Missile Drive Corridor Plan
Cheyenne, Wyoming

Prepared For:
Cheyenne Metropolitan Planning Organization

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May 2010

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Project Location

The Missile Drive Corridor is located along the west side of the City of Cheyenne. The project is located along Missile Drive from West Lincolnway to the south and the I-25 interchange to the northwest. This section of Missile Drive is approximately 0.75 miles in length.

Project Objectives

The following are the objectives of the Missile Drive Corridor Plan:

- Provide a safe and efficient, and aesthetically pleasing facility through design, access management, and intersection improvements
- Incorporate street design enhancements that serve vehicular traffic plus promote use by all users (transit, pedestrian and bicycle) and incorporate Americans with Disabilities Act enhancement considerations
- Include public input in design process
- Evaluate appropriate cross-section alternatives for Missile Drive
- Coordinate Missile Drive enhancements with I-25 interchange improvements
- Promote economic development along the Missile Drive corridor
- Address Old Happy Jack Road intersection issues
- Create a city gateway with enhanced aesthetics and landscaping
- Evaluate and improve corridor drainage conditions
- Develop 35% design level plans that are compatible with City ARC/Info GIS system
- Provide opinions of preliminary alternative improvement construction cost estimates

Existing and Future Land Use Analysis

The West Cheyenne Land Use and Infrastructure Improvement Plan and PlanCheyenne were reviewed and used as a starting point for this study. The proposed intersection improvements and land use shown in these plans has been expanded and updated as part of the Missile Drive Corridor Paln.

Existing Land Use

The study area is bound by I-25 to the west, and Lincolnway to the south. It includes Missile Drive and all of the adjacent properties along Missile Drive between I-25 and Lincolnway. The study area also includes the area west of Missile Drive to the Burlington Northern Railroad R.O.W. Crow Creek passes underneath Missile Drive, and is a significant natural amenity within the study area.

Existing land uses within the study area include residential, commercial, and industrial uses. As part of a long term redevelopment strategy, PlanCheyenne identifies three different land use classes for this area. These include the following:

1. **Industrial**. Industrial encompasses the heavier and light industrial areas and generally provides a location where less restrictive regulations are applied. Outdoor storage and heavy industry may be appropriate in certain areas and will be evaluated as part of the development review process. High visibility locations require greater attention to design. Industrial areas should be located with access to major transportation facilities, such as interstates and railroads.

2. **Mixed Use Employment Campus**. PlanCheyenne provides for Mixed-Use Employment Campus along Missile Drive. The Mixed Use Employment Campus category is intended to promote a

range of land uses, with primarily office and light industry designed in a business campus setting. The campus should include open space, parks and plazas, and pedestrian walkways. Retail and services are an important component to creating a functional business campus. Secondary uses include places of worship and other public or civic uses are also appropriate.

The intent is to create an environment that has employment opportunities integrating buildings and outdoor spaces, transportation and parks, open space, civic uses, and other uses as appropriate. Uses may be mixed either vertically or horizontally. Mixed-Use Employment Campus areas should be developed in an integrated, pedestrian friendly manner and should not be overly dominated by any one land use.

3. **Mixed-Use Commercial.** Mixed-Use commercial areas should be located near principal arterial or minor arterial streets or transit facilities and can become larger activity centers if they meet the Mixed-Use Activity Center criteria. The intent is to create an environment that has employment and shopping opportunities, a range of housing types and parks, open space and civic uses, if appropriate. Uses may be mixed either vertically or horizontally.

   Mixed-Use areas should be developed in an integrated, pedestrian friendly manner and should not be overly dominated by any one land use or housing type. No single land use shall exceed eighty (80) percent of the land area of a project, nor should any single land use exceed eighty (80) percent of total building square footage where a mix of uses are provided within the building. Higher intensity employment and residential developments are encouraged in the core of Mixed-Use Commercial areas, or adjacent to principal arterial roadways or at the intersection of a principal arterial or as part of activity centers. Building heights should be evaluated during the development review process. Where appropriate, building height transitions and step-downs should be provided to be compatible with adjacent development.

These land use areas, together with current parcel ownership and other important features within the study area are identified on the Existing Land Use Map shown in Figure 1. This map also identifies potential improvements, including potential redevelopment zones and bridge improvements along the corridor.

Future Corridor Land Use Scenarios

The long term vision for the corridor is a mixed use district that is an extension of downtown. The plan proposes land use alternatives and streetscape enhancements to reinforce a sense of gateway and arrival into downtown Cheyenne, provide multi-modal access along the corridor, and create an address for the district along Missile Drive and Lincolnway. See Figure 2.

As an important front door for the City, the area plays a significant role in defining the character and image of downtown. As a natural gateway element, the existing BNSF railroad crossing creates a logical entry point into the district from I-25.The areas west of the BNSF crossing include hotel, service and commercial zones that are oriented towards I-25 highway users. Areas east of the BNSF crossing take on the character and scale of downtown, including a finer grained street network that encourages pedestrian connections across Missile Drive, mixed use building forward environments that have an address on Missile Drive, and greenway enhancements along the Crow Creek, which provide pedestrian connectivity along the entire corridor.

The long term vision for the corridor proposes five different land uses within the study area. These uses are complementary to the broader land use classes identified in Plan Cheyenne. They include Park/Greenway, Mixed Use, Residential, an Entertainment District, and Hotel. A summary of each of these land use types follow:

Park/Greenway
The Park/Greenway category includes public and private open space, parks and trail corridors. This network of park spaces creates linkages to the Crow Creek Trail.

Mixed Use
The Mixed Use category promotes a range of land uses, with primarily retail, office, light industrial, and live/work uses designed as an “activity center”. Parks, plazas and/or open space are also part of the core of Mixed Use areas.

Residential
The Residential category provides for a broader variety of residential types, including single-family residences, duplexes, patio homes, townhomes, condominiums, and apartments.

Entertainment District
The Entertainment District promotes a range of entertainment venues in a centralized location to create a convenient and thriving destination in partnership with the existing Taco Johns Event Center. A movie theater, restaurants, and other entertainment choices may be included here.

Hotel
The Hotel category promotes connectivity to proposed and existing open space areas and commercial sectors. These sites benefit from access to and visibility from the I-25 corridor.

Figure 1 Existing Land Use

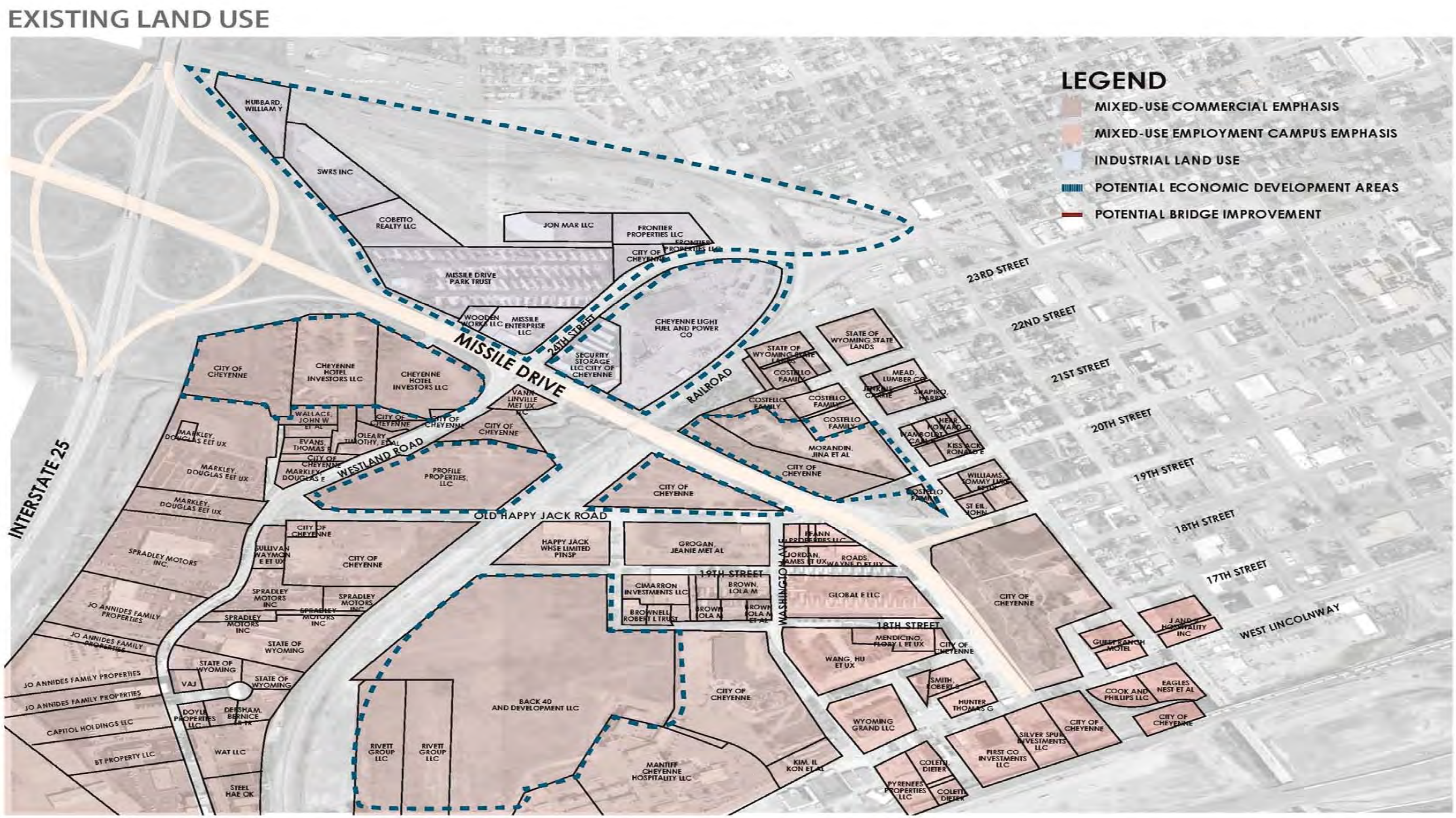


Figure 2 Missile Drive Corridor Long Term Vision

The plan can be phased over time, as determined by market need, and as property becomes available for redevelopment. This approach allows the corridor to transition gradually while maintaining economic viability over the long-term. The phases are determined by the integration of several components, including land ownership and availability, long-term economic feasibility, and the influence of adjacent land uses.

The phasing strategy includes:

Phase I - Promote economic projects and streetscape improvements
Phase II - Establish an entertainment and mixed use district
Phase III - Create Missile Drive commercial frontage and downtown connectivity

Each phase is described in more detail as follows:

Phase I: Promote Economic Catalyst Projects and Provide Streetscape Improvements (Figure 3)
The first phase of development is focused along Missile Drive itself. This phase includes improvements and enhancements to the roadway and BNSF bridge crossing (described in more detail in later sections). These enhancements will redefine the image and character of the corridor, and act as a catalyst for redevelopment to begin to occur. The first phase development also includes new highway oriented uses at the I-25 interchange, and a new neighborhood center east of the BNSF gateway. This neighborhood center may include a grocery store, pharmacy, or other anchor use to support both the existing residences and businesses along the corridor, and the new ones proposed.

A. I-25/ Missile Drive Development
The proposed hotel site, tech/ office campus, mixed-use center and restaurant near I-25 benefit from easy highway access and visibility from I-25.

B. Extension of the Greenway
Extending the park and greenway along the east side of Missile Drive creates an open, welcoming entry into downtown

C. Development Catalyst: Neighborhood Center
A Neighborhood Center near the potential future transit stop and potential entertainment district provides an appropriate development catalyst as it serves a diverse population day, night and year-round.

