

Chapter Three: Alternatives Considered

How Did the Alternatives Development and Evaluation Process Work?

The alternatives considered in the Alternatives Analysis (AA) were developed and screened in the two phases

of the AA. In Phase I, the 23-mile alignment from KCI Airport to the Kansas City Zoo approved by Kansas City voters in November 2006 was evaluated. Phase I also identified transit alternatives for the North/South Corridor that could serve the markets, have reasonable capital costs, and be supportive of development patterns and local infrastructure. Phase II involved much more detail such as determining the roadways the alternatives would operate on, the method of operation (side running vs. median running), and the type of transit to be used (streetcar, light rail, bus rapid transit). This chapter

describes the alternatives developed and screened for each the phases within the Alternatives Analysis.

How Were the Alternatives Selected To Be Studied in Detail?

The first level screening was completed during Phase I of the AA during the second half of 2007. This followed an analysis that concluded that the November 2006 voter approved plan was legally, technically, and financially infeasible.¹ In light of this conclusion, the first level screening was done to identify realistic transit

alternatives for the North/South Corridor that could reasonably serve the markets, have reasonable capital costs, and be supportive of development patterns and local infrastructure. Environmental considerations were also included in this first level screening.

Alternatives Considered: Screening and Definition

This section describes the transit alternatives that were studied in detail during the Alternatives Analysis. The Federal Transit Administration (FTA) mandates that at least three alternatives be studied for an Alternatives Analysis (AA); these include the No Build Alternative, Transportation System Management (TSM) Alternative and Build Alternative(s). The three alternatives that were considered for this study included the No Build Alternative, MAX Alternative and Light Rail Alternative. The process of evaluating alternatives is often referred to as “screening” and is carried out in several increasingly detailed steps or levels.

As prescribed by the KCATA Board of Commissioners and the Kansas City, Missouri City Council the first level screening was carried out under the guidance of the Citizens’ Task Force (CTF). The CTF was a 36-member ad hoc task force jointly appointed by the KCATA and the City of Kansas City in 2007 to help guide the planning process for determining alternative concepts in the North/South Corridor, and provide a recommendation to the KCATA Board and City Council.

The screening process was carried out in conjunction with the CTF. Screening criteria were developed by the Study Management Team (SMT) and accepted by the CTF. The criteria included:

- Ridership potential measured by proximity to population and employment concentrations
- Service to low income areas
- Service to activity centers
- Prospects for federal funding
- Overall capital cost
- Consistency with community plans and transit plans

¹ North/South Corridor Alternatives Analysis, Phase I Summary Report, KCATA, March 2008, pg 14.

○ Potential for economic development

Modal options were evaluated and presented to the CTF, project stakeholders, and the general public. The service, operating and cost characteristics of light rail, bus rapid transit, and streetcar were included in this evaluation.

At this level of analysis, most measures were assessed qualitatively, although estimates of capital costs were developed for use by the CTF. In addition to the 23-mile November 2006 LRT alignment, there were 14 different alignment alternatives, Figure 3-1 shows each alternative. Numerous variations of these alternatives were considered as part of this process. The mode was not specified initially but the focus was on light rail and bus rapid transit. One of the objectives of Phase I was to develop sufficient detail and local consensus on conceptual options to carry into a detailed assessment and analysis in Phase II. The Phase I Summary Report² documents the alternatives and factors used in the initial screening of alternatives.

Public meetings were held October 29, 2007 in Kansas City for the purpose of informing the public on the work of the CTF, and to allow the KCATA and CTF to get input from the public prior to final AA Phase I recommendations on route and mode concepts for the Corridor.

What Was the Outcome of the Phase I Screening Process?

The following is a summary of the conclusions regarding transit alternatives in the North/South Corridor for Kansas City from Phase I of the Alternatives Analysis. The following is a excerpt from the Phase I report that summarizes the conclusions.¹

“Light rail or BRT must be part of a comprehensive transit system with routes and services throughout Kansas City and transit connections to other parts of the

metropolitan area. At a minimum, this comprehensive transit system will include bus rapid transit (BRT) now under design on Troost Avenue, future BRT on Prospect Avenue and connections to areas in the Northland, including the KCI Airport.

KCATA and MARC are updating a regional transit plan, which could include the initial phase of light rail in Kansas City’s commercial core or other alternatives in this Corridor, and long term regional connections.

The conceptual alignments were developed based on the preliminary goals, identified transportation needs, and the following principles:

- *The alignment should connect the north, south and east areas of the City through the central business district.*
- *The preferred route should proceed south from a terminus north of the Missouri River, through the City of North Kansas City, to the Kansas City, Missouri central business district. The northern terminus should be near North Oak Trafficway and Vivion Road.*
- *From the central business district, the route should go south through the Crown Center/Union Station area and Midtown to a terminus near the Country Club Plaza.*
- *A light rail alternative must have a segment that proceeds east to a terminus at Prospect Avenue connecting with BRT lines on Troost and Prospect.*

This alternative, which would likely be a combination of LRT and BRT of approximately 12-to-14 miles, was considered the initial phase of a more extensive regional system and comprehensive transit plan for the Kansas City metropolitan area that will be developed in subsequent phases as funding becomes available.”

² North/South Corridor Alternatives Analysis, Phase 1 Summary Report, KCATA and HNTB, March 2008.

Figure 3-1: Phase I Proposed Study Alignments



An objective was established by the CTF and Kansas City Council to advance a plan for light rail to Kansas City voters by 2008.

Figure 3-2 shows the general alignment for the concepts for enhanced transit service resulting from Phase I. The Phase I alignment was intentionally nonspecific in recognition of the work that would be carried out in Phase II to define the alignment more precisely. It was acknowledged by the CTF and KCATA that many details such as specific street alignments, termini locations, connections with other transit services and station locations will be determined through technical planning and engineering studies in Alternative Analysis Phase II.

Beginning at the north terminus in the general vicinity of the intersection of Vivion Road and North Oak Trafficway, the alignment would proceed south along North Oak Trafficway through North Kansas City. The alignment would cross the Missouri River, likely on a new transit-only structure. The possibility of using the existing Heart of America Bridge or the ASB Railroad Bridge was not ruled out in Phase I.

The alignment would traverse the River Market area and downtown and proceed through the Crossroads District through the Crown Center/Union Station area.

The alignment would continue south through Midtown along Main Street to a southern terminus near the Country Club Plaza, possibly on the west edge of the University of Missouri - Kansas City campus at 51st Street.

An eastern extension would provide a connection to Prospect Avenue; at least two alternatives were identified for review in Phase II. Linwood Boulevard and the Brush Creek Corridor were identified as candidates.

During Phase I, a general definition of the light rail alternative for the Corridor was developed.

- The line will be operated as “street running” light rail. The service will be primarily operated in

reserved lanes within the right-of-way of existing streets.

- Operations will be optimized to achieve travel times using the following techniques:
 - Traffic signal priority or preemption;
 - Use of signals and rail communications systems; and
 - Traffic control measures.
 - The passenger rail service will be fully integrated with bus and BRT service.
 - Some existing bus routes will be modified to serve as feeder routes.
 - New bus routes will be established to serve as feeders, as required to provide appropriate area coverage.
- Vehicles and Systems
 - The vehicle type has not been determined, but
 - Will be low-floor to facilitate passenger access.
 - Vehicles will be powered by electric power distributed through an overhead catenary system. Other techniques for traction power distribution will be evaluated later in the project.

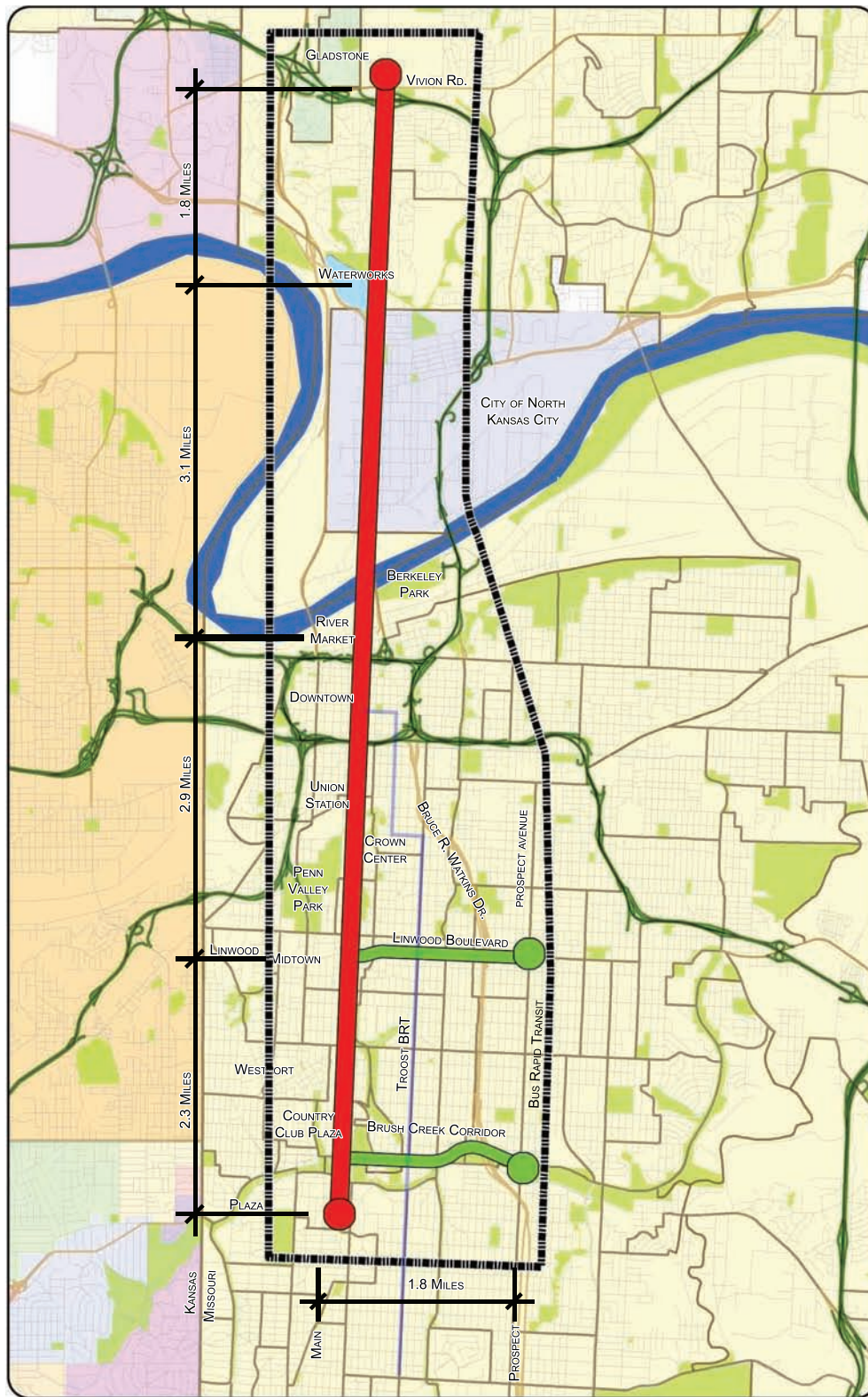
These recommendations were accepted by the KCATA Board of Commissioners at their November 16, 2007 meeting. The CTF recommendations were used as the starting point for Phase II of the Alternatives Analysis.

