 2013 AA reports and 2014 addenda.

The estimated round trip travel time between Carmel City Center and Grand Park for Alt 2 (BRT) would be 39 minutes. Travel time savings associated with the implementation of transit signal priority at signalized intersections was assumed.

The average speed would be exclusive of layover time, which was assumed to be 10 minutes. It was assumed that layover/recovery time would be scheduled at the end of the Red Line at Grand Park.

The proposed span of service for Alt 2 (BRT) is identical to Alt 1 (Shuttle) with 20 hours on weekdays, 18.5 hours on Saturdays and 14.5 hours on Sundays and hours defined as follows:

- Weekdays: 4:30AM – 12:30 AM (20 hours per day)
- Saturdays: 6:00 AM – 12:30 AM (18.5 hours)
- Sundays: 6:30 AM – 9:00 PM (14.5 hours)

Headways were assumed to be:

- Weekdays: 10 minutes during peak period (6:00 AM – 9:00 AM, 4:00 PM – 7:00 PM); 15 minutes during the off-peak period
- Weekends: 20 minutes daytime, 30 minutes night
Alt 2 (BRT) would add nearly 18,400 revenue hours of service to the overall North Red BRT Line (No Build) operation, including layover time at the line’s terminus point. This would be an increase in total North Red BRT Line (No Build) revenue hours of approximately 35%.

Each of the ten stations for Alt 2 (BRT) were assumed to be of the “Basic” classification, as defined in the Red Line AA study. These stations are characterized by an enhanced shelter, real-time passenger information, off-board fare collection, security system, lighting, trash receptacles, bicycle parking, and raised platforms/level boarding.

The peak vehicle requirement for the fixed route alternative would add five vehicles to the overall North Red BRT Line (No Build). Four added vehicles would be required during weekday off-peak periods. It was assumed that 60-ft articulated BRT-style buses would be used, which is consistent with the recommendation from the Red Line AA study for service south of Carmel’s City Center.

### 4.0 IMPACT ON RED LINE CORRIDOR

#### 4.1 CAPITAL AND OPERATING COSTS

##### 4.1.1 CAPITAL COSTS

Capital costs for the two Build Alternatives are consistent with the Red BRT Line (No Build) unit costs that were developed based on industry unit costs for different equipment items and local construction costs. Capital costs are summarized using the FTA Standard Cost Categories (SCC) worksheets for the different service elements, including running-way, transit priority treatments, vehicles, and stations. The SCC worksheets identify different capital improvement and project management categories and associated contingencies. These worksheets are the standard format that FTA requires for projects to be considered for Section 5309 funding.

The capital cost for Alt 1 (Shuttle) assumed features consistent with a full service IndyGo transit station with bus shelters and seating areas at all nine stop locations. Capitol costs for Alt 1 (Shuttle) also assumed 40-foot (standard) buses as the preferred vehicle. Capital costs for Alt 2 (BRT) are reflective of the station improvements, transit signal priority treatments, off-board fare collection, real-time passenger information, security systems, and the number of vehicles from the operating plan assumed. Costs for these elements were aggregated into the different FTA SCC categories, as shown in Table 4-1.

The assumed contingency for different construction line items (known as “allocated” contingency), ranges from 15 to 20%, and is consistent with FTA assumptions and practices. An “unallocated” contingency of 10% across all project elements was also identified, based on FTA guidance and consultant team project experience. Finally, Project Management was assumed to be 27% of Items in cost categories 10-50, which is consistent with comparable FTA projects, and is broken out into the different items as shown.