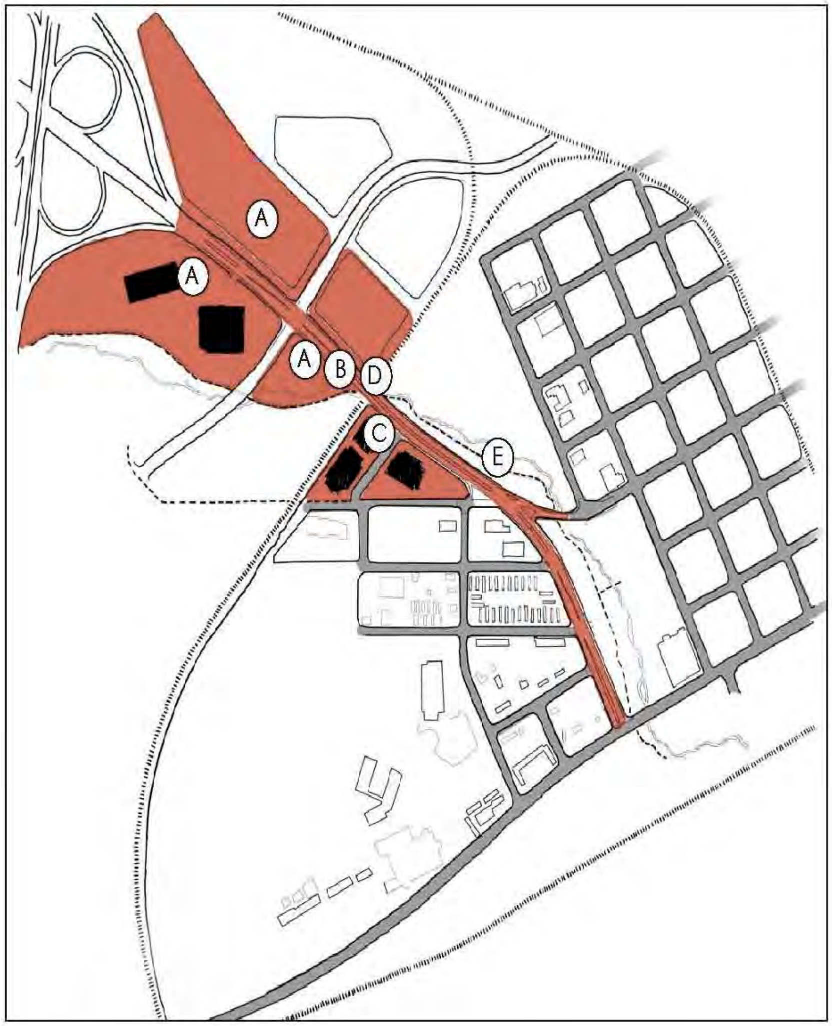
D. Crow Creek/Railroad Bridge Improvement
The Crow Creek/Railroad Bridge, with aesthetic enhancements, marks the logical arrival point into downtown Cheyenne.

E. Missile Drive Corridor Streetscape Enhancements
Streetscape enhancements along Missile Drive create a welcome environment, and provide a visual cue of the entry into downtown.

Figure 3 Land Use Design Phase I

PHASING DIAGRAM

PHASE I: PROMOTE ECONOMIC PROJECTS AND PROVIDE STREETSCAPE IMPROVEMENTS



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MISSILE DRIVE CORRIDOR LONG TERM VISION

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Phase II: Establish an Entertainment and Mixed Use District (Figure 4)
The second phase of development is focused primarily on the western edge of the study area. In partnership with the existing recreation oriented uses, a new mixed use entertainment district is established, creating a unique amenity for the community and region, and providing an attraction within the district after normal business hours. In partnership with the entertainment district, a finer grain street network with a mix of residential types is proposed, creating a distinct urban styled district unique to Cheyenne. The scale of these finer grain residential blocks echo the scale of the existing neighborhoods found east of Crow Creek and Missile Drive, and begins the transformation of the district into an extension of downtown.

F. Grid Extension
The existing street grid east of Missile Drive continues to the west side, thereby extending the downtown neighborhood, improving connectivity, and creating a finer grained environment that provides multi-modal access across Missile Drive.

G. Entertainment District
A new entertainment district incorporates the existing Taco Johns Event Center and golf course. The district extends south, creating a visible address on Lincolnway.

H. Residential Development
The single-family and multi-family residential development provides the density to support the potential Entertainment District, and provide an alternative urban living option in Cheyenne.

I. Lincolnway Improvement
The grid continues south to Lincolnway, providing visual and physical access to the new development.

Phase III: Create Missile Drive Commercial Frontage and Downtown Connectivity (Figure 5)
The third and final phase is focused on bridging new development to the west with the existing development east of Missile Drive, as well as creating new commercial frontage along Missile Drive that provides "building forward" environments along the corridor. This new commercial development type promotes building facades adjacent to the corridor, with parking located behind. A new parkway on 19th Street extends across Missile Drive from downtown, serving as a multi-modal connector between the new district and downtown. This final phase completes the re-orientation of the city street grid, resulting in a complete network that extends to the BNSF railroad line, and solidifies the district as an extension of downtown.

J. Parkway
19th Street becomes a parkway, creating a distinct entry into downtown and linking the west side of Missile Drive to the existing neighborhoods on the east side.

K. Mixed Use Development
Mixed-Use Development provides the appropriate transition from I-25 to downtown, and creates a welcome presence along Missile Drive.

Figure 4 Land Use Design Phase II

PHASING DIAGRAM

PHASE II: ESTABLISH AN ENTERTAINMENT AND MIXED USE DISTRICT

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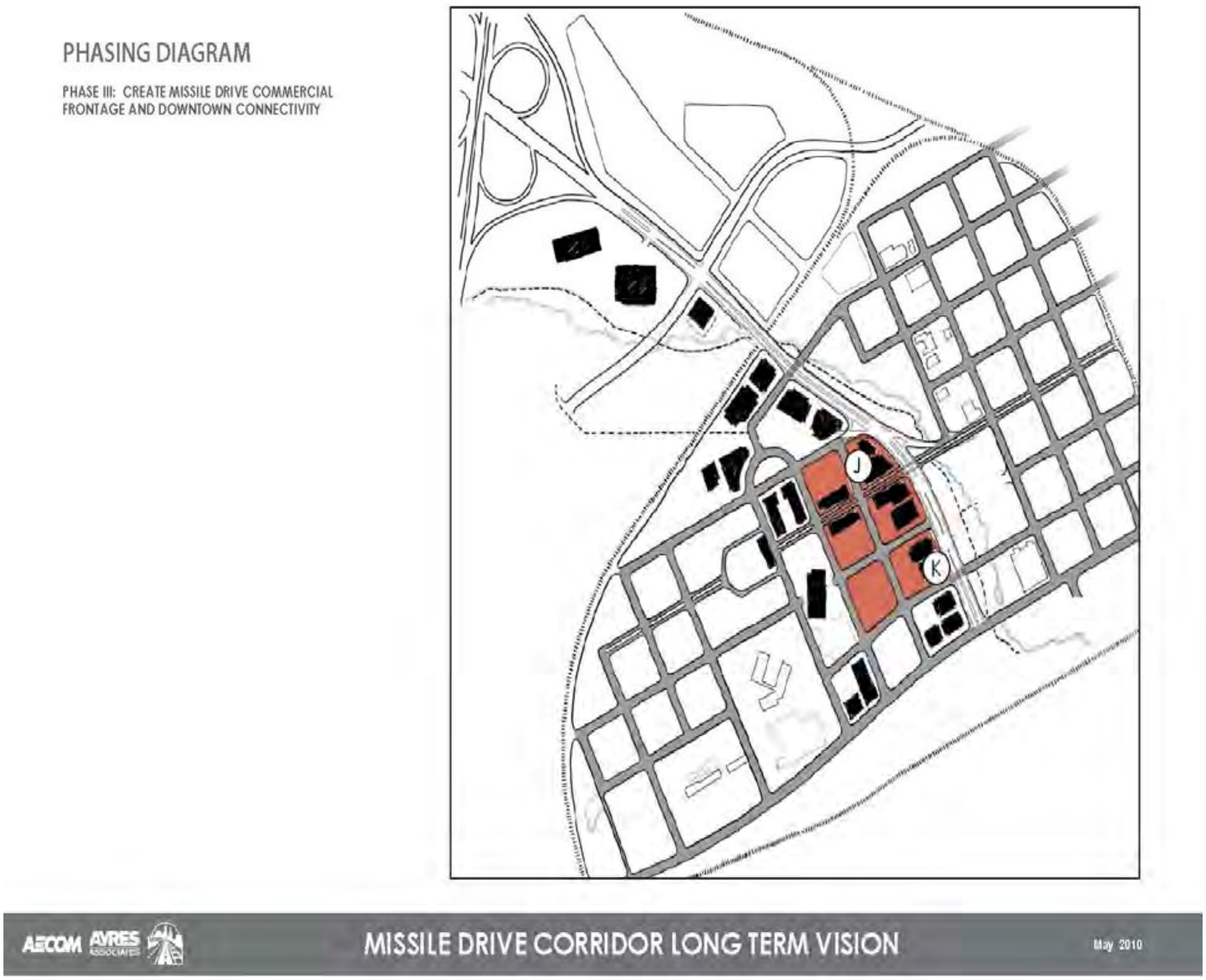
Figure 5 Land Use Design Phase III



Corridor Historical and Cultural Assessment

History of the Corridor

Although the study area does not fall within a historic district, the history of the area has significance to the community:

> The Pacific Railway Act of 1862 provided land grants to the Union Pacific Railroad to assist with the cost of construction of the cross-continental railroads. Union Pacific chose a location to cross Crow Creek, and established a rail stop at what would become Cheyenne. The first trains passed through in 1867. Cheyenne quickly grew from a small tent town to a full-fledged city.
>
> While the United States had many rural roads connecting towns and cities by the beginning of the twentieth century, Lincoln Highway was the first auto road to cross the United States from California to New York. This would be the first major paved road in the United States, allowing cross-continental travel via auto, rather than train as had been the standard mode of transportation. Construction began in 1913 and it quickly became known as “The Main Street Across America”. Prosperity and growth came to the towns and cities that the Lincoln Highway passed through, including Cheyenne. In 1925, the American Association of State Highway Officials began planning a federal highway system, which led to the now-familiar numbered U.S. highway system. The Lincoln Highway was broken up into several U.S. highways, including U.S. 30 – Lincolnway as it passes through Cheyenne.
>
> Prosperity following World War II allowed many Americans to buy cars, and auto travel became a national pastime. Themed architecture and signage were unique qualities of the auto-courts and roadside restaurants, attracting the motoring public as they vacationed across the country on the historic Lincoln Highway. Today, these motels and restaurants, with their unique neon signs stand as representatives of a by-gone era. These elements can be found within the study area along Lincolnway.

Compliance with National Historic Preservation Act

If federal funds are used in the project or if a federal agency is a part of the planning and implementation, a Section 106 Study is required to determine potential impacts to historic properties. This study needs to be completed prior to construction or implementation. The Wyoming State Historic Preservation Office (SHPO) will need to be contacted to discuss the parameters of the project. In consultation with the SHPO, the area of potential affect will be defined and properties within this area will need to be evaluated. In addition, the Cheyenne Historic Preservation Board should be consulted if impacts to historic properties are anticipated.

Historic properties are generally considered to be 50 years old and older, and will be identified using the Secretary of the Interior’s Standards and Guidelines for Identification. The properties identified as historic will then be evaluated for the potential effect of the planned work.

Several findings can be determined, including: no historic properties affected, historic property adversely affected, or historic property not adversely affected. Depending upon the effect determined there are different processes for resolution. In addition to the SHPO and the Historic Preservation Board, it is common to include the public or property owners in the discussion of impacts to historic resources.

Public and Stakeholder Involvement

First Public Meeting

On December 2, 2008 an open house format meeting was held at the New Kingdom Church of God in Christ, 1120 West 20th Street, Cheyenne, Wyoming. The purpose of the meeting was to gather information from the public and stakeholders on what changes if any they would like to see along the Missile Drive corridor. The project team presented displays from the "West Cheyenne Land Use and Infrastructure Improvement Plan" as well as displays showing the existing land use along the corridor.

Approximately 30 people from the community attended the public meeting. Attendees were asked to comment on the displays, as well as to complete a questionnaire regarding the corridor improvements. A summary of responses is included in Addendum A. Based upon the comments about the alternatives from the 10 percent plan, one-on-one discussions with individuals, and responses collected in the questionnaire, there were 3 concerns that were consistently expressed.

1. *Provide connectivity between the east and west sides of Missile Drive.*
2. *Improve the look of the corridor.*
3. *Address flooding issues in the project area.*

Focus Group Meeting

The Focus Group meeting was conducted on Monday, February 16th, 2009 from 3:00 pm to 5:00 pm at the Cheyenne Public Library. A total of five area residents and a representative of the BNSF Railroad participated in the meeting. A list of focus group participants is included as an attachment to this report along with meeting guidelines. The Focus Group meeting was used to provide background information for the Design Charrette.

The following common themes were expressed at the Focus Group meeting:

1. *Development change in the corridor has been very slow*
2. *A clear vision of the future development in the corridor is difficult to describe due to existing mix of uses*
3. *Need to protect access to concrete redi-mix plant*
4. *Do not take land from Martin Luther King (MLK) park*
5. *Connect Greenway to Warren Air Force Base, New Freedom Elementary School*
6. *Improve Missile Drive amenities and landscaping*
7. *Area flooding issues should be addressed*

Design Charrette

The Charrette meeting was conducted on Tuesday, February 17th, 2009 from 6:15 pm to 8:30 pm at the Cheyenne Public Library. A total of 18 people participated in the Charrette. A list of Charrette participants is included as an attachment to this report along with a set guidelines used as part of the Charrette.