What Were the Alternatives Studied in Phase II?

No Build Alternative

The No Build Alternative includes existing transit service and highway facilities, and committed transportation projects anticipated to be operational by 2030. Committed transportation projects are those programmed in the Mid-America Regional Council

Figure 3-2: Phase I Transit Alignment Concepts



2008-2012 Transportation Improvement Program (TIP). The only significant new transit system project currently committed at this time is the Troost Avenue BRT project. Main Street MAX currently operates in the south portion of the North/South Corridor, connecting the River Market, Central Business District, Crown Center, and Country Club Plaza districts with continuing service (reduced service level, local stops) to the Waldo neighborhood at 74th Terrace. Troost MAX, now in the construction phase with service start up anticipated in 2010, would operate south from downtown along Troost Avenue to 75th Street, with local service continuing to the Three Trails Area at Hillcrest Road and Bannister Road.

The No Build Alternative does not include any major new transit projects that may arise from Corridor studies currently being conducted including those along the I-35 corridor, Shawnee Mission Parkway, and Metcalf Avenue corridors in Johnson County and the State Avenue corridor in Kansas City, Kansas. There are no significant changes in bus system level of service, including vehicle miles and hours, peak vehicles, and geographical coverage.

Figure 3-3 on the following page shows the elements of the No Build Alternative.

MAX Alternative

The MAX Alternative includes transit improvements to increase the attractiveness of existing bus services operated throughout the North/South Corridor. The MAX Alternative would expand upon the two MAX routes in the No Build Alternative. The MAX Alternative represents a level of capital investment that is greater than the No Build Alternative but substantially less than the Light Rail Build Alternative.

BRT-type improvements will be extended along Brookside Boulevard and Wornall Road to the current service terminus at 74th Terrace and Broadway in the Waldo neighborhood. In addition, BRT-type improvements will

also be extended along the Brush Creek corridor, via Volker Boulevard, and Prospect Avenue to Meyer Boulevard at Research Medical Center. A second MAX route would extend north from downtown along Burlington and Swift Avenue in North Kansas City and North Oak in Kansas City, north. A third MAX route will operate from downtown along Prospect Avenue to 63rd street. These BRT improvements will include improved stations with shelters, markers for higher visibility and electronic bus arrival information signs. Reserved lanes beyond the existing reserved lanes on Main Street do not appear to be justified due to low levels of traffic congestion and sufficient roadway space is not readily available. Transit signal priority (TSP) will be installed at key signalized intersections to improve transit travel times.

Improved transit services incorporated in the MAX Alternative include:

- Main Street MAX Extension – Main Street MAX will be modified and extended to serve the Waldo/Brookside area to 74th Terrace and the Brush Creek corridor and Prospect Avenue south to Meyer Boulevard. This route alignment is shown in Figure 3-6 on page 3-8.

Main Street MAX will use the current MAX routing in the River Market, Downtown, Crossroads, and Crown Center/Union Station districts.

- North Oak MAX – The North Oak MAX will extend BRT service across the Missouri River using the Heart of America Bridge, through the City of North Kansas City on Swift Avenue and to the vicinity of the Vivion Road and North Oak Trafficway intersection. A park and ride lot at the north terminus and a small park and ride lot in North Kansas City will be established. Queue jumpers may be used at key intersections such as Burlington Street, North Oak Trafficway, and Route 9 in North Kansas City. Service frequency will be similar to the current MAX service levels.

Figure 3-3: No Build Alternative

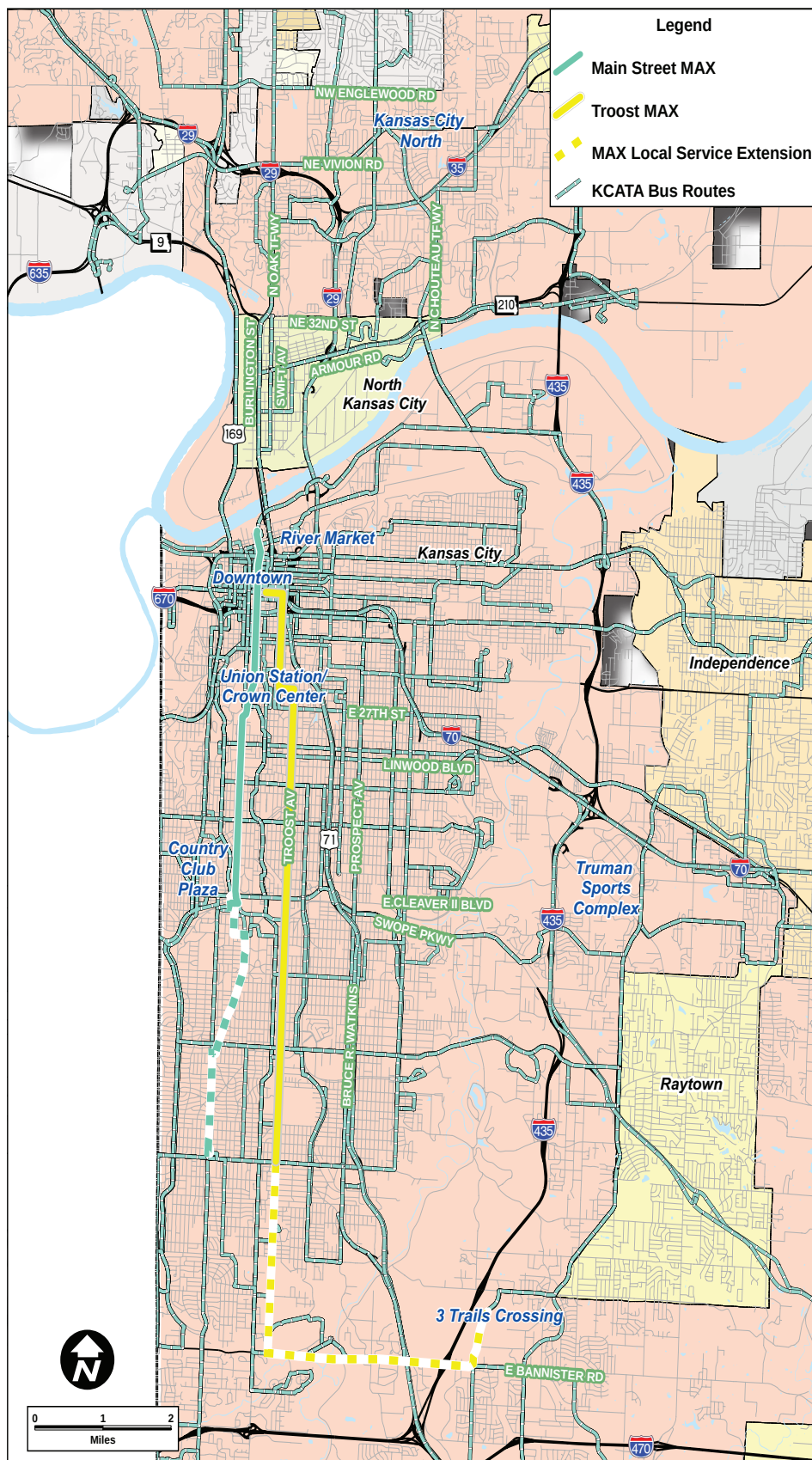
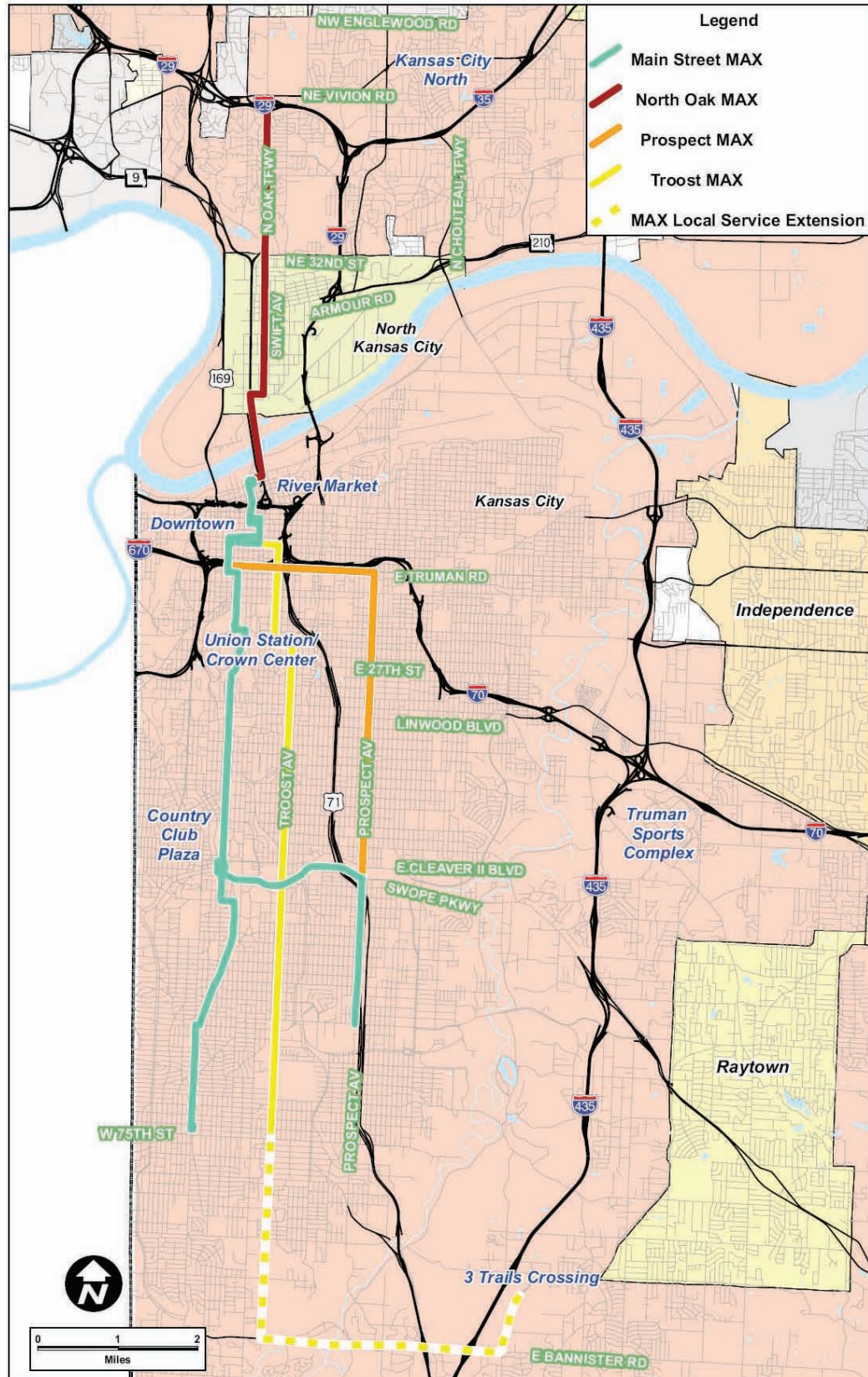