<table>
<thead>
<tr>
<th>FTA Standard Cost Category</th>
<th>Alt 1 (Shuttle)</th>
<th>Alt 2 (BRT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Guideway &amp; Track Elements</td>
<td>$117,288.00</td>
<td>$130,320.00</td>
</tr>
<tr>
<td>20 Stations, Stops, Terminals, Intermodal</td>
<td>$594,270.00</td>
<td>$3,198,362.40</td>
</tr>
<tr>
<td>40 Sitework &amp; Special Conditions</td>
<td>$381,510.00</td>
<td>$550,560.00</td>
</tr>
<tr>
<td>50 Systems</td>
<td>$124,200.00</td>
<td>$504,407.00</td>
</tr>
<tr>
<td>70 Vehicles</td>
<td>$2,520,000.00</td>
<td>$4,882,500.00</td>
</tr>
<tr>
<td>80 Professional Services</td>
<td>$361,528.60</td>
<td>$1,301,943.87</td>
</tr>
<tr>
<td>Unallocated Contingency</td>
<td>$409,879.66</td>
<td>$1,056,809.33</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$4,508,676.26</td>
<td>$11,624,902.60</td>
</tr>
</tbody>
</table>
4.1.2 Operating Costs

The estimated annual operating and maintenance (O&M) cost for Alt 1 (Shuttle) is estimated to be $2.2 million in 2014 dollars for the segment between Carmel City Center and Grand Park. The estimated incremental annual O&M cost for Alt 2 (BRT) is $1.9 million (2014 dollars). This cost estimate will require refinement in the next stage of project development which may result in a slightly different revenue hour and revenue mile totals.

The estimates of O&M costs were based on an extrapolation of the cost estimates for the base Red Line BRT (No Build), which used 2012 dollars (based on IndyGO operating costs per revenue hour). A total 3.94 percent inflation rate for the two-year period between 2012 and 2014 was applied to develop 2014 estimates, using the change in the Consumer Price Index for Cincinnati, which is the closest city to Indianapolis for which the Bureau of Statistics monitors CPI. This yielded a total O&M cost estimate of $104.35 per bus revenue hour in 2014.

The transit travel times have been predicted based upon travel speeds applied to roadway segments between stations. Time was added for dwell time at stops/stations; assumed to be 20 seconds per station for Alt 2 (BRT) and 30 seconds per stop for Alt 1 (Shuttle). These assumptions are based on input from IndyGo and are consistent with recent analysis efforts comparing local transit operations with BRT operations.

Travel time savings for transit signal priority treatments was assumed to be 10 percent and it was only assumed for Alt 2 (BRT). Alt 2 (BRT) was assumed to have an overall dwell time of 2.7 minutes whereas Alt 1 (Shuttle) was assumed to have an overall station dwell time of 4 minutes. A layover time of 10 minutes was assumed at the northern terminus at Grand Park for both alternatives.

Table 4-2 identifies the specific service characteristics and estimated annual operating cost for each Build Alternative.

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Round Trip Travel Time (min.)</th>
<th>Number of Buses (Peak / Off-Peak)</th>
<th>Total Number Revenue Hours (Annual)</th>
<th>Total Operating Cost (Annual)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alt 1 (Shuttle)</td>
<td>45</td>
<td>6 / 4</td>
<td>21,229</td>
<td>$2,215,161</td>
</tr>
<tr>
<td>Alt 2 (BRT)</td>
<td>39</td>
<td>5 / 4</td>
<td>18,399</td>
<td>$1,909,876</td>
</tr>
</tbody>
</table>

Weekday Peak - 6-9 AM, 4-7 PM

Weekday Off-Peak - 4:30 AM - 6:00 AM, 9 AM-4 PM, 7-12:30 AM

4.2 Added Ridership

The Central Indiana Travel Demand Model (TDM) was used to develop the ridership estimates for each of the study’s Build Alternatives, as well as the No Build alternative. It should be noted that the TDM has limitations with regard to estimating potential ridership. The TDM does not take into account the potential for additional trip generation that may occur as a result of transit oriented development. The TDM also does not take into account special trip generators, such as Grand Park, which may have inconsistent peak hours of transit use or demand on the roadway system by automobiles. The TDM primarily estimates ridership based on permanent potential trip generators with traditional (morning/afternoon) peak hours of service such as residential uses and employment with consistent hours of operation.