The following common themes were expressed at the Design Charrette:

1. *Missile Drive enhancements should create a gateway progression into downtown.*
2. *Drainage issues exist in 19th Street area*
3. *MLK Park needs to be enhanced as part of future development plans*
4. *Old Happy Jack Road railroad tunnel is not a critical roadway link*
5. *Need to connect greenway, sidewalk and bicycle enhancements to destinations east of I-25*
6. *Roadway enhancements with landscaping would benefit corridor*
7. *19th and 20th Street intersection alternative connections and/or a roundabout at Missile Drive should be looked at further*
8. *Need to maintain access to existing businesses along Old Happy Jack Road*
9. *Potential new development could include a super market, hospital campus, hotel, office and/or service commercial*
10. *Future residential development could be encouraged through greenway improvements*

The following surprises were discussed at the Charrette:

1. *The residential trailer park area may experience turnover in the future leading to potential redevelopment*
2. *No clear opinion if new residential development would be appropriate in the corridor due to conflicts with existing development land uses*
3. *The I-25 interchange area could become a high intensity campus type development zone*
4. *Need to maintain street connectivity on both sides of Missile Drive*
5. *Consider roundabout at 24th Street/Westland Road intersection with Missile Drive*

Second Public Meeting

The second public meeting for the Missile Drive Corridor was held on February 16, 2010 in the Sunflower room of the Laramie County Library. The objective of the meeting was to present the phased land use alternative, the preferred corridor improvement, and the five intersection alternatives for the intersection of Old Happy Jack Road/19th Street/Missile Drive.

Alternative 1 – Existing Condition
Alternative 1 is a no-build alternative. There will not be any improvements to the intersection or the culverts. See Figure 15 on Page 29.

Alternative 2 – 19th Street Reconfiguration (A)
Alternative 2 improves the 19th Street/Old Happy Jack intersection by creating 2 T-intersections that tie into Missile Drive at close to 90 degrees. 19th Street would use the existing culverts over Crow Creek. See Figure 16 on page 35.

Alternative 3 – 19th Street Reconfiguration (B)
Alternative 3 improves the 19th Street/Old Happy Jack intersection by creating 2 T-intersections that tie into Missile Drive at close to 90 degrees. 19th Street would be straightened and new culverts would be

installed at Crow Creek. This alternative was presented as the preferred alternative. See Figure 17 on Page 37.

Alternative 4 – 19th Street Closed & 20th Street Extended

Alternative 4 would remove the 19th Street intersection with Missile Drive. 20th Street would be extended to Missile Drive and tie into Old Happy Jack Road. This alternative would require a bridge be constructed over Crow Creek.   See Figure 18 on Page 38.

Alternative 5 – 19th Street Reconfigured & 20th Street Extended

Alternative 5 improves the 19th Street intersection by straitening 19th Street and installing new culverts at the Crow Creek crossing. 20th Street would be extended to Missile Drive and tie into Old Happy Jack Road. This 20th Street would require a bridge be constructed over Crow Creek. See Figure 19 on Page 40.

Approximately 20 people attended the second public open house for the Missile Drive Corridor project. Based upon the input from the attendees, as well as from the questionnaires the majority of the people preferred Alternative 3. They also want to see the area landscaped to improve the appearance of the corridor.

Drainage Analysis

The study corridor is enhanced by the adjacent Crow Creek. There is great potential to improve upon the creek and the future Greenway System to provide an attractive greenbelt area adjacent to one of the main gateway corridors into the City's historic downtown area. This planning effort evaluated the existing hydraulic issues and constraints within the corridor and how they relate to both the proposed extension of the City's Greenway System and the proposed improvements to Missile Drive and the adjacent Crow Creek. The drainage analysis for this report was based off of the Crow Creek Floodway Model Report – Analysis of Greenway & Pat Griffin Park improvements.

The study reach is a combination of a natural riparian corridor and man-made alterations to both channel and overbanks. The study reach is approximately 1.0 mile long with an average slope of 0.4%. The reach is generally confined by roads or development on both sides of the channel. The 1985 flood flows were generally confined within the channel, except at the furthest upstream sections where the left (north) overbank elevations are lowest. The channel top widths through the study reach range from approximately 50 to 180 feet. Channel banks vary from 5 to 12 feet high. The furthest upstream cross section is taken at the downstream face of the I-25 crossing. The Westland Road Bridge and Missile Drive Culverts are the other two crossings located within the study reach. The 19th Street crossing is located at the downstream end of the study reach. The following is a summary of our findings.

The picture shows the channel upstream of the Westland Road crossing. The picture is looking downstream at the Westland Road crossing of Crow Creek. It is representative of the channel and lower floodplain terrace in the vicinity of Lot 2, Block 1, Pat Griffin Park.

Beginning on the west end of the corridor, Ayres Associates previously modeled this reach of Crow Creek between I-25 and the Missile Drive culverts in support of a successful LOMR through FEMA in May, 2006. At that time, our surveyed information was limited to Lot 4, Block 2, Griffin Addition. Westland Road bridge information from WYDOT and the City's 1994 GIS topo were used to supplement the survey data to account for physical changes that had occurred prior to the date of the 1994 FIS effective model.

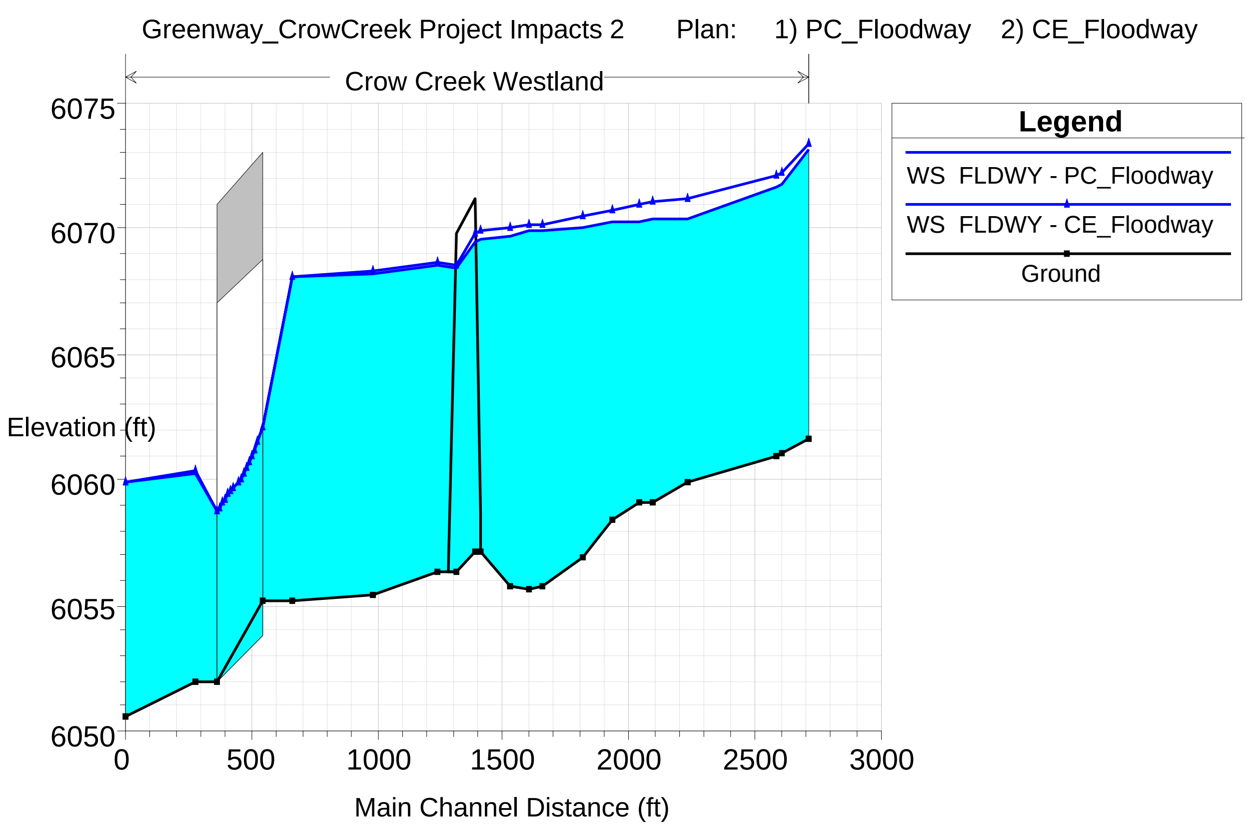
Ayres' LOMR request to FEMA was subsequently approved in August, 2006. Since that time, Ayres has conducted additional surveying through this reach of Crow Creek in support of both a commercial development for what is now Lot 1, Block 1, Pat Griffin Park, and the City's Pat Griffin Park development located adjacent to the commercial development in Lot 2, Block 1, Pat Griffin Park. Our additional survey information has been incorporated into our latest hydraulic analysis of this reach of Crow Creek to provide the City with the most accurate information. Our detailed HEC-RAS hydraulic model took into account the future extension of the City's Greenway through this corridor, including the proposed use of the Missile Drive culverts for a pathway and effectively set the stage for the City's future Pat Griffin Park.

This picture shows the study reach looking upstream from the Missile Drive culverts towards the Westland Road crossing. It is representative of the channel and overbank areas between Missile Drive and Westland Road, downstream of Lot 2, Block 1, Pat Griffin Park. In general, this portion of the study reach is characterized by a high right overbank. Ayres' hydraulic model evaluated the proposed access of the existing Missile Drive culverts for the City's Greenway System. Our preliminary findings indicate that placement of the pathway within the south box of the hydraulic structure is feasible, but care must be taken in the pathway design or it will potentially impact the regulatory Base Flood Elevation (BFE). The south box represents the most feasible choice, but will require a low flow crossing of Crow Creek just east of the Westland Road Bridge to locate the pathway on the north side of the creek within the proposed Pat Griffin Park. A second bridge will be required west (upstream) of the Park to locate the pathway back to the south side of the creek within the WYDOT right-of-way as required by the WYDOT.

This picture shows the upstream face of the Missile Drive Culverts. The culvert face is skewed approximately 50^0 to the thalweg. The culvert box walls are aligned with the flow, providing a skew-corrected 15' x 15' opening. There are (4) "15' x 15' RCB culverts" under the Missile Drive crossing. The culverts are approximately 165' in length and bend around the center support for the BNSF railroad viaduct that crosses both Missile Drive AND Crow Creek at this location.

Ayres Associates completed the Pat Griffin Park grading plan including the construction documents on behalf of the Parks and Recreation Department, finalizing those plans in early 2010. The Pat Griffin Park will be a linear facility along Crow Creek between I-25 and Westland Road with access for the public off of Westland Road and including a corridor for the future Greenway System. The grading for the proposed City Park accommodates significant off-site drainage patterns from the adjacent commercial property and WYDOT right-of-way.

Figure 6 Floodway Profile



The Figure 6 shows the floodway profile comparison between the corrected effective and proposed conditions models for the hydraulic evaluation of the proposed Pat Griffin Park and Greenway System improvements. As can be readily seen, there is no rise to the corrected effective floodway profile due to the proposed improvements. Again, care must be taken in the final design of the pathway within the Missile Drive culverts to avoid impact to the BFE.

As the greenway project progresses to the construction phase for the Missile Drive and Westland Road transitions, permitting through the US ACOE Regulatory office will be required. An informal consultation with the US Fish and Wildlife Service will most likely be required by the COE, however, impact to endangered species habitat through the study reach has been addressed in previous projects and should not be a major issue for the design and construction of this phase of the City's greenway path system.

There have been proposed development plans south of the creek between Westland Road and the BNSF. Ayres Associates has participated in the preliminary civil design for the proposed development and has recommended to staff preservation of the existing wetland feature adjacent to the BNSF. We further proposed a Greenway connection adjacent to the wetland feature that would provide public access to Old Happy Jack Road and the proposed commercial development. Drainage of the proposed site development would include a water quality feature and a potential enhancement of the existing wetland.

There is an existing City maintained EPA-319 project funded constructed wetland located just east of Westland Road along the north side of the creek. We propose that as funding becomes available, that this facility be redesigned so that it functions and is more aesthetically pleasing. This reach of Crow Creek is truly a 'diamond in the rough' and has great potential to become a much more attractive, well-used part of the City's Greenway System.

The area north of the creek on the east side of the BNSF lends itself to development of a constructed wetland to treat stormwater discharge from the existing Snyder Avenue storm sewer. This storm sewer is slated to be increased in size and a constructed wetland at its outfall would be quite beneficial to the City with respect to its ongoing MS-4 compliance efforts. Also, in light of the recent TMDL development of Crow Creek within the corporate limits, this is a great location for a constructed wetland to provide the City with a cost-effective BMP for compliance with the TMDL as it becomes approved by the EPA. A constructed wetland at this location would have the additional benefit of providing an aesthetically pleasing backdrop for the Greenway System and eliminate an existing transient location.

Between this location and the downstream 19th Street crossing, the Crow Creek corridor is hemmed in by Missile Drive and the Moran Concrete Plant. Future land use planning along the Missile Drive corridor envisions redevelopment of the Moran Concrete Plant site. There is currently adequate space along the right overbank (south bank) of Crow Creek for placement of the Greenway path. This area can also provide adequate water quality for roadway drainage as well as space for landscaping enhancements.