Figure 3-6 MAX Alternative



- Prospect MAX – The Prospect MAX will operate from 63rd and Prospect to downtown via Prospect Avenue and Truman Road. A park and ride lot will be established at the south terminus. Service frequency will be similar to current MAX service levels. The Prospect MAX and the southeast leg of the Main Street MAX will provide combined service between Meyer Boulevard and Swope Parkway.

MAX Vehicles

MAX vehicles would be similar in scale and function to the existing MAX vehicles. Figure 3-4 and 3-5 show the MAX vehicles used for Main and Troost MAX.

Figure 3-4: Existing Main Street MAX Vehicle



Figure 3-5: Proposed Bus Color Coding for Main and Troost MAX



MAX Stations

Proposed station locations have been developed for the three MAX alternatives. The successful station configuration used by KCATA's Main Street MAX will be:

- MAX station spacing of approximately 1/4 to 1/3 mile on the central portion of the routes.
- MAX service operated as an extension to the BRT route segment will make local stops.

Table 3-1 shows the pattern of stops on the MAX Alternative.

MAX stations would be similar in scale and function to the existing MAX station/stops. Figure 3-7 shows a typical MAX station.

Table 3-1: Stop Configurations - MAX Alternative

Route	Stop Configuration
Main Street MAX	Limited stops from 75th Street to downtown on southwest leg and 63rd Street to downtown on the southeast leg.
North Oak MAX	Limited stops from Vivion Road to downtown.
Prospect MAX	Limited stops from 63rd Street to downtown.

Figure 3-7: MAX Station



Modifications to the KCATA Bus System with the MAX Alternative

There will be modifications to the bus system to properly integrate the MAX routes into the overall regional transit system. Some existing bus routes would be duplicated by the new MAX routes and could be discontinued or reduced. Other bus routes need to be modified to feed bus passengers into MAX stations to achieve the desired system connectivity. New bus routes would need to be created to provide connecting service to areas presently not served, or underserved, to take best advantage of the investment in MAX.

In general, the “new” Main Street MAX would replace the current Main Street MAX service, with an increase in service levels on the Brookside/Waldo leg. The Brush Creek/Prospect leg would replace the current Route 71 Prospect local service allowing this route south of Brush Creek to be reduced. New routes in the Plaza area and Brush Creek area would be created to feed the MAX stations along Brush Creek.

The Prospect MAX would replace the current Prospect Avenue local service north of Brush Creek allowing service on this route to be reduced.

The North Oak MAX would replace service on local

Route 142, North Oak. Other services in the Northland would be reconfigured to serve as feeders to the MAX stations.

Service along Linwood Boulevard provided by Route 28 Blue Ridge would be improved by creating a local service route connecting with Blue Ridge Boulevard in the vicinity of 51st Street. The existing route extension to southeast Kansas City would be maintained. The purpose of this service modification is to improve east – west connectivity and provide improved service transit in the eastern part of Kansas City.

Table 3-2 summarizes the modifications to the bus system for the MAX Alternative. The bus service modifications for the MAX Alternative would result in an annual operating cost reduction of \$6.7 million. The reduction would partially offset the cost of operating the new MAX services.

Light Rail Transit (LRT) Alternative

The technical team developed a LRT Alternative to improve transit service in the North/South Corridor guided by an extensive program of agency and public input. Among the important considerations were ridership potential, minimizing land use and traffic impacts and local and federal funding sources. This alternative involves the construction and operation of a light rail fixed guideway transit system from northern Kansas City south to the Country Club Plaza area, with easterly legs on Emanuel Cleaver II Boulevard or Volker Boulevard. A south extension from Prospect Avenue along Bruce R. Watkins Drive to the Research Medical Center at 63rd Street is also included in this alternative.

The LRT Alternative also includes Prospect MAX to enhance bus service along this important north – south arterial. The inclusion of enhanced transit on Prospect Avenue was considered critical to the acceptance of the project. The Prospect MAX would operate from Swope Parkway and Prospect to downtown via Prospect Avenue and Truman Road.

Table 3-2: Bus System Modifications with Max Alternative

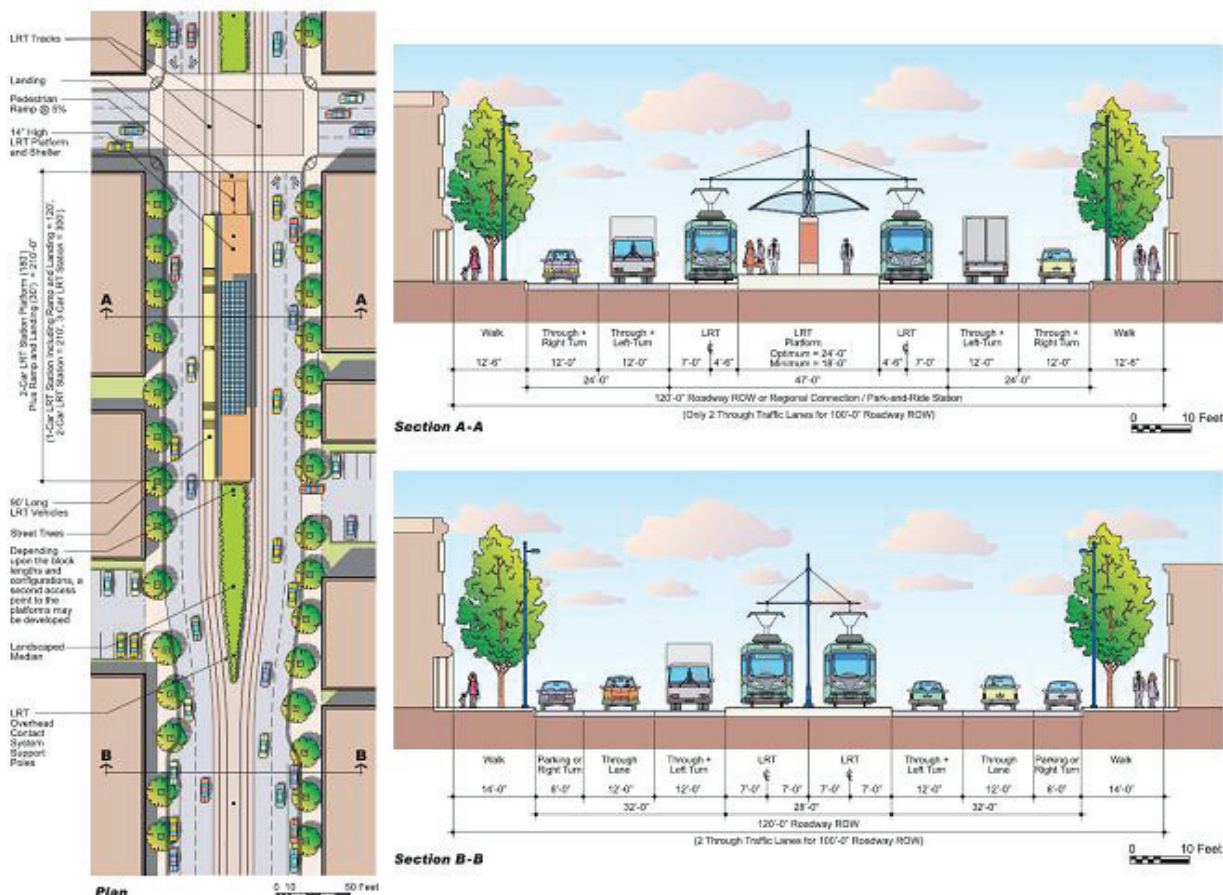
Route	Service Change with MAX Alternative
Main Street MAX	Discontinue route.
28 Blue Ridge	Create new local service from Main Street to Blue Ridge Blvd. and south regular route. Reduce parallel service on Route 31.
37 Gladstone	Terminate route and Vivion/N.Oak transit center.
38 Meadowbrook	Terminate route at NKC transit center(Armour/ Burlington). Extend route to N. Brighton & 64th.
147 A Plaza Shuttle	New route to serve the Plaza and residential west of Plaza via 47th Street.
147 B Brush Creek Connector	Route from Prospect LRT station east on Cleaver II following #47 alignment to Kensington.
71 Prospect	Service reduction with MAX.
142 North Oak	New feeder route from Boardwalk Shopping Center to 103rd and North Oak via Metro North transit center.
137 Metro North - Antioch	Extend to North Oak.
56x Red Bridge Express	Discontinue route.
133x Vivion Antioch Express	Discontinue route.