Table 4-3 compares the results of the model runs. The two Build Alternatives each add about 700 to 800 total new transit users over the No Build alternative, an increase of about 2.4% in total ridership. This includes transit trips on the Red Line service as well as trips that will be taken on local bus and express bus to access the Red Line. The majority of Alt 1 (Shuttle) ridership appears to be for trips both originating and terminating in Westfield. Only 37 of the new Alt 1 (Shuttle) trips travel south of Carmel’s City Center to utilize the Red Line BRT.
Table 4-3. Ridership Estimates (Per Average Weekday)

<table>
<thead>
<tr>
<th>SCENARIO</th>
<th>BRT Transit</th>
<th>Non-BRT Transit</th>
<th>All Transit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Drive</td>
<td>Walk</td>
<td>Total</td>
</tr>
<tr>
<td>No Build (BRT Greenwood to Carmel)</td>
<td>5,563</td>
<td>3,722</td>
<td>9,285</td>
</tr>
<tr>
<td>Alt 1 (Shuttle)</td>
<td>5,216</td>
<td>3,801</td>
<td>9,322</td>
</tr>
<tr>
<td>Alt 2 (BRT)</td>
<td>6,140</td>
<td>3,958</td>
<td>10,098</td>
</tr>
</tbody>
</table>

Alt 2 (BRT) produces the highest BRT ridership – about 8.7% higher than the No Build alternative. Most of this ridership accrues in the southbound direction and consists of drive-access users (primarily park and ride (PNR)).

Despite the increase in ridership for the Build Alternatives, the BRT connection itself is not heavily utilized, as shown in the following ridership profile charts. Figure 4-1 is for the No Build alternative. Figure 4-2 is for Alt 2 (BRT). The Alt 1 (Shuttle) profile is not provided here because the BRT Ridership for Alt 1 (Shuttle) is indistinguishable from the BRT Ridership for the No Build alternative.

Ridership Profile - No Build

![Ridership Profile - No Build](image)

Figure 4-1. Ridership Profile - No Build
The BRT connection corresponds to the area shaded in orange in the second chart, which shows that the overall ridership during this interval within Westfield. The main ridership generator is the proposed park and ride (PNR) lot located at Clay Terrace Mall near 146th Street. This facility appears to generate slightly more ridership than the comparable No Build alternative PNR lot at 116th Street, increasing ridership by about 100 more riders.

4.3 PER-TRIP COSTS

Table 4-4, below, shows the Red Line implementation costs per trip for the three options under study: the preferred alternative from the Red Line AA study (No-Build), Alt 1 (Shuttle) and Alt 2 (BRT). These figures are for the entire Red Line corridor, from Greenwood to the north terminus (Carmel or Westfield depending on the alternative). For purposes of this analysis, total capital costs were annualized assuming 30-year bonding at 3%.

Table 4-4. Per-Trip Costs

<table>
<thead>
<tr>
<th></th>
<th>No-build (BRT Greenwood to Carmel)</th>
<th>Alt 1 (Shuttle)</th>
<th>Alt 2 (BRT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost per BRT trip</td>
<td>$ 7.18</td>
<td>$ 8.04</td>
<td>$ 7.44</td>
</tr>
<tr>
<td>Cost per transit trip</td>
<td>$ 2.38</td>
<td>$ 2.61</td>
<td>$ 2.61</td>
</tr>
</tbody>
</table>
5.0 AGENCY AND PUBLIC INVOLVEMENT

5.1 AGENCY COORDINATION

During the scope development process, the Indianapolis MPO, Parsons Brinckerhoff, and representatives from the Cities of Westfield and Carmel all met to discuss the scope of the study and screen out alternatives to help narrow the limits of the study. Matt Skelton, the Director of Economic and Community Development and Ken Alexander, the Director of Public Works were in attendance from the City of Westfield. Mike Hollibaugh, the Director of Community Services and David Littlejohn, the Alternative Transportation Coordinator were in attendance from the City of Carmel. This initial pre-project meeting established the project limits and the alignment alternatives to be studied. The Indianapolis MPO kept the Cities of Westfield and Carmel appraised of the progress of the study, and also coordinated with those entities to attain relevant data and development information to assist during the study process. Final meetings were held in January 2015 with the Cities of Westfield and Carmel to discuss the results of the analysis.