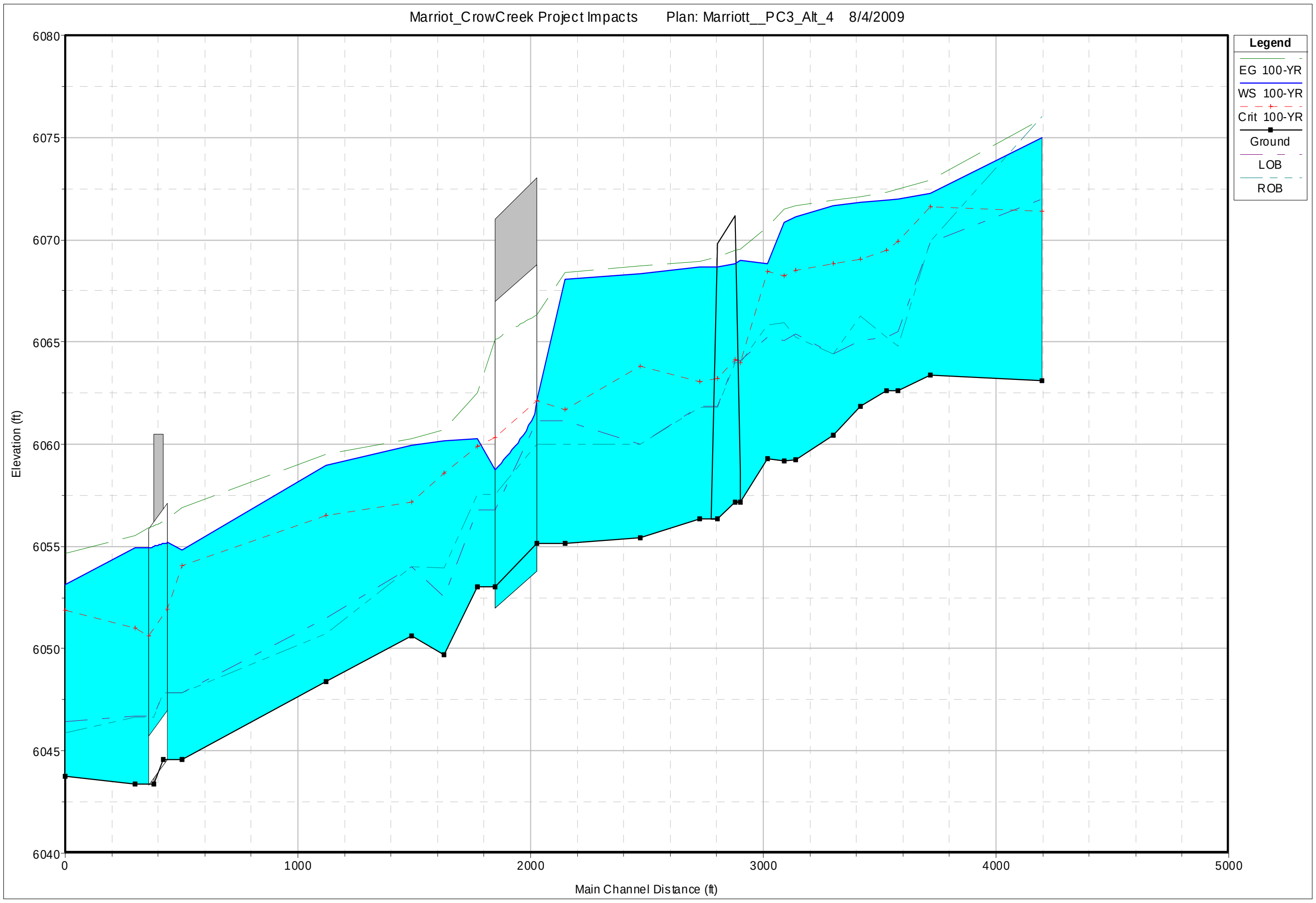
The City's Hazard Mitigation Plans are up for renewal in 2010. The 19th Street bridge replacement is currently the highest priority project in the City's Floodplain Management Assistance Plan. This picture shows the existing 19th Street culverts. The existing structure lacks the hydraulic capacity to convey the regulatory 100-year flood event and the corresponding overtopping of the 19th Street crossing contributes to both a hazardous floodplain downstream of 19th Street as well as to impact to the traveling public. Ayres Associates evaluated a range of alternative crossing configurations that would work well for the transportation objectives of the Missile Drive Corridor Plan and potentially be eligible for federal funding from FEMA.

In order to qualify for federal funding through available FEMA programs, a benefit-cost analysis of the proposed project must demonstrate that it is cost-effective with a corresponding benefit/cost ratio in excess of 1.0 using the FEMA Riverine Limited Data Module for benefit cost analysis of hazard mitigation projects. A benefit/cost greater than 1.0 would make a project competitive for both PDM and FMA project grant funds through FEMA.

Four different structure types were considered for the Missile Drive 19th Street crossing improvements as part of the overall Missile Drive Corridor Plan. The structure types considered were bridges and culverts. The structures considered are as follows:

A two-span CON/SPAN precast arch structure could be used at the site. The CON/SPAN arches would have a clear span of 42-feet and 48-feet. This alternative would minimize the amount of road grade raise required and should require minimum maintenance. Debris is a moderate concern with this type of structure. Using a structure width of 67.5-feet, which would be required for Alternate #3, the estimated cost of the CON/SPAN structure would be $680,000. This is the most cost effective alternative.

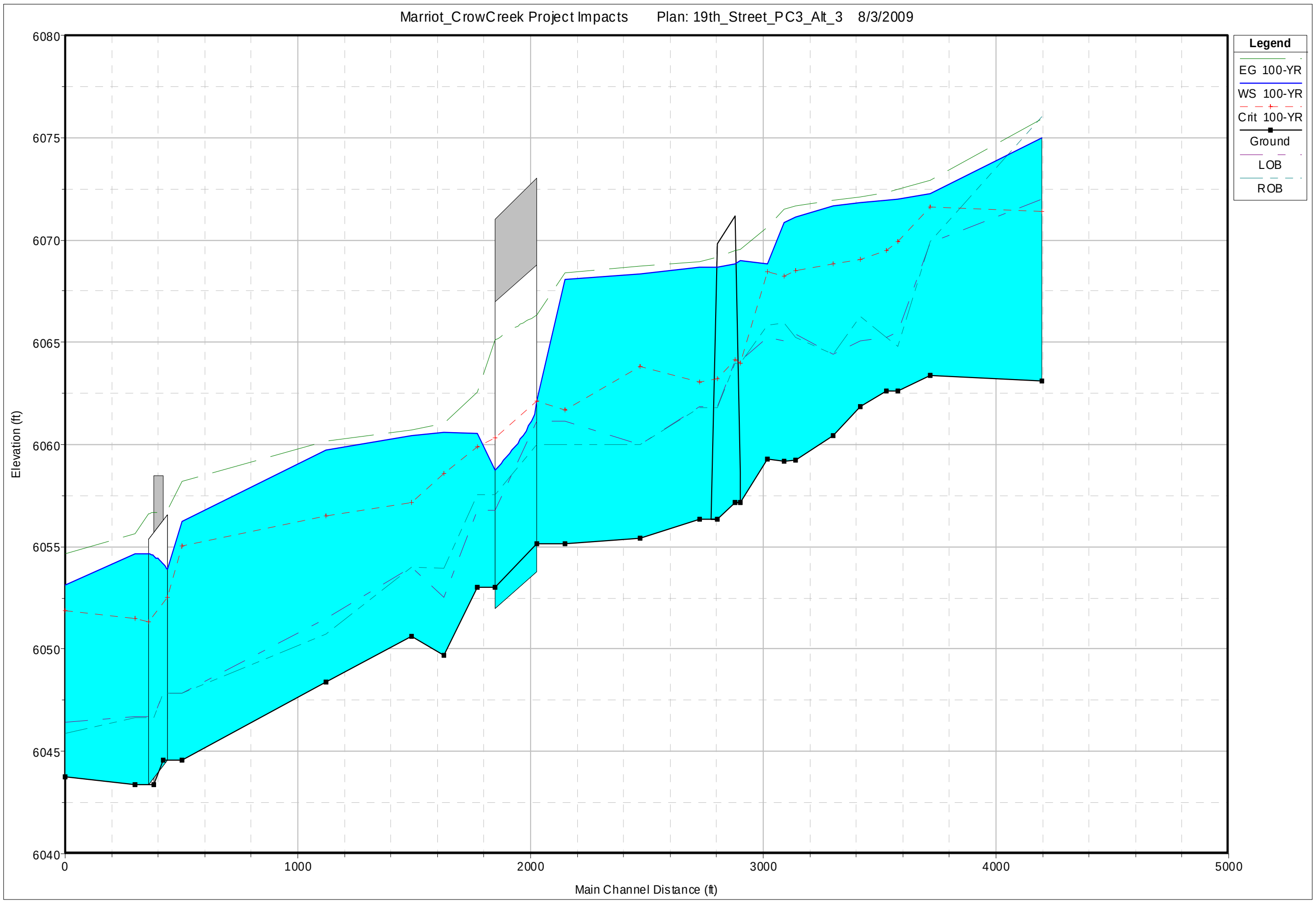
Figure 7 Water Surface Profile for Two-Span CON/SPAN Precast Arch Structure



As shown in Figure 7, the CON/SPAN alternative can be sized to effectively convey the regulatory flood event with no overtopping of the roadway.

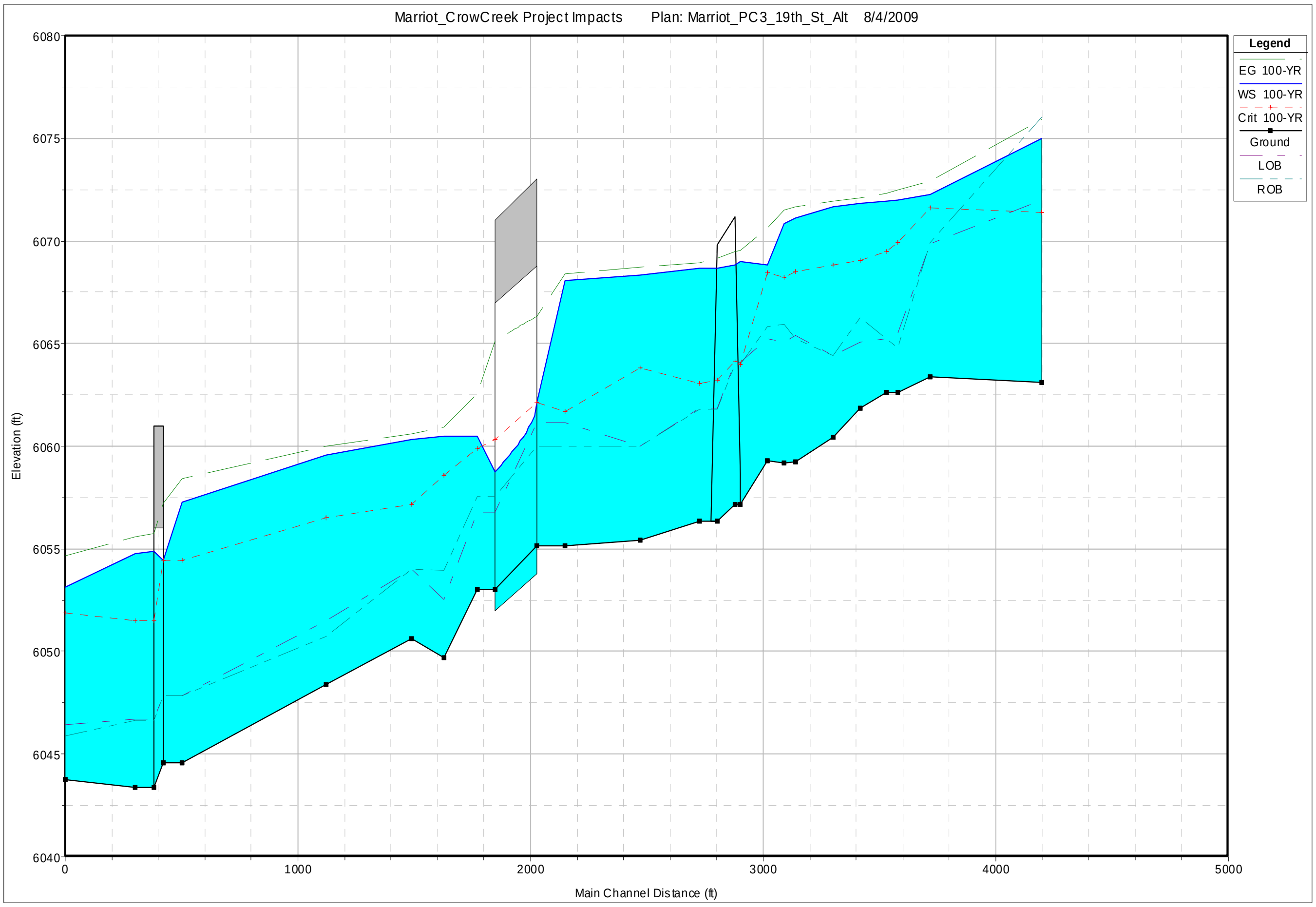
Elimination of roadway overtopping will effectively reduce the downstream floodplain and significantly reduce the corresponding flood hazard and impact to the travelling public.