Operations and Service

The LRT Alternative would operate on existing city streets or highway rights of way where possible and would require the construction of a new Missouri River crossing. LRT vehicles would operate predominantly in reserved lanes in the center median of roadways. Figure 3-8 shows a cross section of light rail operating in the median. Operating speeds would be limited to posted speed limits for the street (typically 35 mph). However, in segments of an alignment separated from vehicular traffic, such as a Missouri River crossing and along Bruce R. Watkins Drive, operating speeds would be higher. In congested areas and in areas of high pedestrian traffic levels, operating speeds would be limited to 15 mph. LRT vehicles would have limited delay at signalized intersections with the use of traffic signal priority controlled by specific LRT signals and communications systems. Station dwell times would



Figure 3-8: Light Rail Median Running Cross Section



be approximately 20 seconds for most stations, and approximately 40 seconds for heavy loading stations.

Light Rail Vehicles

Light Rail Vehicles (LRVs) range from about 80 feet to 100 feet in length and are 8 ½ to 9 feet wide. The LRVs have a gross weight for structural rating of approximately 150,000 pounds. The vehicles are typically articulated and can be operated in trains of up to four units. There is no single light rail standard vehicle and LRVs are usually customized for each transit entity. Figures 3-9 and 3-10 show pictures of other cities' LRVs.

Figure 3-9: Charlotte Light Rail Vehicle



Figure 3-10: Houston Light Rail Vehicle



LRT Segments

The LRT Alternative is comprised of several distinct segments and several possible terminus points. The segments were used to structure the evaluation and public input for Phase II. Summarized below are the preferred alignments for each segment.

- Kansas City North Segment – The alignment between Vivion Road and North 32nd Street would use North Oak Trafficway, although other alignments were considered. Currently North Oak is a four-lane roadway with turn lanes at major intersections; the available right-of-way is approximately 100 feet.
- North Kansas City Segment – The alignment would use Burlington through the City of North Kansas City from the vicinity of Burlington Street and 32nd Street south to a Missouri River crossing. Burlington serves an arterial function as a state roadway. Several other alignments through North Kansas City were considered.
 - Missouri River Crossing – The alignment would use a new Missouri River bridge to cross from North Kansas City to the south side of the River.
 - River Market, Downtown, Crossroads, and Crown Center/Union Station Segments – The alignment would pass through these important activity centers. This central segment has several possible LRT alignment variations.
- Midtown Segment – The LRT alignment through the Midtown and Plaza areas is along Main Street. Main Street is an arterial roadway, typically six lanes, that serves a local commercial function as well.
- Eastern Segment - Three LRT alignment eastern variations are included in the LRT Alternative. An extension serving the neighborhoods east of Main Street along Troost and Prospect avenues was

considered critically important to connect these low income areas with the Central Business Corridor. The first generally follows Brush Creek and would utilize a combination of Emanuel Cleaver II Boulevard (47th Street alignment) and Swope Parkway with a new crossing of Brush Creek just east of The Paseo. The second would use Volker Boulevard on the south side of Brush Creek. The third would be a combination of the two.

- Southern Segment - A southward segment along Bruce R. Watkins Drive would utilize existing Missouri Department of Transportation (MoDOT) right-of-way between Bruce R. Watkins Drive and private properties to the west along Prospect Avenue. This right-of-way was preserved during construction of the roadway specifically for potential future rail transit improvements. The south alignment segment would run approximately two miles from the vicinity of Prospect Avenue and Swope Parkway south to the vicinity of 63rd Street and Prospect Avenue. The Southern segment was included because of the importance of serving low income neighborhoods, to provide a connection to the City's neighborhoods to the south along Watkins Drive, and connect with jobs center around Research Medical Center.

Light Rail Alternatives and Alignment Options Evaluated

During the Alternatives Analysis, considerable work was done to identify the specifics of the alignment, including the streets LRT would use, terminus points and station locations. A number of alignment variations were evaluated and conclusions were drawn that lead to the identification of specific alignments. However, several LRT alignment variations were not decided upon during the Alternatives Analysis. These alignment variations were to be carried into preliminary engineering for more detailed evaluation and determination.

Kansas City North Segment

North Oak was determined to be the preferred alignment because it is a major transportation corridor in the Northland and the corridor has sufficient right-of-way for the light rail alignment. The LRT alignment along North Oak could create a major transit node at the juncture of North Oak, Vivion Road and I-29.

An alignment using Route 9 and US 169 through the Briarcliff area to the interchange area of I-29 and US 169 was considered but dropped from further consideration. This alignment was previously studied as part of the Northland MIS. Available right-of-way identified during this previous study was subsequently used for highway purposes. Without the right-of-way this alignment was considered to be too costly due to the need for considerable earthwork required to negotiate the severe topography. In addition, Northland project stakeholders were not in favor of this alignment, preferring the alignment along North Oak.

North Oak is identified in the City's North Oak Corridor Plan as the alignment for enhanced transit, light rail or bus rapid transit.

Early in Phase II there was consideration of a terminus in the vicinity of 32nd Street and North Oak. This idea was evaluated but not recommended because it was considered by project stakeholders and City Council as insufficient penetration into Kansas City North. In addition, land currently owned by the Kansas City Water Department west of North Oak was determined to be unavailable for transit use. It was determined that there would be insufficient space for a park and ride lot and a transit station without access to the Water Department land.

With the conclusion that the north terminus station for the 14-mile alignment will be near Vivion Road and North Oak Trafficway it was necessary to identify sufficient space for a park and ride lot and a bus transfer facility near the LRT station platform. A site of at least five acres is required. The area is mostly developed with commer-

cial, residential and park uses, thus identifying a suitable site was a challenge.

Moreover, the interchange of I-29 and North Oak Trafficway is physically restricted and cannot accommodate LRT on North Oak through the interchange. A new interchange would have to be constructed.

To avoid the cost of reconstructing a new interchange two alignment variations were identified from over six initial terminal location and alignment possibilities. The two variations are 1) the southwest corner of Vivion Road and North Oak, just north of I-29, and 2) the southeast quadrant of the I-29/North Oak interchange. Variation 1 would require the LRT to “flyover” I-29 just west of North Oak to access the site that is currently developed as retail commercial. Property acquisition would be required. Variation 2 would not cross I-29, instead would use a site now occupied by a church at the intersection of 46th Street and North Oak. The church is expected to relocate within the next several years. Again, property acquisition would be required. Figure 3-11 shows these alignment variations for the north terminus.

The “flyover” option was determined to be the preferred approach because it would avoid the I-29/North Oak interchange and provide for a park and ride lot and transit center on Vivion Road.

North Kansas City Segment

The project team worked closely with staff and City Council from North Kansas City regarding alignment options in North Kansas City. The alignments were discussed with a group comprised of the Mayor and City Council, Planning Commission members, City staff and representatives of the City’s business community in two public work sessions.