5.2 PUBLIC INVOLVEMENT

The current IndyGo Forward initiative has conducted an extensive outreach effort throughout greater Indianapolis, including specific public involvement opportunities in Hamilton County. In September 2014, the IndyGo Forward team conducted a workshop with the Hamilton County Transit Forum, a group from Hamilton County that includes representatives from its cities and towns, major employers, school districts, and other stakeholders. The intent of the workshop was for the consultant team to better understand what Hamilton County stakeholders desire to achieve with a transit system and to help educate them on transit opportunities and choices in their communities. The potential alignment option for the Red Line Connection into Westfield was reviewed by the Forum during this workshop and feedback was received and recorded.

This Westfield Connection Study is intended to be a feasibility study. The Indianapolis MPO intends to conduct a public outreach effort within Hamilton County that is specific to the Red Line Study during the first quarter of 2015, which would feed directly into the environmental assessment, which is the next phase of study. As with previous phases of this study, outreach will be designed to educate the public on the study’s analysis and recommendations and also to receive input and feedback for incorporation into its next phases of study.
6.0 SUMMARY OF RESULTS

This study examined options for connecting transit service from the rapid transit Red Line’s currently planned northern terminus at Carmel City Center (as indicated in the 2013 Alternatives Analysis and 2014 Addenda -- No Build alternative) further north to Westfield. A number of route alternatives were examined and screened out for technical reasons, leaving a single local fixed route option -- Alt 1 (Shuttle) -- and a single Bus Rapid Transit (BRT) option -- Alt 2 (BRT) -- as remaining alternatives. Alt 1 (Shuttle) would connect from Grand Park at the northern terminus to the No Build alternative Red Line BRT at Carmel City Center as a transfer, while Alt 2 (BRT) would entail a seamless no-transfer option at City Center for northbound and southbound BRT passengers. Both alternatives used the same 7.8-mile alignment and station locations.

The Evaluation Measures table below (Table 6-1) outlines important metrics when comparing the two alternatives to the No Build alternative. It summarizes the annualized capital and operating costs associated with each of the three options (the No Build alternative of BRT service from Greenwood to Carmel City Center; Alt 1 (Shuttle) which includes local fixed route service from City Center to Grand Park; and Alt 2 (BRT), which provides for BRT service from Greenwood to Grand Park).

The table also shows the total ridership specific to each option. The Central Indiana Travel Demand Model (TDM) was used to develop the ridership estimates. It should be noted that the TDM has limitations with regard to estimating potential ridership. The TDM does not take into account the potential for additional trip generation that may occur as a result of transit oriented development. The TDM also does not take into account special trip generators, such as Grand Park, which may have inconsistent peak hours of transit use or demand on the roadway system by automobiles. The TDM primarily estimates ridership based on permanent potential trip generators with traditional (morning/afternoon) peak hours of service such as residential uses and employment with consistent hours of operation. Therefore, ridership estimates included in this analysis should be considered as conservative estimates.

The next phase of study for the Red Line (the environmental review phase) could evaluate the current BRT connection alignment and station locations, and perhaps a truncated connection as well. Local bus service does not appear relevant to Red Line BRT ridership, whatever other local benefit such service might provide.

Table 6-1. Evaluation Measures

<table>
<thead>
<tr>
<th></th>
<th>No Build (BRT Greenwood to Carmel)</th>
<th>Alt 1 (Shuttle)</th>
<th>Alt 1 (BRT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Cost (Annualized)</td>
<td>$6,283,379</td>
<td>$6,513,425</td>
<td>$6,876,478</td>
</tr>
<tr>
<td>O&amp;M Cost (Annual)</td>
<td>$13,370,000</td>
<td>$15,585,000</td>
<td>$15,289,000</td>
</tr>
<tr>
<td>New Annual Trips (all transit modes)</td>
<td>8,266,213</td>
<td>8,461,165</td>
<td>8,495,487</td>
</tr>
<tr>
<td>Cost per trip</td>
<td>$ 2.38</td>
<td>$ 2.61</td>
<td>$ 2.61</td>
</tr>
</tbody>
</table>