Figure 8 Water Surface Profile for Five-Cell Cast-In-Place Concrete Box Culvert Structure



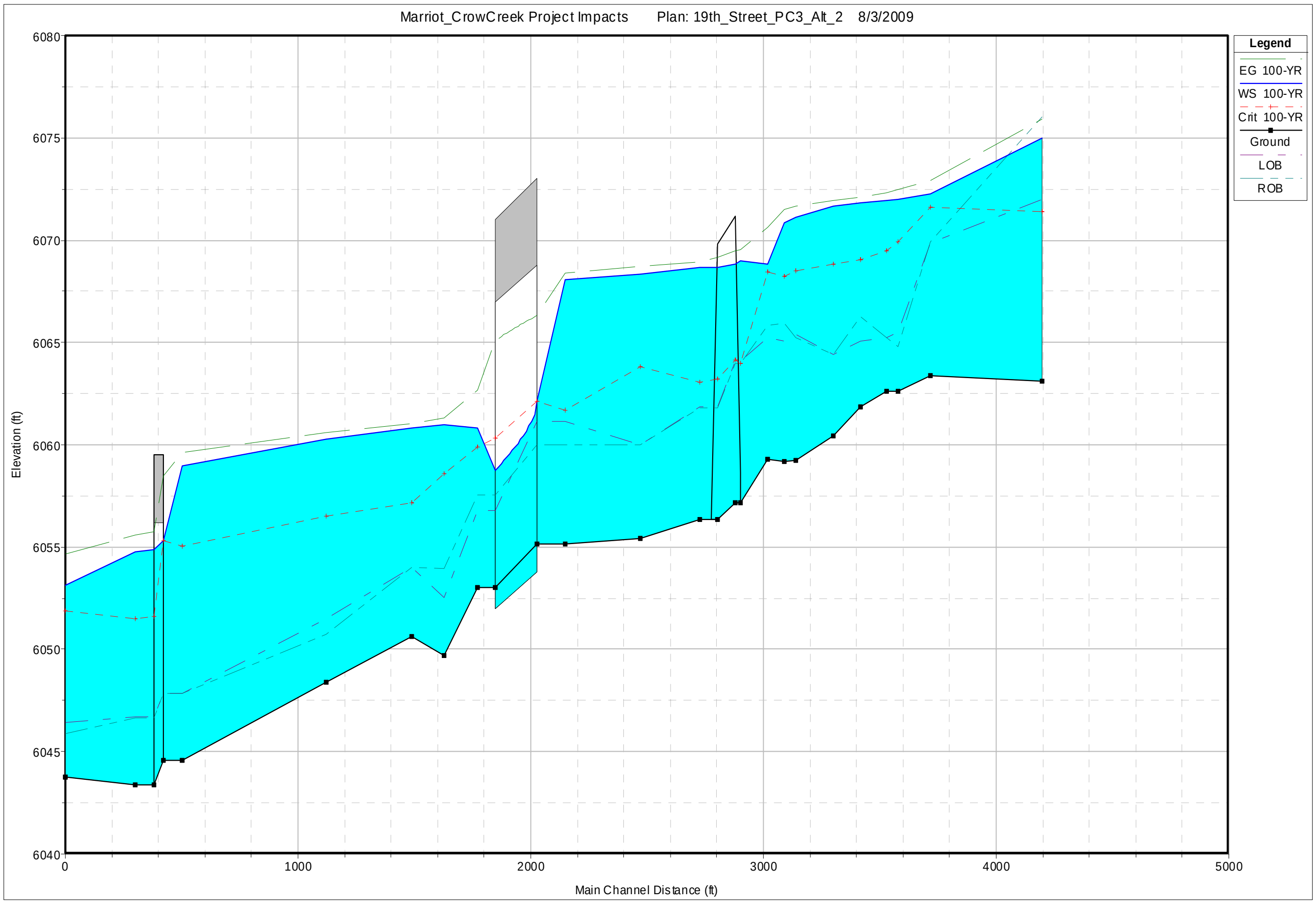
A five-cell cast-in-place concrete box culvert structure could also be used at the site. The box culvert would have two 12-foot by 12-foot cells and three 12-foot by 10-foot cells. Figure 8 shows the corresponding water surface profile for this alternative. This alternative would minimize the amount of road grade raise required and should require minimum maintenance. Debris could be a concern with this type of structure. Using a roadway width of 65-feet, which would be required for the preferred intersection alternative, the barrel length of the cast-in-place box culvert would be approximately 143-feet long and the estimated cost of the structure would be $890,000. As in the case for the CON/SPAN alternative, the box culverts will effectively convey the 100-year flood event and eliminate overtopping of the 19th Street crossing.

Figure 9 Water Surface Profile for Single-Span Prestressed Concrete Deck Girder Bridge



A single-span prestressed concrete deck girder bridge could also be used at the site. The bridge would have a span of 120-feet. Figure 9 shows the corresponding water surface profile for this alternative. This alternative would require the largest amount of road grade raise. The bridge will also require some moderate maintenance, especially the deck surface, during its life. Debris should be a minimal concern with this type of structure. Using a structure width of 67.5-feet, which would be required for the preferred 19th Street intersection alternative, the estimated cost of the single-span prestressed concrete deck girder bridge would be $1,100,000. This alternative will convey the regulatory flood while eliminating overtopping.

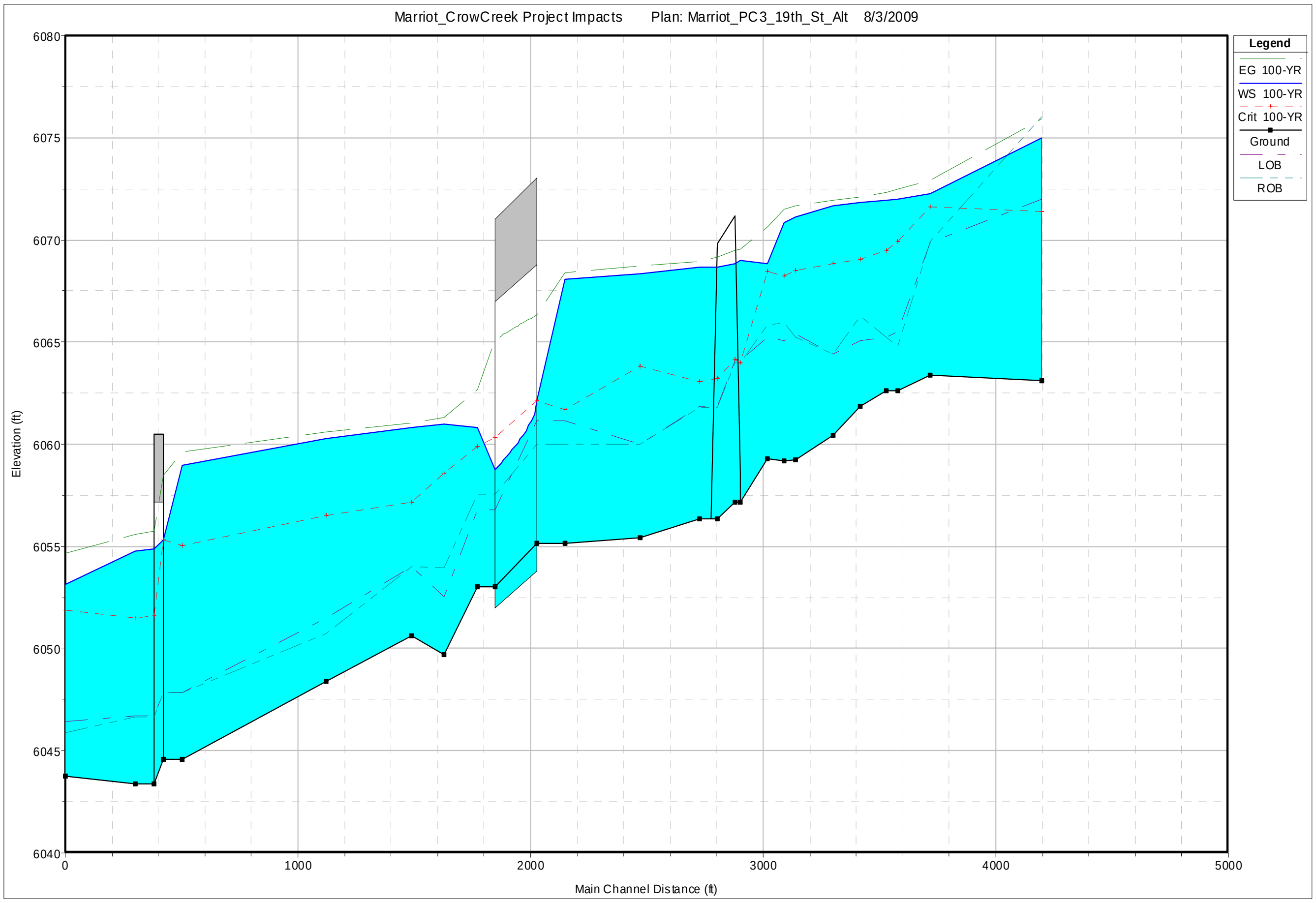
Figure 10 Water Surface Profile for Two-Span Concrete Haunched Slab Bridge



A two-span concrete haunched slab bridge could also be used at the site. The bridge would have two spans of 60-feet each. Figure 10 shows the corresponding water surface profile for this alternative. This alternative would require the second least amount of road grade raise. The bridge will also require some maintenance, especially the superstructure and deck surface, during its life. Debris is a moderate concern with this type of structure.

Using a structure width of 67.5-feet, which would be required for the preferred roadway alternative, the estimated cost of the two-span concrete haunched slab bridge would be $1,185,000.

Figure 11 Water Surface Profile for Two-Span Prestressed Concrete Deck Girder Bridge



A two-span prestressed concrete deck girder bridge could also be used at the site. The bridge would have two spans of 60-feet each. Figure 11 shows the corresponding water surface profile for this alternative. This alternative would require a moderate amount of road grade raise. The road grade raise would be more than a culvert or CON/SPAN but less than the prestressed concrete deck girder bridges. The bridge will also require some moderate maintenance, especially the deck surface, during its life. Debris is a moderate concern with this type of structure.

Using a structure width of 67.5-feet, which would be required for the preferred intersection alternative, the estimated cost of the two-span prestressed concrete deck girder bridge would be $1,210,000.   Both two-span bridge alternatives can be sized to effectively convey the 100-year flood event and eliminate overtopping of the structure. With regard to eligibility for federal funding, however, the two-span bridge alternatives are not cost-effective.

Ayres Associates has evaluated the flood damages due to the existing overtopping of the 19^{th} Street crossing and in order to meet the threshold of an acceptable benefit/cost greater than 1.0 and be competitive for both PDM and FMA project grant funds through FEMA, the 19^{th} Street structure improvements cost would need to be limited to approximately $725,000 or less. The preferred CON/SPAN structure may reasonably meet eligibility criteria for funding through one of the FEMA project grant programs.

The City's Greenway path can be readily placed under the 19^{th} Street crossing for any of these proposed structure alternatives. The box culverts would be the most sensitive with respect to impact to the upstream water surface elevation. The BFE is lowered sufficiently for all alternative structures that placement of the Greenway path will not produce an adverse impact with respect to compliance with floodplain management requirements for the City.

Roadway Design

Corridor Design

The Missile Drive Corridor is currently constructed as a four-lane divided roadway with 12 foot lanes, 6 foot shoulders, and a 16 foot median. There are no sidewalks along this segment of roadway. The speed limit along Missile Drive varies from 35 to 40 mph. Existing traffic volumes range between 6460 and 11920 along the corridor study area.

The existing roadway cross section meets City standards for a principal arterial street. Even though Missile Drive is currently classified as a minor arterial we recommend rebuilding it to meet the City's principal arterial standards. The traffic projections over the next 20 years show sections of Missile Drive meeting primary arterial standards.

Missile Drive was split into two segments. The first is from West Lincolnway to the BNSF railroad bridge crossing Missile Drive. The second is from the BNSF railroad bridge to the I-25 Interchange.

The typical section for the first segment would maintain the existing four 12 foot lanes and the 16 foot median. The two foot gutter pan would provide a buffer between the travel lane and the curb. Pedestrian conditions would be improved by constructing detached 8 foot sidewalks that can be used as multi-use paths on both sides of Missile Drive. With the exception of at the BNSF railroad bridge the sidewalks will be detached and have a 10 foot tree lawn between them and the road. See Figure 12 for a detail of the typical cross section.

The typical section for the second segment would maintain the existing four (4) 12 foot lanes, 6 foot shoulders and the 16 foot median. Pedestrian conditions would be improved by constructing standard 6 foot detached sidewalks on both sides of Missile Drive. With the exception of at the BNSF railroad bridge the sidewalks will be detached and have an 8 foot tree lawn between them and the road. See Figure 13 for a detail of the typical cross section.