Initially five alignment alternatives were identified for consideration as shown in Figure 3-12. The alignments west of Burlington were dropped from further study because they were considered too far from NKC’s commercial district and had significant physical challenges based on preliminary alignment reviews. The alignment using the abandoned railroad right-of-way just east of Burlington was found to be infeasible because portions

Figure 3-11: North Terminus Alignment Variations

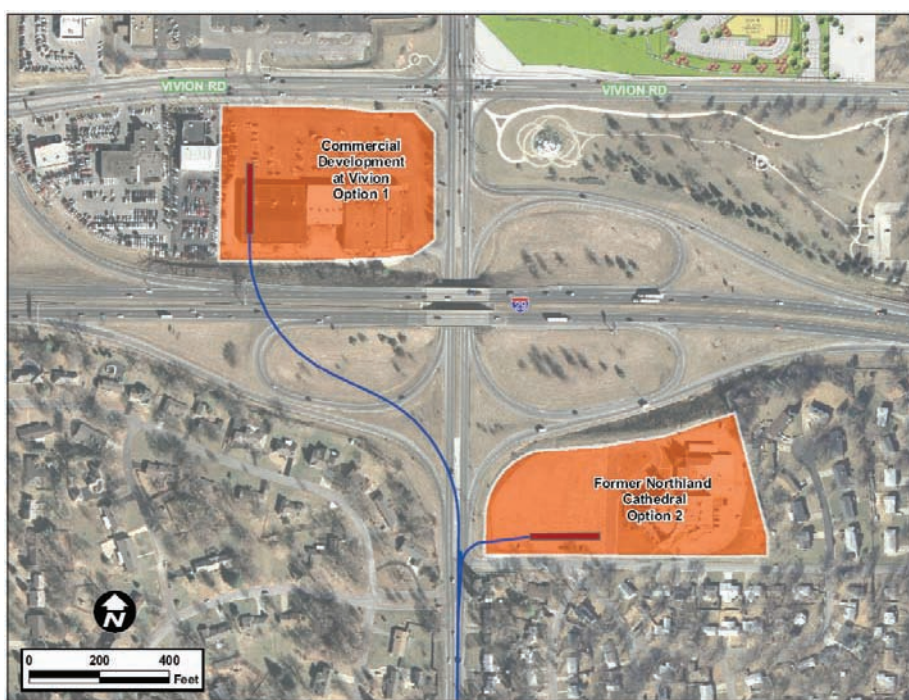
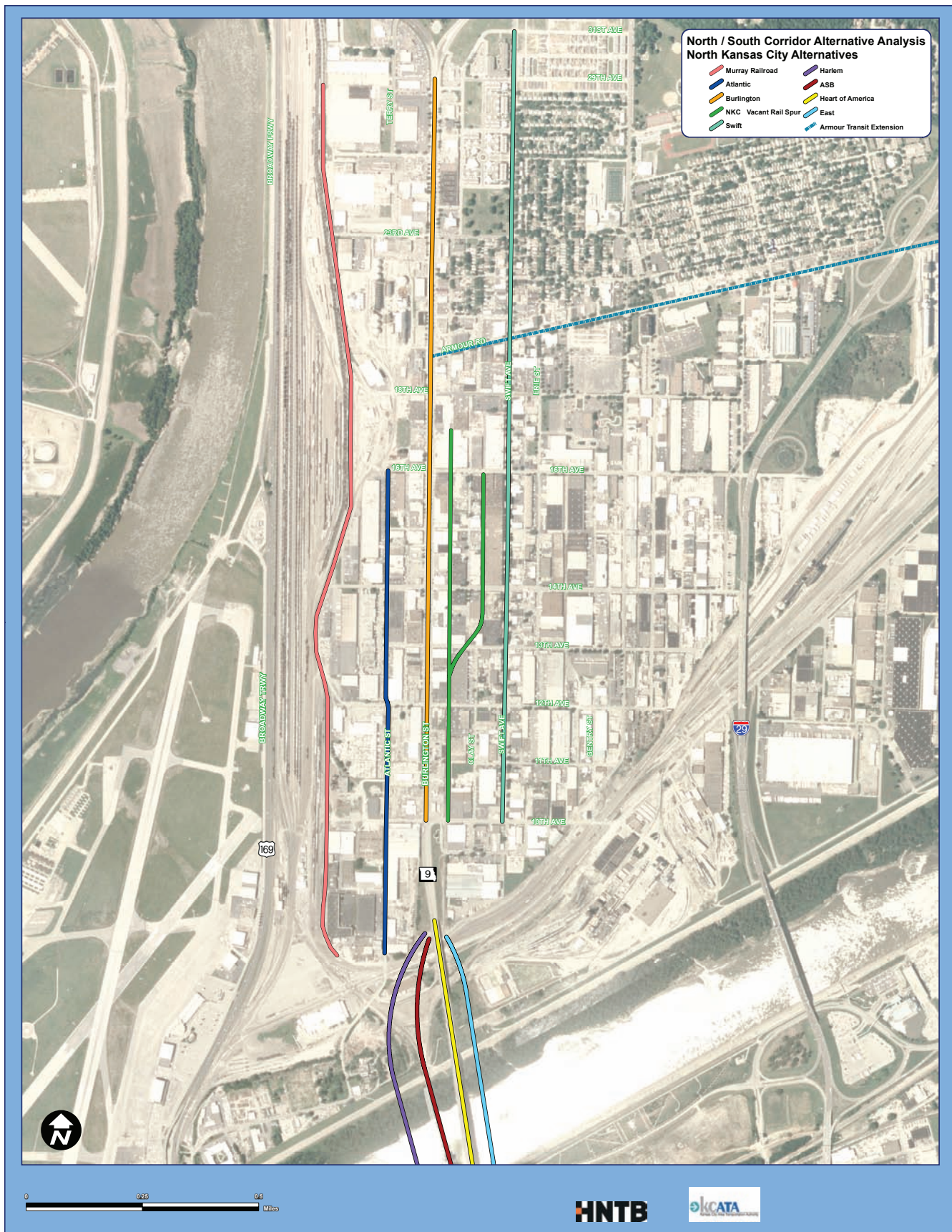


Figure 3-12: North Kansas City LRT Alignment Options



of the right-of-way have been sold and are in active use. Business disruptions would be significant.

The Swift and the Burlington alignments were advanced for more detailed study. Conceptual design alignments were developed for both alignments along with traffic impact studies. Based on the information provided by the project team, the NKC City Council concluded that the Burlington alignment was preferable because there would be fewer negative impacts on the City business district, and more development potential and shorter travel times. For example, a light rail alignment on Swift would require the elimination of some on street parking spaces which are considered critical to many of the area businesses.

The NKC Council passed a resolution on August 7, 2008 expressing their support for a Burlington alignment for light rail rather than Swift Avenue.

Missouri River Crossing Segment

Following an analysis of River crossing options, it was determined that a new Missouri River bridge crossing would be constructed rather than retrofitting an existing highway or railroad bridge structure to carry light rail.³ A conceptual engineering study concluded that the cost of a new structure exclusively for light rail was estimated to be less than retrofitting either of the two existing bridges. In addition, the impacts of retrofitting the Heart of America Bridge would be substantial with the possibility of having to close the bridge to traffic for a period of up to one year.

A new bridge structure east of the existing Heart of America Bridge (Route 9) has been determined to provide the best alignment. The east side alignment aligns with the LRT route on both the south and north side of the River.

River Market Segment

The River Market segment had only one alignment that

was studied in detail, the Grand Boulevard alignment. Alignments further to the west were considered as part of a review of alternative alignments in the downtown area, including Wyandotte and Walnut. However both of these streets are too narrow and the business and community disruptions would be substantial. The project team worked with the River Market Business Association in the evaluation of the routes and the selection of Grand as the preferred alignment.

Downtown Kansas City Segment

Perhaps the most difficult part of the alignment to determine the preferred routing is the downtown area with questions about existing and future land use and businesses, traffic impacts and other concerns. Five alignment variations were identified through working with representatives of the downtown community in work sessions organized by the Downtown Council, and City staff from the Public Works and Community Development departments. These downtown route variations are shown in Figure 3-13.

Variation 1. Grand Boulevard

Variation 2. Wyandotte Street connecting on the south via 16th Street (or possibly Truman Road) and extending to 3rd Street in the River Market.

Variation 3. Walnut Street connecting to Main or Grand on the south and Grand on the north.

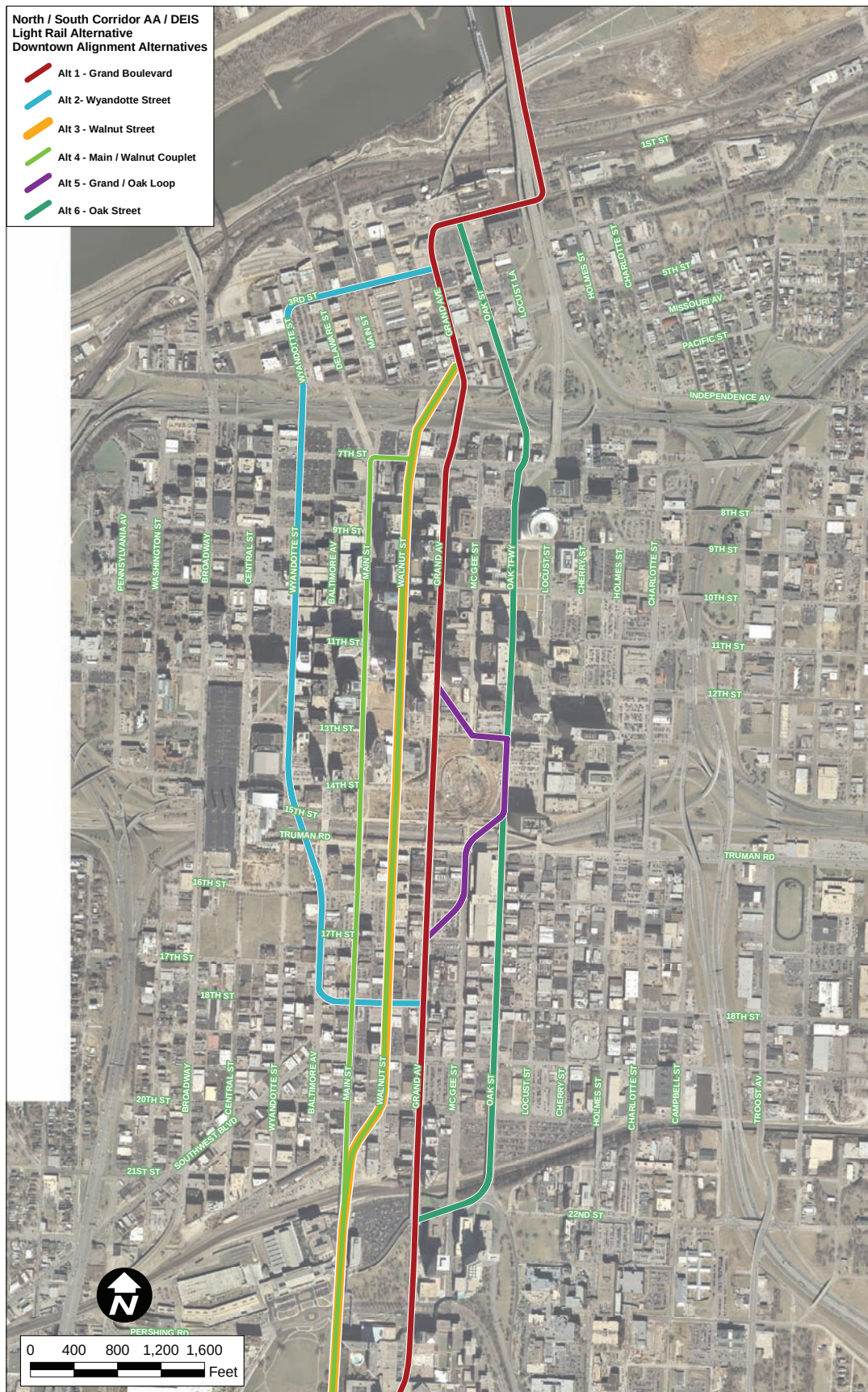
Variation 4. Main/Walnut couplet connecting to Main or Grand on the south and Grand on the north.

Variation 5. Oak Street connecting to Grand north and south of the Sprint Center.

Grand Boulevard was judged to be preferred from a transit operations perspective due to its width and directness. Grand is a straight alignment between the River Market and Crown Center. However, concerns

³ Kansas City North/South Corridor AA/DEIS Technical Memorandum, *Light Rail Crossing of the Missouri River*, September 2, 2008, HNTB.

Figure 3-13: Downtown Light Rail Alternative Route Variations



exist with Grand due to possible conflicts with downtown businesses including the new Sprint Center (sports and entertainment arena) and the Power and Light entertainment district, both located at 13th/14th and Grand.

All downtown alignments were found to have issues as well. The decision on the preferred alignment downtown was deferred to a subsequent phase of the project.

Crossroads and Crown Center/Union Station Segment

The area south of downtown Kansas City is another challenging area to determine a specific light rail alignment. The variations considered include Grand Boulevard and Main Street. The Grand variation would be on Grand Boulevard through the Crown Center development. The Main variation would be on Main Street, two blocks west of Grand, and would have a LRT station adjacent to historic Union Station.

Figure 3-14 shows the alignment variations south of downtown.

The preferred alignment in the Crossroads District will be determined based on decisions made regarding the alignment downtown and in the Crown Center area.

A primary question in the Crown Center/Union Station area is how LRT should serve Union Station - using Main or Crown Center on Grand. Proponents of the Main alignment express the opinion that directly serving the historic train station is critical. Proponents for the Grand alignment believe the ridership potential and economic development potential of directly serving the Crown Center multi-use development and Union Station via - pedestrian link is of greater practical importance.

There are engineering issues as well. A Main Street alignment was found to be more expensive in part due to the cost of retrofitting the Main Street viaduct over the Kansas City Terminal Railway main line tracks at approximately 23rd Street. The viaduct is a very long

structure, approximately 1,100 feet, and would need to be strengthened to accommodate the light rail vehicles.

The decision regarding this alignment variation was deferred to the preliminary engineering phase when additional detailed information could be developed.

Midtown Segment

In Midtown, only one alignment was considered during Alternative Analysis phase II, Main Street.

Brush Creek Corridor Segment

As the alignment turns east from Main Street along the Brush Creek corridor there are three alignment variations that were studied, Emanuel Cleaver II Boulevard (47th Street) on the north side of Brush Creek, Volker Boulevard on the south side of Brush Creek, and a combination of the two. Because these variations would be on different sides of Brush Creek, the service area is significantly different for the three variations. Figure 3-15 shows the Brush Creek variations.

The project team worked closely with the Board of Parks and Recreation and the Parks Department staff. The Parks Board has jurisdiction over both Emanuel Cleaver II Boulevard and Volker Boulevard, as well as the parklands adjacent to Brush Creek.

Concern was expressed that the light rail alignment would impact the parklands adjacent to Brush Creek, particularly a new LRT bridge structure crossing the Creek. Conceptual engineering plans were developed for alignments on both Cleaver and Volker boulevards. Also, surveys of possible community impacts were initiated. A neighborhood on Cleaver Boulevard between Rockhill and Troost expressed concerns about neighborhood impacts. Uses on the south side of the Creek, including the Stowers Institute at Volker and Rockhill are known to have concerns with possible impacts.

The evaluation of these alignments ceased with the unsuccessful light rail funding referendum in November

Figure 3-14: Crossroads - Crown Center/Union Station LTR Alternative Route Variations

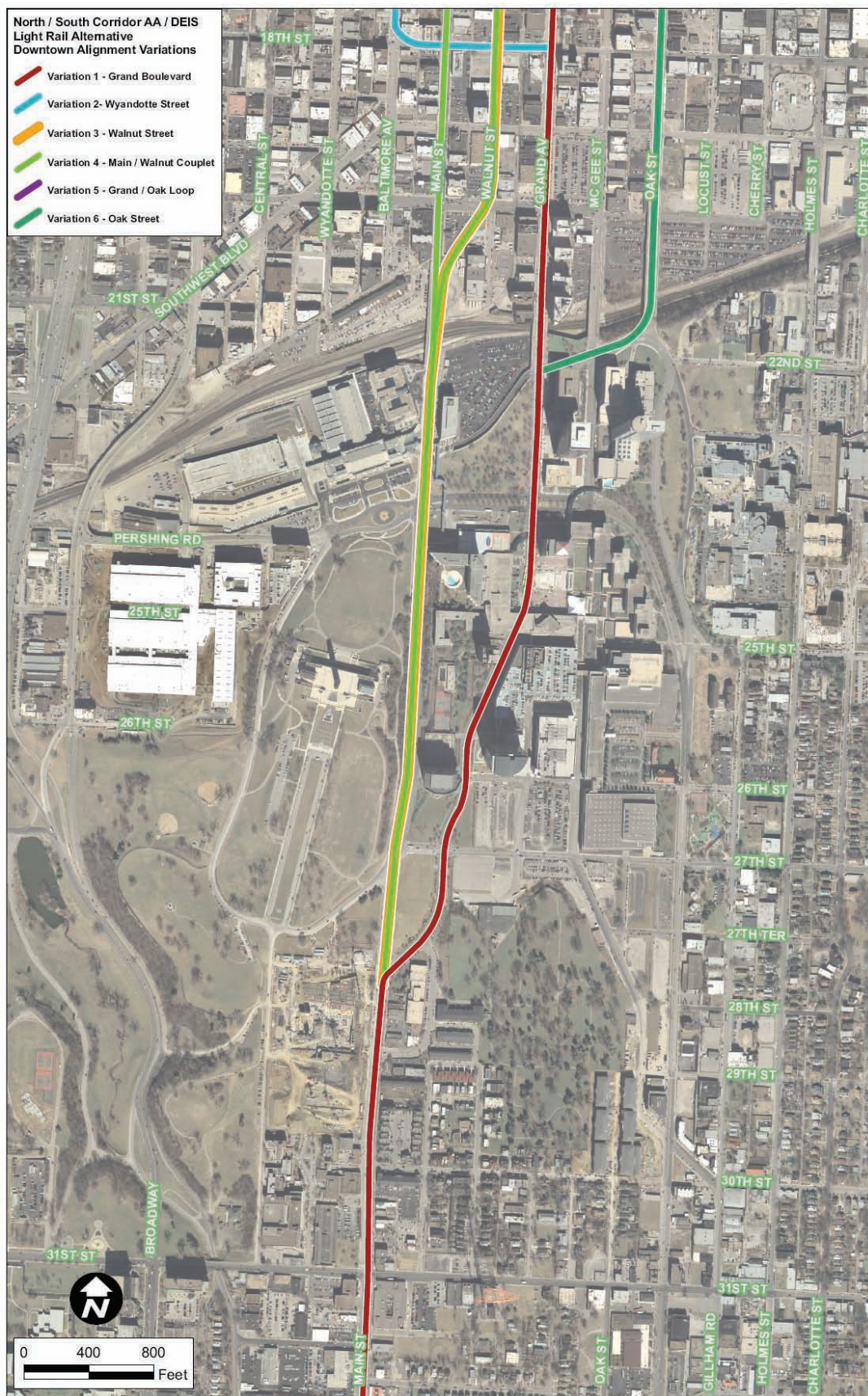


Figure 3-15 Brush Creek Corridor Route Variations



2008. These alignment options will have to be evaluated and decided upon if a fixed guideway transit system is to be developed in the Brush Creek corridor.

Watkins Drive Corridor Segment

The alignment along Bruce R. Watkins Drive would be in the MoDOT highway right-of-way along the west side of Watkins Drive. The roadway was designed to accommodate light rail as an addition to the corridor. The design options included at-grade intersections with 55th Street and 59th Street and other roadways intersecting Watkins Drive from the west, and a grade separated option. Both design options were included in the Alternatives Analysis, although the grade separated option was preferred by KCATA for safety and efficiency reasons.