An exhibit of the recommended 35% corridor design is attached in Appendix D.

Figure 12 Typical Cross Section Segment 1

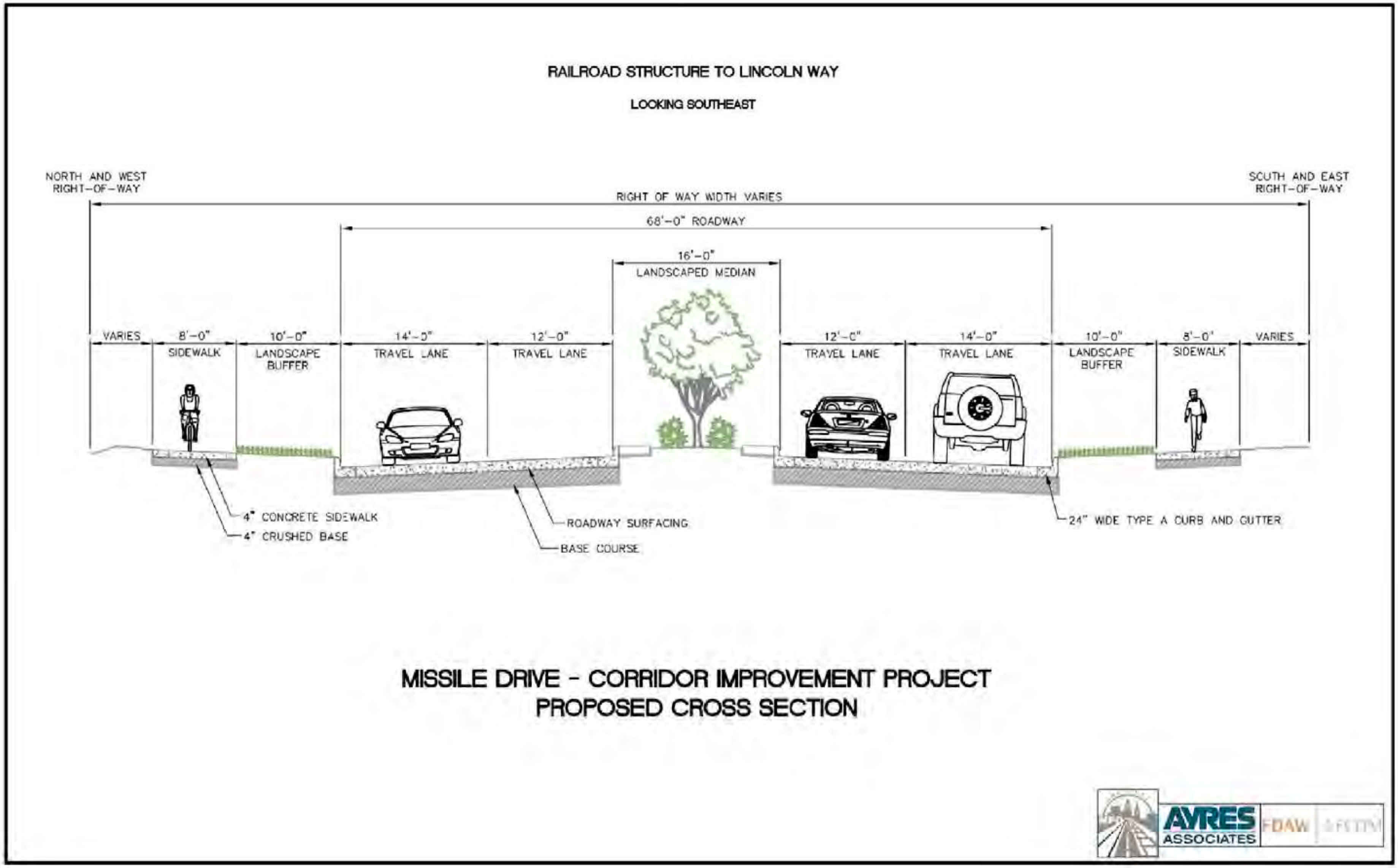
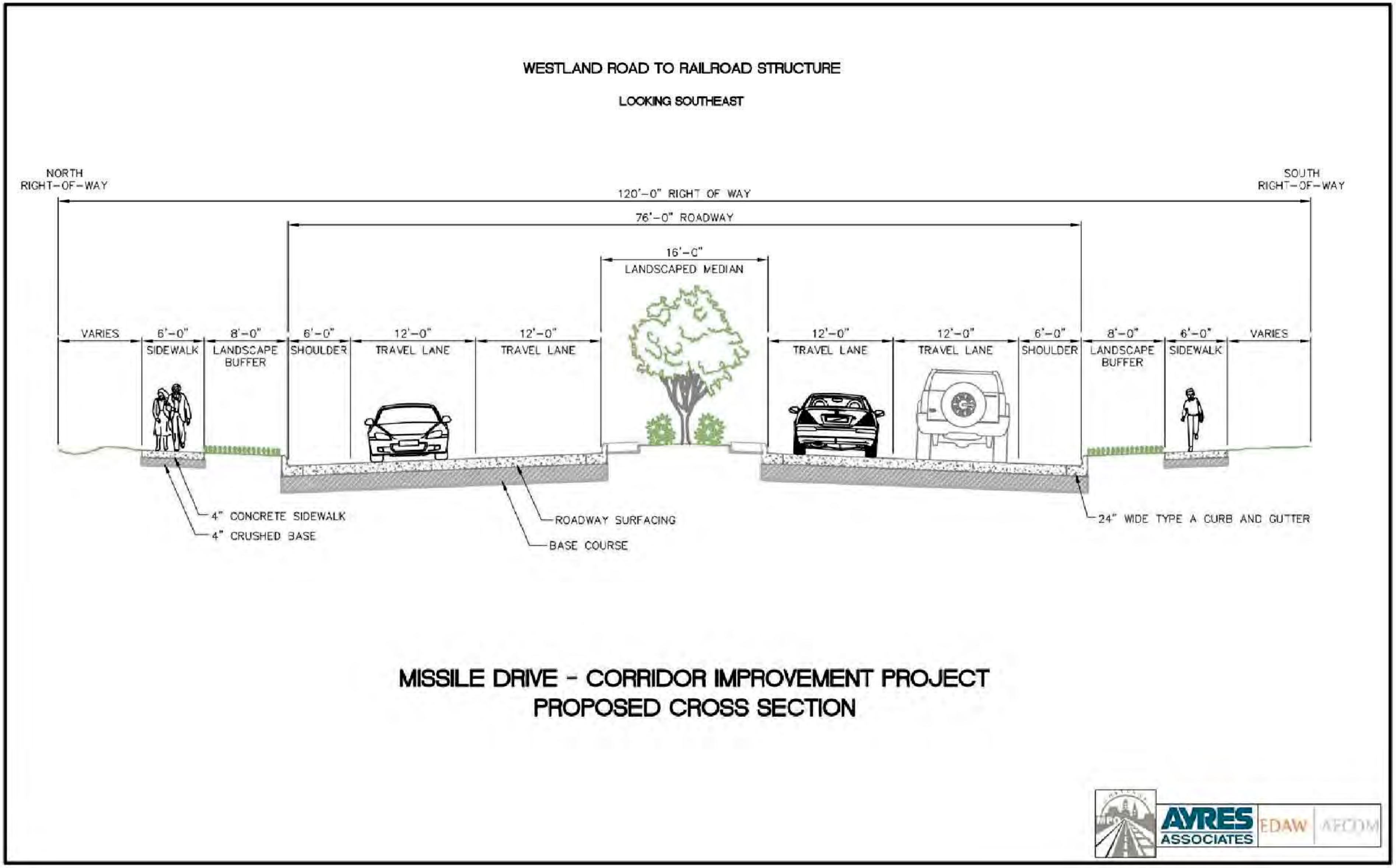


Figure 13 Typical Cross Section Segment 2



Intersection Analysis and Alternatives

An intersection operation sensitivity and crash analysis was performed at the following Missile Drive intersections for the morning and evening peak hour traffic periods with background year 2009 traffic volumes and a range of design year 2029 traffic volumes:

- Westland Road/24th Street
- Old Happy Jack Road/19th Street

Several adjustments to the Plan Cheyenne Land Use/Transportation Model resulted in varying daily traffic volume projections for the Missile Drive project design year. To consider the full range of volumes within these varying projections, the intersection operation sensitivity analysis was conducted using the high and low average daily traffic (ADT) design year volumes from the model. This sensitivity analysis identifies if any intersection peak hour traffic operation analysis conclusions are affected by the range in model traffic projections.

Design year volume sensitivity analyses were conducted for five potential intersection improvement alternatives at the Missile Drive intersection with Old Happy Jack Road and 19th Street. Only one improvement alternative analysis was conducted for the Missile Drive intersection with Westland Road/24th Street.

Morning and evening peak period traffic counts, general intersection geometric and traffic control information were collected for the study intersections. Information regarding these intersections is summarized below.

Intersection Descriptions

Missile Drive and Westland Road/24th Street

The intersection of Missile Drive and Westland Road/24th Street operates under fully actuated-uncoordinated traffic signal control. Each approach provides dedicated left turn and right turn lanes. The northwest approach of the intersection has a dedicated right-turn lane with a flared approach. Two through lanes are provided for traffic traveling on Missile Drive in both the northwest and southeast directions. One through lane is provided on the southwest Westland Road and northeast 24th Street approaches.

The left turn lanes on Missile Drive in the north and southbound directions are approximately 165 feet and 100 feet long, respectively. The northbound right turn lane provides approximately 165 feet of storage. Both turn lanes in the eastbound direction are approximately 100 feet long with the turn lanes in the westbound direction providing approximately 175 feet of storage. The existing intersection geometry is shown in Figure 14.

Figure 14 Existing Missile Drive/24th Street/Westland Road Intersection

Missile Drive and Old Happy Jack Road/19th Street

The intersection of Missile Drive and Old Happy Jack Road/19th Street operates under two-way stop sign control with free flow traffic movement along Missile Drive. A dedicated left turn lane, a dedicated right turn lane, and two through lanes are provided for traffic traveling along Missile Drive in both directions. The southbound right turn lane operates under yield sign control. Old Happy Jack Road, which approaches the intersection from the west, provides a shared left/through lane and a designated right turn lane. The 19th Street approach from the east provides a shared left/through lane and a dedicated right turn lane that operates under yield sign control. The alignment of Old Happy Jack Road and 19th Street is offset by approximately 50 feet. 19th Street curves slightly to the north just before the intersection to align at a skew angle with Missile Drive.

The left turn lanes on Missile Drive in the north and southbound directions are both approximately 150 feet long. The northbound right turn lane provides approximately 150 feet of storage. The right turn lane in the eastbound direction is approximately 200 feet long with both the left and right turn lanes in the westbound direction providing approximately 150 feet of storage. The existing intersection geometry is shown in Figure 15.

Figure 15 Alternative 1: Existing Missile Drive/19th Street/Old Happy Jack Road Intersection

Crash Data

Crash data for the intersections of Missile Drive at 19th Street and 24th Street were provided by the City of Cheyenne. A total of three crashes were reported at the study intersections during the 3 year time period from 2005 to 2007. Crash locations and collision types were tabulated and analyzed. A summary of the crash history is presented in Table 1 with detailed crash information for each study intersection included in Appendix E.

Table 1 Intersection Crash Summary (2005 – 2007)

		Westland Road/19th Street & Missile Drive	Missile Drive & Old Happy Jack Road/24th Street	Total
Intersection AADT		17,400	8,075	
Crash Rate (per MEV)		0.05	0.23	
Accident Severity	PDO	0	2	2
	INJ	1	0	1
	FAT	0	0	0
	Total	1	2	3
Accident Type	Right Angle	0	2	2
	Left Turn	0	0	0
	Rear-End	1	0	1
	SSS	0	0	0
	SSOP	0	0	0
	Head-On	0	0	0
	Other	0	0	0
	Total	1	2	3
Year	2005	1	1	2
	2006	0	0	0
	2007	0	1	1
	Total	1	2	3
Road Conditions	Dry	1	2	3
	Wet	0	0	0
	Snow	0	0	0
	Total	1	2	3

SSS = Side-swipe same direction

SSOP = Side-swipe opposite direction

Two of the crashes were property damage only, one involved an injury, and no fatalities were reported. The crash rates are well below the average rate for an intersection of each type. Due to the relatively low number of crashes it is concluded that traffic operation at these intersections is currently not a safety problem. It is noted, however, that the sharp 19th Street skew angle with Missile Drive does create difficult traffic merging and crossing conditions at the intersection. Filed observations by Ayres Associates staff noted a number of near misses at the 19th Street intersection.

Existing Operating Conditions

2009 Existing Traffic

Existing traffic volumes were compiled from data gathered by the Cheyenne MPO, WYDOT and Ayres Associates.