LRT Alternative Phasing Options

Several phasing options for the LRT Build Alternative were developed for evaluation in the Alternatives Analysis using differing combinations of route length, north and south termini, and eastern extensions as summarized in Table 3-3. These phasing options recognize that it may not be possible to construct the entire 14-mile alignment

at once. The phasing options also allow the evaluation of segments of the total alignment with respect to transportation, environmental, and cost effectiveness considerations. Three proposed LRT alignment phasing options are described in the following sections and illustrated in Figures 3-16 through 3-18.

- LRT Phasing Option 1 – Phase 1 of this option is a 5.8-mile north-south route with a northern terminus in the River Market and a southern terminus at 51st Street and Brookside Boulevard. A second phase would extend the LRT route on both the north end, to Vivion Road, and south end, to Meyer Boulevard. Figure 3-16 shows LRT Option 1.
- LRT Phasing Option 2 – Phase 1 of this option is a 10.6-mile alignment with a northern terminus near Vivion Road and North Oak Trafficway and a southern terminus at 51st Street and Brookside

Table 3-3: LRT Alternative Phasing Options

LRT Option	Phase 1	Phase 2
Option 1	River Market to 51 st Street south	River Market to Vivion Road and 47 th Street to Meyer Boulevard
Option 2	Vivion Road to 51 st Street south	47 th Street to Meyer Boulevard
Option 3	River Market to Meyer Boulevard	River Market to Vivion Road

Figure 3-16: LRT Phasing Option 1



Figure 3-17: LRT Phasing Option 2

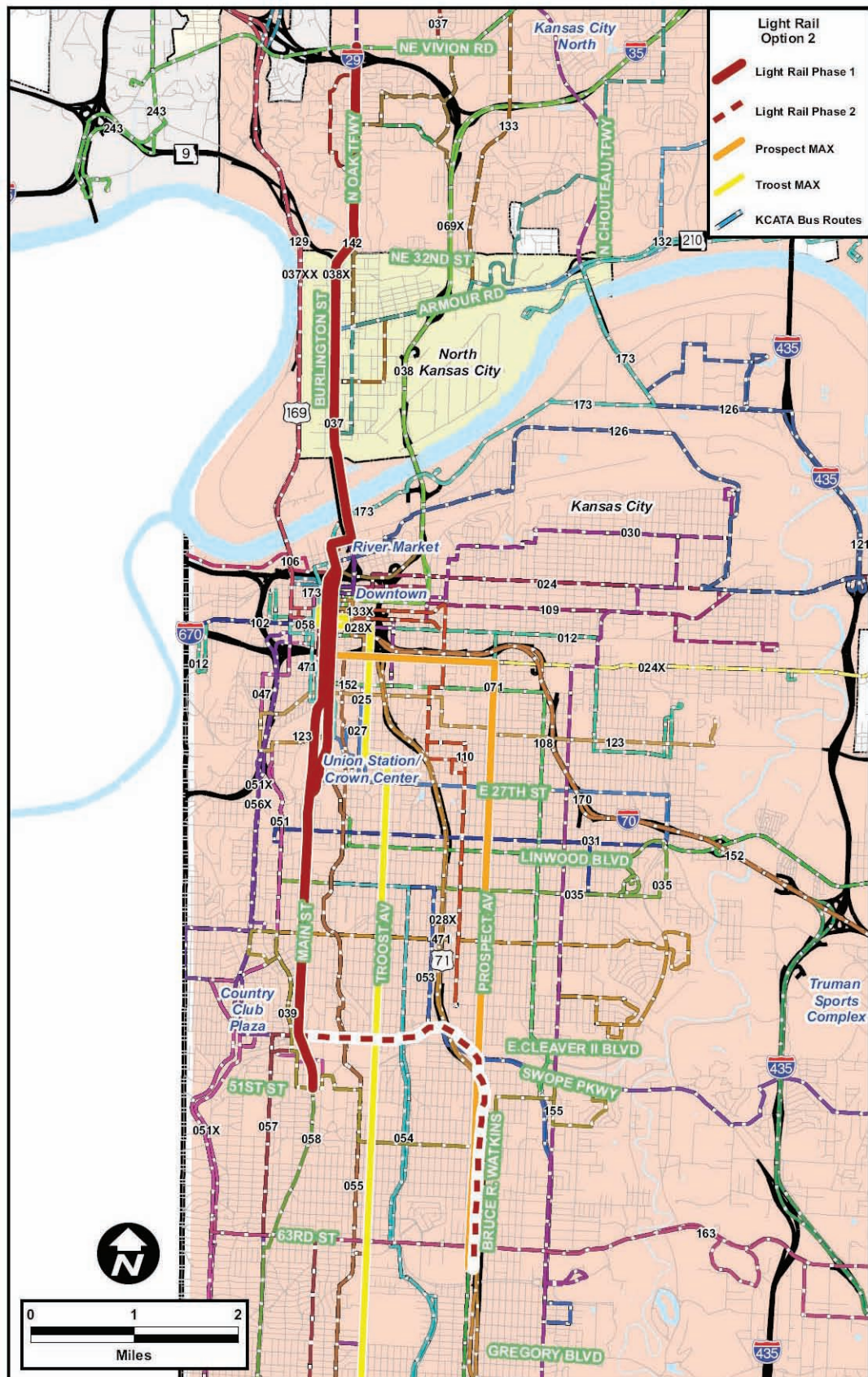
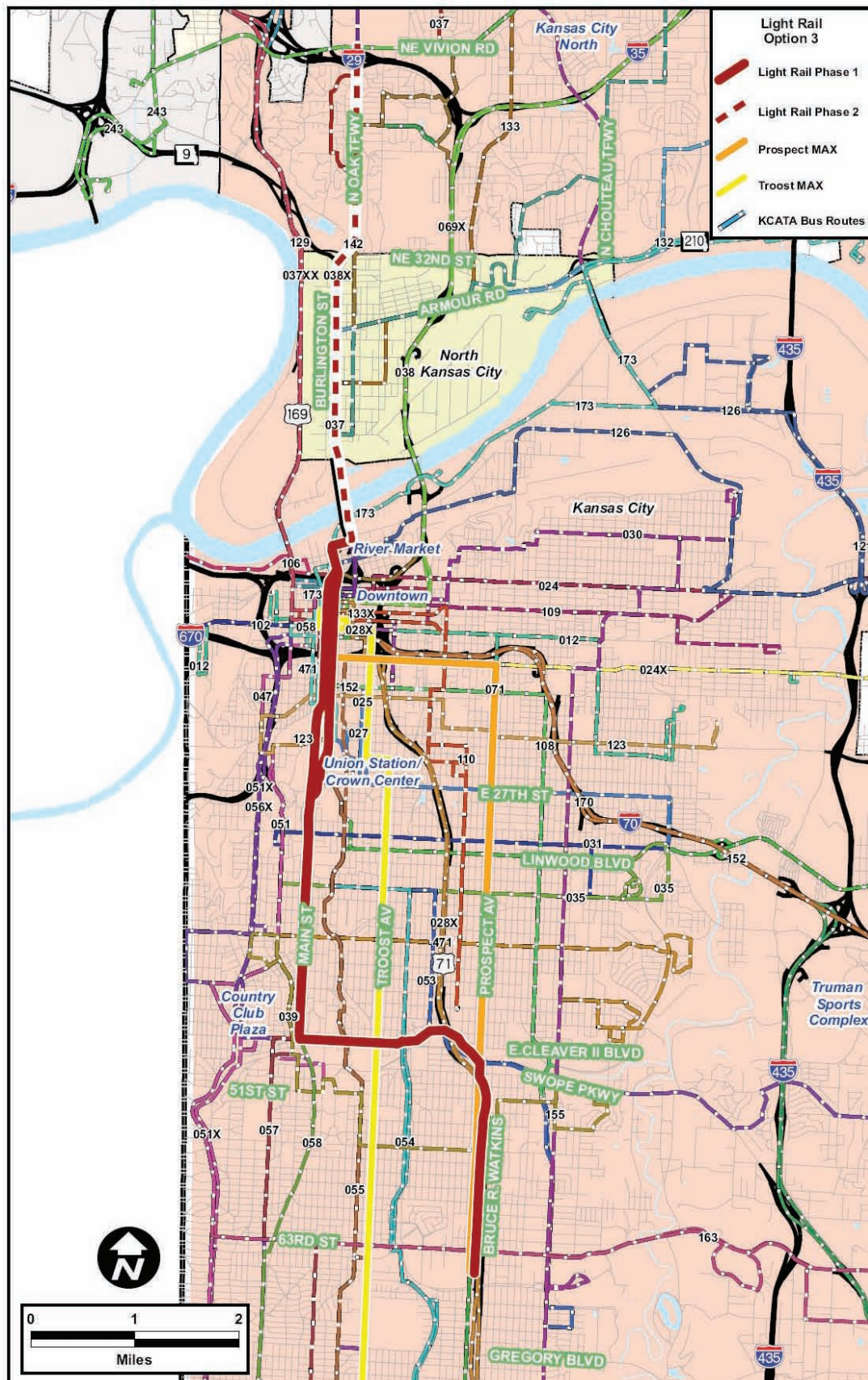


Figure 3-18: LRT Phasing Option 3



Boulevard. A second phase would extend the LRT route on the south end to Meyer Boulevard. Figure 3-17 shows LRT Option 2.

- LRT Phasing Option 3 – Phase 1 of this option is a 9.7-mile north-south route with a northern terminus in the River Market and a southern terminus at Meyer Boulevard and Prospect Avenue. The eastern leg along Brush Creek would utilize a combination of Emanuel Cleaver II Boulevard, a new crossing of Brush Creek, and Volker Boulevard/Swope Parkway. Figure 3-18 shows LRT Option 3 Phase II. A second phase would extend the LRT route on the south end to Meyer Boulevard.

Modifications to the KCATA Bus System with the Light Rail Alternative

There will be modifications to the bus system to properly integrate light rail into the overall regional transit system. Some existing bus routes would be duplicated by the LRT line and could be discontinued or reduced. Other bus routes need to be modified to feed bus passengers into LRT stations to achieve the desired connectivity between the two modes. New bus routes would need to be created to provide connecting service to areas presently not served, or underserved, to take best advantage of the investment in light rail.

The bus system modifications vary with the specifics of the light rail alignment. The full 14-mile LRT alignment would require many more bus system modifications than an LRT alignment that only operates south of the Missouri River.

In general, the LRT alignment would replace the Main Street MAX service, with the MAX service south of the Plaza

becoming a feeder to the LRT station at the Plaza. New routes in the Plaza area and Brush Creek area would be created to feed the LRT stations along Brush Creek.

The portion of the service area north of the Missouri River would have much more significant bus system modifications, in part because of the limited existing transit service. The establishment of light rail service in the Northland would represent a substantial improvement in transit service, but there is a limited opportunity for pedestrian access to the stations due to lower density development patterns. Bus service would be added to serve as feeders to the LRT stations, and support the investment in light rail.

Service along Linwood Boulevard provided by Route 28 Blue Ridge would be improved by creating a local

Table 3-4: Bus System Modifications with Light Rail Alternatives

Route	14-Mile LRT Alignment	6-Mile LRT Alignment
Main Street MAX	Shorten route to feed LRT at 51st St., with service to Plaza. Route provides combined service with #156 north from Waldo.	Shorten route to feed LRT at 51st St., with service to Plaza. Route provides combined service with #156 north from Waldo.
28 Blue Ridge	Create new local service from Main Street to Blue Ridge Blvd., and south regular route. Reduce parallel service on Route 31.	Create new local service from Main Street to Blue Ridge Blvd., and south regular route. Reduce parallel service on Route 31.
37 Gladstone	Terminate route at Vivion/N. Oak transit center	No change
38 Meadowbrook	Terminate route at NKC transit center (Armour/Burlington). Extend route to N. Brighton & 64th.	No change
38A Briarcliff Connector	New route to serve Briarcliff residential and commercial area along Briarcliff Road.	No change
147A Plaza Shuttle	New route to serve the Plaza and residential west of Plaza via 47th Street	New route to serve the Plaza and residential west of Plaza via 47th Street
147B Brush Creek Connector	Route from Prospect LRT station east on Cleaver II following #47 alignment to Kensington	Route from Plaza LRT station east on Cleaver II following #47 alignment to Kensington
71 Prospect	Service reduction with MAX	Service reduction with MAX
Prospect MAX	New Service - BRT from downtown to Swope Parkway	New Service - BRT from downtown to Swope Parkway
142 North Oak	North terminus at Boardwalk - Connect with LRT at Vivion Rd.	No change
142A North Oak	North terminus at Boardwalk - Connect with LRT in NKC.	No change
132 Gracemor	Terminate route at NKC transit center (Armour/Burlington).	No change
133 Vivion/Antioch	Terminate route at NKC transit center (Armour/Burlington).	No change
135 Winnwood	Terminate route at NKC transit center (Armour/Burlington).	No change
136 Boardwalk-Antioch	Extend south on N. Oak from Englewood	No change
137 Metro North-Antioch	Extend to N. Oak	No change
156 Red Bridge	Route provide combined service north of Waldo with MAX, increase service level.	Route provide combined service north of Waldo with MAX, increase service level.
244 NKC MetroFlex	Increase service	No Change
37xx North Broadway Express	Connect with LRT at Vivion/N. Oak transit center via Vivion Road	No Change
38x Meadowbrook Express	Service from 67th & Prospect loop via Antioch Shopping Center; connect with LRT at Vivion/N. Oak transit center.	No Change
56x Red Bridge Express	Discontinue route	Discontinue route
133x Vivion Antioch Express	Discontinue route	No Change

service route connecting with Blue Ridge Boulevard in the vicinity of 51st Street. The existing route extension to southeast Kansas City would be maintained. The purpose of this service modification is to improve east – west connectivity and provide improved service transit in the eastern part of Kansas City.

Table 3-4 summarizes the modifications to the bus system for a 14-mile LRT alignment and for a shorter 6-mile LRT alignment that would operate only in the portion of Kansas City south of the Missouri River.

The bus service additions to support the 14-mile LRT alignment would result in an annual operating cost increase of \$1.4 million. Conversely, the bus service modifications with the 6-mile LRT alignment would result in an annual operating cost increase of \$300,000. Again, the difference is that the 14-mile LRT alignment would require significant service additions in the Northland.

LRT Stations

Proposed station locations have been developed for the three LRT alternative phasing options. Table 3-5 lists proposed station locations and displays which of the three LRT Phasing Options would utilize specific station locations. The stations will be the same for all three alternatives from the Riverfront to the Plaza and are shaded on the table.

Proposed stations would vary in configuration due to right-of-way and environmental constraints, existing roadway configurations, neighborhood and commercial corridor characteristics, circulation and parking issues, and other community factors to be determined during the AA process. Generally, LRT station platforms would be located in the median on opposite sides of existing roadway intersec-

tions. Opposing-side station platforms would be unidirectional (i.e., southbound LRT vehicles would load and unload on the south side of an intersection, and northbound operations would occur on the north intersection station platform) and would be accessible via crosswalks at intersections. Mid-block crosswalk access may also be provided if necessary. Platforms would be approxi-

Table 3-5: LRT Station Locations

Station Name	LRT Phasing Option 1	LRT Phasing Option 2	LRT Phasing Option 3
Vivion Road	2P	XP	2P
42 nd Street	2	X	2
29 th Avenue on Burlington/Swift	2	X	2
18 th Avenue on Burlington	2P	XP	2P
12 th Avenue on Burlington	2	X	2
Riverfront	X	X	X
3 rd Street	X	X	X
9 th Street on Grand/Main	X	X	X
13 th /14 th Street on Grand/Main	X	X	X
18 th Street on Grand/Main	X	X	X
22 nd Street on Grand/Main	X	X	X
Pershing Road on Grand/Main	X	X	X
27 th Street on Grand/Main	X	X	X
31 st Street	X	X	X
Armour Boulevard	X	X	X
39 th Street	X	X	X
44 th Street	X	X	X
Country Club Plaza	X	X	X
Brookside South Termini			
51 st on Brookside Boulevard	XP	XP	
Brush Creek Eastern Extension			
Troost on Emanuel Cleaver II	2	2	X
Swope Parkway and Prospect	2P	2P	XP
Bruce R. Watkins South Extension			
59 th Street	2	2	X
63 rd Street and Prospect Avenue	2P	2P	XP

Shaded stations are common to each of the phasing options.

X Indicates stations for the initial phase of each phasing option.

2 Indicates stations that would be added for the second phase of each phasing option.

P Indicates stations with Park and Ride lots.

mately 14 inches above rails and would be constructed as open-air, covered shelters. Figure 3-19 shows a rendering of what the station at Main Street and 39th Street could look like.

Park-and-ride facilities would be provided at north and south alignment termini and other key high-ridership station locations that could accommodate parking facilities. Parking facilities would consist of off-street surface lots. The number of parking spaces to be provided would be determined by parking needs studies, ridership analy-

ses, and the availability of space for construction of lots or garages. Parking facilities would provide direct or easy access to LRT station platforms via crosswalks, stairways, or ramps depending upon the station configuration and location of the park-and-ride facility. Figure 3-20 shows what the park-and-ride facility at the River Market could look like.

Figure 3-19: Main Street and 39th Street Light Rail Station

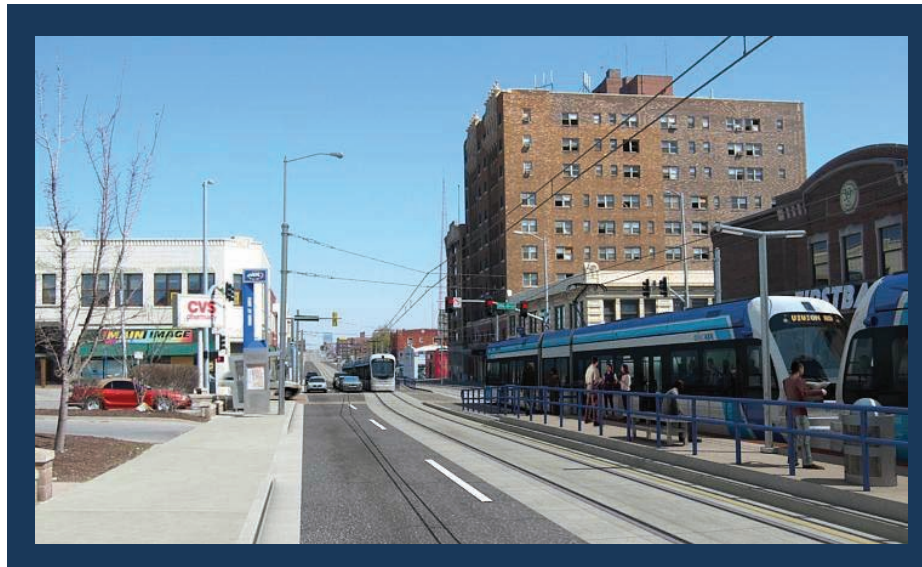


Figure 3-20: River Market Station