The Cheyenne MPO provided intersection turning movement counts for the intersection of Missile Drive at 24th Street/Westland Road. This traffic count data was collected for the morning peak period from 7AM to 9AM, the mid-day peak period from 11AM to 1PM, and the evening peak period from 3PM to 6PM on Friday, April 11, 2008.

Ayres Associates collected turning movement counts at the intersection of Missile Drive at 19th Street/Old Happy Jack Road on Wednesday, December 17, 2008 during the peak traffic periods from 6AM to 9AM and 3PM to 6PM.

Based on potential seasonal volume differences between the traffic counts, the traffic volumes on Missile Drive have been increased at the intersection of Missile Drive at 19th Street to balance with the 24th Street volume data.

Table 2 displays the volume to calculated capacity ratio, Level of Service (LOS), and maximum queuing for each study intersection with existing 2009 traffic volumes.

Table 2 Existing Operating Conditions

2009 Background	Traffic Signal	Missile Drive & Westland Road/24th Street		Eastbound			Westbound			Southbound			Northbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
		AM	v/c ratio	0.20	0.12	0.01	0.11	0.35	0.03	0.19	0.21	0.10	0.03	0.18	0.02
			LOS	B	B	B	B	B	B	A	A	A	A	A	A
			Queue (ft)	25	25	25	25	50	25	50	50	25	25	50	25
		PM	v/c ratio	0.43	0.17	0.03	0.12	0.16	0.08	0.09	0.21	0.04	0.03	0.31	0.02
			LOS	B	B	B	B	B	B	A	A	A	A	A	A
			Queue (ft)	25	25	0	25	25	0	25	25	0	25	25	0

2009 Background	Minor Street Stop Controlled	Missile Drive & Old Happy Jack Road/19th Street		Eastbound			Westbound			Southbound			Northbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
		AM	v/c ratio	0.06	0.06	0.06	0.13	0.13	0.13	0.09	0.05	0.01	0.02	0.05	0.01
			LOS	B	B	B	B	B	B	A	A	A	A	A	A
			Queue (ft)	25	25	25	25	25	25	25	0	0	25	0	0
		PM	v/c ratio	0.10	0.10	0.10	0.10	0.10	0.10	0.06	0.06	0.01	0.00	0.07	0.01
			LOS	B	B	B	B	B	B	A	A	A	A	A	A
			Queue (ft)	25	25	25	25	25	25	25	0	0	0	0	0

As shown in Table 2, all intersections are currently operating at LOS ‘B’ or better conditions during the peak traffic periods.

The traffic volumes corresponding to this analysis are shown in Appendix E.

Future Operating Conditions

<u>2029 Traffic</u>

As described above, variations of the PlanCheyenne Land Use/Transportation Model resulted in a range of design year traffic projections for Missile Drive. Therefore an intersection operation sensitivity analysis was conducted using the low and high ADT volumes from the model. In the traffic operation analysis described below, the results for the “Low Projection” and the “High Projection” are provided. Summaries of the ADT information provided by the Cheyenne MPO for the low and high projections, are included in Appendix E. The percent ADT growth was used to develop design year morning and evening peak hour traffic volume projections.

According to the low 2029 ADT projection, it is expected that Missile Drive traffic volumes are projected to grow at an annual rate between 2% and 3% per year. Traffic on the segment of 24th Street west of Missile Drive is expected to grow at an annual rate of less than 1%. East of Missile Drive, 24th Street traffic is expected to grow at a rate just under 6% per year. In comparison, at 19th Street, the traffic volumes are expected to increase at an annual rate below 1% per year west of Missile Drive and increase 3% per year east of Missile Drive.

The high projection for 2029 ADT volumes show a traffic growth on Missile Drive at an annual rate between 3% and 4% per year. Traffic on the segment of 24th Street west of Missile Drive is expected to grow at an annual rate just over 1%. East of Missile Drive, 24th Street traffic is expected to grow at a rate just over 6% per year. In comparison, at 19th Street, the traffic volumes are expected to increase at an annual rate below 1% per year west of Missile Drive and increase 3% per year east of Missile Drive.

The intersection turning movement volumes corresponding to the analysis for the low and high projections are shown in Appendix F.

Missile Drive and 24th Street/Westland Intersection

The intersection of Missile Drive at 24th Street is expected to operate at or above LOS ‘B’ conditions during the morning and evening peak hours for both the low and high design year traffic projections except for the evening peak hour eastbound left turn movement which is expected to operate at LOS ‘C’, under the high traffic projection scenario, as shown in Table 3.

Table 3 2029 Operating Conditions at Missile Drive & Westland Road/24th Street

2029 Background Low Projection		Missile Drive & Westland Road/24th Street		Eastbound			Westbound			Southbound			Northbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
	Traffic Signal	AM	v/c ratio	0.21	0.11	0.01	0.31	0.41	0.11	0.47	0.37	0.14	0.07	0.34	0.04
			LOS	B	B	B	B	B	B	A	A	A	A	B	B
			Queue (ft)	50	50	25	50	75	25	100	100	25	25	75	25
		PM	v/c ratio	0.46	0.24	0.03	0.28	0.32	0.20	0.25	0.33	0.07	0.05	0.52	0.04
			LOS	B	B	B	B	B	B	A	A	A	A	B	A
			Queue (ft)	75	75	25	50	50	50	50	100	25	25	100	25

2029 Background High Projection		Missile Drive & Westland Road/24th Street		Eastbound			Westbound			Southbound			Northbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
	Traffic Signal	AM	v/c ratio	0.25	0.12	0.01	0.38	0.46	0.13	0.55	0.42	0.16	0.08	0.41	0.05
			LOS	B	B	B	B	B	B	A	A	A	A	B	B
			Queue (ft)	50	50	25	50	75	25	100	125	25	25	75	25
		PM	v/c ratio	0.54	0.26	0.04	0.32	0.34	0.24	0.31	0.36	0.07	0.36	0.62	0.05
			LOS	C	B	B	B	B	B	A	A	A	A	B	A
			Queue (ft)	75	75	25	50	50	50	50	125	25	25	150	25

Maximum queuing is expected for the southbound through movement at 125 feet during both the morning and evening peak hours. The intersection provides adequate storage length for all turning lanes under the range of high/low 2029 traffic volume projections.

At the Missile Drive intersection with 19th Street, traffic is expected to operate at LOS ‘C’ or better under both the low and high projections except for:

- Low volume projection
    - o The eastbound and westbound approaches are expected to operate at LOS ‘D’ during the morning peak hour with a maximum queue length of 75 feet in the westbound direction.

- High volume projection
    - o The eastbound and westbound approaches are expected to operate at LOS ‘E’ and LOS ‘F’ respectively, during the morning peak hour with a maximum queuing expected of 100 feet for the westbound movements during the morning peak hour.
    - o During the evening peak hour, eastbound traffic is expected to operate at LOS ‘D’.

The intersection provides adequate storage length for all turning lanes under the year 2029 traffic volumes. Table 4 summarizes the volume to capacity ratios, LOS, and queuing for the intersection of Missile Drive and Old Happy Jack Road/19th Street with projected year 2029 traffic volumes.

Table 4 2029 Operating Conditions at Missile Drive & Old Happy Jack Road/19th Street

2029 Background Low Projection	Minor Street Stop Controlled	Missile Drive & Old Happy Jack Road/19th Street		Eastbound			Westbound			Southbound			Northbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
		AM	v/c ratio	0.19	0.19	0.19	0.45	0.45	0.45	0.17	0.09	0.01	0.03	0.08	0.01
			LOS	D	D	D	D	D	D	A	A	A	A	A	A
			Queue (ft)	25	25	25	75	75	75	25	0	0	25	0	0
		PM	v/c ratio	0.19	0.19	0.19	0.26	0.26	0.26	0.11	0.10	0.01	0.01	0.10	0.01
			LOS	C	C	C	B	B	B	A	A	A	A	A	A
			Queue (ft)	25	25	25	50	50	50	25	0	0	25	0	0

2029 Background High Projection	Minor Street Stop Controlled	Missile Drive & Old Happy Jack Road/19th Street		Eastbound			Westbound			Southbound			Northbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
		AM	v/c ratio	0.26	0.26	0.26	0.65	0.65	0.65	0.19	0.10	0.01	0.05	0.10	0.02
			LOS	E	E	E	F	F	F	A	A	A	A	A	A
			Queue (ft)	25	25	25	100	100	100	25	0	0	25	0	0
		PM	v/c ratio	0.25	0.25	0.25	0.33	0.33	0.33	0.13	0.11	0.01	0.01	0.13	0.02
			LOS	D	D	D	C	C	C	A	A	A	A	A	A
			Queue (ft)	25	25	25	50	50	50	25	0	0	25	0	0

Missile Drive & Old Happy Jack Road/19th Street Intersection Improvement Alternatives

Five intersection geometric improvement alternatives were considered at the Missile Drive intersection with Old Happy Jack Road and 19th Street:

- **Alternative 1: No-Build scenario**
    - o Intersection remains under existing geometric design.

- **Alternative 2: Two ‘T’ Intersections**
    - o Realignment of the Old Happy Jack Road and 19th Street intersections with Missile Drive into two separate ‘T’ intersections.

- **Alternative 3: Two 'T' Intersections with straight alignment of 19th Street**
    - Realignment of the Old Happy Jack Road and 19th Street intersections with Missile Drive into two separate 'T' intersections. The east leg of 19th Street would approach Missile Drive at a straight alignment.

- **Alternative 4: Closure of 19th Street**
    - Realignment of Old Happy Jack Road to intersect Missile Drive at 20th Street. 19th Street would be terminated at Dey Avenue and 20th Street would operate with two-way traffic flow.

- **Alternative 5: Two One-Way Streets**
    - Realignment of Old Happy Jack Road to intersect Missile Drive at 20th Street. 20th Street would operate as a one-way street in the westbound direction and 19th Street would operate as a one-way street in the eastbound direction.

<u>Alternative 1: No-Build</u>

As previously described and summarized in Table 4, the Missile Drive intersection with 19th Street under 'No-Build' conditions is expected to operate with several approaches at LOS 'D' or worse under both the low and high design year projection scenarios. To achieve the LOS 'C' design threshold under existing geometric conditions, an analysis was conducted with traffic signal installation at the intersection of Missile Drive and 19th Street. Table 5 provides the volume to capacity ratio, LOS, and queuing associated with the intersection of Missile Drive and 19th Street under traffic signal operation for the low and high projections of the year 2029 traffic volumes.

Table 5 2029 Alternative 1 Operating Conditions

		Missile Drive & Old Happy Jack Road/19th Street		Eastbound			Westbound			Southbound			Northbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
2029 Background Low Projection	Traffic Signal Controlled	AM	v/c ratio	0.19	0.19	0.01	0.47	0.47	0.03	0.38	0.17	0.02	0.07	0.14	0.02
			LOS	B	B	B	C	C	B	A	A	A	A	A	A
			Queue (ft)	25	25	25	50	50	25	75	50	25	25	50	25
		PM	v/c ratio	0.20	0.20	0.01	0.27	0.27	0.12	0.28	0.20	0.01	0.02	0.20	0.02
			LOS	B	B	B	B	B	B	A	A	A	A	A	A
			Queue (ft)	25	25	25	50	50	50	50	50	25	25	50	25

		Missile Drive & Old Happy Jack Road/19th Street		Eastbound			Westbound			Southbound			Northbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
2029 Background High Projection	Traffic Signal Controlled	AM	v/c ratio	0.19	0.19	0.01	0.50	0.50	0.03	0.43	0.18	0.01	0.10	0.17	0.02
			LOS	B	B	B	C	B	B	A	A	A	A	A	A
			Queue (ft)	25	25	25	50	50	25	100	50	25	25	50	25
		PM	v/c ratio	0.21	0.21	0.01	0.28	0.28	0.13	0.30	0.21	0.02	0.03	0.24	0.02
			LOS	B	B	B	B	B	B	A	A	A	A	A	A
			Queue (ft)	50	50	25	50	50	50	75	50	25	25	75	25

As shown in Table 5, with traffic signals installed at the intersection, operation of all movements are expected to improve to LOS 'C' or better conditions. Existing turn lane storage lengths are expected to provide adequate space for maximum peak hour traffic queuing conditions. A traffic signal warrant analysis was not conducted as part of this study. It is recommended that the City monitor traffic volume demand at the intersection through the year 2029 to identify when traffic signal warrants are met for the installation of future traffic signals at the intersection.

Alternative 2: Two 'T' Intersections

Alternative 2 would realign Old Happy Jack Road and 19th Street at Missile Drive intersection into two separate intersections approximately 250 feet apart, as shown in Figure 16. This would improve the skew that currently exists on the east and west approaches. The north intersection would be relocated so that Old Happy Jack terminates at Washington Avenue, which would continue north and intersect with Missile Drive. At the southern intersection, 19th Street would be relocated slightly to the south. The traffic volumes corresponding to the analysis for the low and high projections under this alternative are shown in Addendum F.

Figure 16 Alternative 2: Two 'T' Intersections

Table 6 provides the volume to capacity ratio, LOS, and queuing for the Missile Drive intersection with Washington Avenue associated with Alternatives 2 and 3 under stop sign control for the year 2029 traffic volumes. Under the both the high and low traffic projection scenarios, the intersection is expected to operate at LOS 'B' or better during both time periods with a maximum expected queue of 50 feet for eastbound traffic during the morning peak traffic period under the high traffic projection scenario.

Table 6 2029 Alternatives 2 & 3 Operating Conditions at Missile Drive & Washington Avenue

2029 Traffic Volumes Low Projection	Stop Sign Controlled	Missile Drive & Washington Avenue		Eastbound			Westbound			Southbound			Northbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
		AM	v/c ratio	0.08	N/A	0.08	N/A	N/A	N/A	N/A	0.21	0.12	0.10	0.09	N/A
			LOS	B	N/A	B	N/A	N/A	N/A	N/A	A	A	A	A	N/A
			Queue (ft)	25	N/A	25	N/A	N/A	N/A	N/A	0	0	25	0	N/A
		PM	v/c ratio	0.10	N/A	0.10	N/A	N/A	N/A	N/A	0.19	0.10	0.05	0.15	N/A
			LOS	B	N/A	B	N/A	N/A	N/A	N/A	A	A	A	A	N/A
			Queue (ft)	25	N/A	25	N/A	N/A	N/A	N/A	0	0	25	0	N/A

2029 Traffic Volumes High Projection	Stop Sign Controlled	Missile Drive & Washington Avenue		Eastbound			Westbound			Southbound			Northbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
		AM	v/c ratio	0.10	N/A	0.10	N/A	N/A	N/A	N/A	0.23	0.12	0.13	0.11	N/A
			LOS	B	N/A	B	N/A	N/A	N/A	N/A	A	A	A	A	N/A
			Queue (ft)	50	N/A	50	N/A	N/A	N/A	N/A	0	0	25	0	N/A
		PM	v/c ratio	0.11	N/A	0.11	N/A	N/A	N/A	N/A	0.21	0.12	0.06	0.18	N/A
			LOS	B	N/A	B	N/A	N/A	N/A	N/A	A	A	A	A	N/A
			Queue (ft)	25	N/A	25	N/A	N/A	N/A	N/A	0	0	25	0	N/A

Table 7 provides the volume to capacity ratio, LOS, and queuing for the Missile Drive intersection with 19th Street associated with Alternatives 2 and 3 under stop sign control for the year 2029 traffic volumes. Under the high projection, the intersection is expected to operate at LOS 'B' or better during both time periods with a maximum expected queue of 50 feet for westbound traffic during the evening peak travel period under the high and low traffic projection scenarios.

Table 7 2029 Alternatives 2 & 3 Operating Conditions at Missile Drive & 19th Street

2029 Traffic Volumes Low Projection	Stop Sign Controlled	Missile Drive & 19th Street		Eastbound			Westbound			Southbound			Northbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
		AM	v/c ratio	N/A	N/A	N/A	0.18	N/A	0.18	0.19	0.10	N/A	N/A	0.12	0.07
			LOS	N/A	N/A	N/A	B	N/A	B	A	A	N/A	N/A	A	A
			Queue (ft)	N/A	N/A	N/A	25	N/A	25	25	0	N/A	N/A	0	0
		PM	v/c ratio	N/A	N/A	N/A	0.29	N/A	0.29	0.14	0.11	N/A	N/A	0.14	0.08
			LOS	N/A	N/A	N/A	B	N/A	B	A	A	N/A	N/A	A	A
			Queue (ft)	N/A	N/A	N/A	50	N/A	50	25	0	N/A	N/A	0	0

2029 Traffic Volumes High Projection	Stop Sign Controlled	Missile Drive & 19th Street		Eastbound			Westbound			Southbound			Northbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
		AM	v/c ratio	N/A	N/A	N/A	0.21	N/A	0.21	0.22	0.10	N/A	N/A	0.15	0.09
			LOS	N/A	N/A	N/A	B	N/A	B	A	A	N/A	N/A	A	A
			Queue (ft)	N/A	N/A	N/A	25	N/A	25	25	0	N/A	N/A	0	0
		PM	v/c ratio	N/A	N/A	N/A	0.34	N/A	0.34	0.16	0.12	N/A	N/A	0.18	0.11
			LOS	N/A	N/A	N/A	B	N/A	B	A	A	N/A	N/A	A	A
			Queue (ft)	N/A	N/A	N/A	50	N/A	50	25	0	N/A	N/A	0	0

According to the City of Cheyenne Road Design Standards, the northbound left-turn lane at Washington Avenue should provide 100 feet of storage and the southbound left-turn lane at 19th Street should provide 150 feet of storage for Alternative 2. The low volumes for the right-turn movements along Missile Drive do not require a dedicated right turn lane.

<u>Alternative 3: Two 'T' Intersections with Straight Alignment of 19th Street</u>

Alternative 3 consists of a similar intersection design to that of Alternative 2, with the exception of the 19th Street alignment as shown in Figure 17. No curves would be added to the 19th Street alignment as in Alternative 2. The straight alignment would relocate the intersection relatively close to the Missile Drive intersection with the west leg of 19th Street. A traffic count was conducted at the Missile Drive intersection with the west leg of 19th Street to verify that the proximity of the two intersections (approximately 350 feet) would not create an issue for vehicles attempting to cross Missile Drive and continue on 19th Street. During the morning and evening peak traffic hours four vehicles and five vehicles, respectively, made a left turn from the west leg of 19th Street to Missile Drive and then made a right turn to the east leg of 19th Street. The number of vehicles trying to make the complimentary movement during peak traffic hours, from the east leg to the west leg of 19th Street, totaled zero during the morning and one during the evening.

Figure 17 Alternative 3: Two 'T' Intersections with Straight Alignment of 19th Street

The volume to capacity ratio, LOS, and queuing associated with this alternative under stop sign control for the year 2029 traffic volumes are expected to be similar to the results of Alternative 2, shown in Table 6 and Table 7. The traffic volumes corresponding to the analysis for the low and high projections under Alternative 3 are the same as Alternative 2 and are shown in Appendix F.

According to the City of Cheyenne Road Design Standards, the northbound left-turn lane at Washington Avenue should provide 100 feet of storage and the southbound left-turn lane at 19th Street should provide 150 feet of storage for Alternative 3. The low volumes for the right-turn movements along Missile Drive do not require a dedicated right turn lane.

Alternative 4: Closure of 19th Street

Alternative 4 would eliminate the19th Street approach to Missile Drive by vacating the segment of 19th Street between Dey Avenue and Missile Drive, as shown in Figure 18. 20th Street would be extended to the west to align more directly with Old Happy Jack Road and would operate as a two-way street, replacing the vacated segment of 19th Street.

Figure 18 Alternative 4: Closure of 19th Street

Table 8 2029 Alternative 4 Operating Conditions (Stop Sign Control)

2029 Traffic Volumes Low Projection	Stop Sign Controlled	Missile Drive & Old Happy Jack Road/20th Street		Eastbound			Westbound			Southbound			Northbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
		AM	v/c ratio	0.21	0.21	0.01	0.47	0.47	0.04	0.17	0.12	0.12	0.03	0.10	0.10
			LOS	E	E	A	E	E	A	A	A	A	A	A	A
			Queue (ft)	25	25	25	75	75	25	25	0	0	25	0	0
		PM	v/c ratio	0.23	0.23	0.02	0.27	0.27	0.19	0.12	0.14	0.14	0.01	0.13	0.13
			LOS	D	D	A	D	D	B	A	A	A	A	A	A
			Queue (ft)	25	25	25	50	50	25	25	0	0	25	0	0

2029 Traffic Volumes High Projection	Stop Sign Controlled	Missile Drive & Old Happy Jack Road/20th Street		Eastbound			Westbound			Southbound			Northbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
		AM	v/c ratio	0.32	0.32	0.01	0.68	0.68	0.05	0.20	0.14	0.14	0.05	0.13	0.13
			LOS	F	F	A	F	F	A	A	A	A	A	A	A
			Queue (ft)	50	50	25	100	100	25	25	0	0	25	0	0
		PM	v/c ratio	0.30	0.30	0.02	0.35	0.35	0.22	0.13	0.15	0.15	0.01	0.17	0.17
			LOS	E	E	A	E	E	B	A	A	A	A	A	A
			Queue (ft)	50	50	25	50	50	25	25	0	0	25	0	0

Table 8 provides the volume to capacity ratio, LOS, and queuing associated with Alternative 4 under stop sign control under the year 2029 high and low traffic volume projection scenarios. The intersection north and southbound intersection approaches of Missile Drive are expected to operate at LOS ‘C’ or better under both the low and high projection scenarios. However, under the high projection scenario, the east and westbound through and left turn movements during both the morning and evening peak traffic hours are expected to operate at LOS ‘E’ and ‘F’. Maximum queuing is expected to reach 100 feet for the westbound shared through/left turn movement during the morning peak traffic hour. In comparison, under the low volume projection scenario the east and westbound approach movements are expected to operate at LOS E during the morning peak hour and LOS D during the evening peak hour with a maximum queue of 75 feet for the westbound shared left/through movement during the morning peak hour. The traffic volumes corresponding to this analysis are shown in Appendix F.

Table 9 2029 Alternative 4 Operating Conditions (Traffic Signal Control)

2029 Traffic Volumes Low Projection	Traffic Signal Controlled	Missile Drive & Old Happy Jack Road/20th Street		Eastbound			Westbound			Southbound			Northbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
		AM	v/c ratio	0.37	0.37	0.01	0.60	0.60	0.03	0.37	0.17	0.17	0.07	0.14	0.14
			LOS	C	C	C	C	C	C	A	A	A	A	A	A
			Queue (ft)	50	50	25	75	75	25	100	75	75	25	50	50
		PM	v/c ratio	0.36	0.36	0.01	0.32	0.32	0.12	0.28	0.20	0.20	0.02	0.20	0.20
			LOS	C	C	C	C	C	C	A	A	A	A	A	A
			Queue (ft)	50	50	25	50	50	50	75	75	75	25	75	75

2029 Traffic Volumes High Projection	Traffic Signal Controlled	Missile Drive & Old Happy Jack Road/20th Street		Eastbound			Westbound			Southbound			Northbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
		AM	v/c ratio	0.47	0.47	0.01	0.52	0.52	0.03	0.44	0.19	0.19	0.10	0.18	0.18
			LOS	C	C	C	C	C	C	A	A	A	A	A	A
			Queue (ft)	50	50	25	75	75	25	125	50	50	25	50	50
		PM	v/c ratio	0.49	0.49	0.01	0.32	0.32	0.13	0.31	0.22	0.22	0.03	0.26	0.26
			LOS	C	C	C	C	C	C	A	A	A	A	A	A
			Queue (ft)	50	50	25	50	50	50	75	75	75	25	75	75

Additional analysis was conducted to determine the expected LOS and queuing of the Missile Drive intersection with Old Happy Jack Road/20^{th} Street under traffic signal control. As shown in Table 9, the intersection is expected to operate at LOS ‘C’ or better under both the high and low traffic projection scenarios. Under the high projection scenario, the east and westbound movements are expected to operate at LOS ‘C’ during the morning and evening peak hours. Maximum queuing of 125 feet for the southbound left turn movement is expected during the morning peak hour.

According to the City of Cheyenne Road Design Standards, the northbound left-turn lane should provide 75 feet of storage and the southbound left-turn lane should provide 125 feet of storage. Right turn lanes along the side street approaches should be 50 feet long. The low volumes for the right-turn movements along Missile Drive do not require a dedicated right turn lane.

Alternative 5: Two One-Way Streets

Alternative 5 would eliminate the Missile Drive intersection with Old Happy Jack Road and 19th Street and would result in two offset 'T' intersections approximately 200 feet apart, as shown in Figure 19. The north intersection would be realigned so that Old Happy Jack would turn slightly north before intersecting with Missile Drive, reducing the skew angle that currently exists. 20th Street would be extended to the west to intersect with Missile Drive at Old Happy Jack Road and would operate as a one-way street in the westbound direction. At the south intersection, 19th Street would be realigned slightly to the south and would operate as a one-way street in the eastbound direction. The high and low projected traffic volumes corresponding to this analysis are shown in Appendix F.

Figure 19 Alternative 5: Two One Way Streets

Table 10 summarizes the volume to capacity ratio, LOS, and queuing for the Missile Drive intersection with Old Happy Jack Road and 20th Street associated with Alternative 5 under stop sign control for the year 2029 traffic volume scenarios. The intersection is expected to operate at LOS 'C' or better for both of the traffic projection scenarios except for:

- Low volume projection
  - The eastbound left turn is expected to operate at LOS 'D' during the morning peak hour with a maximum queue length of 50 feet on the westbound approach.

- High volume projection
  - The intersection is expected to operate at LOS 'D' during the morning peak traffic hour for the eastbound left turn and westbound shared left/through movements during the morning peak hour. During the evening peak hour only the eastbound left turn is expected to operate at LOS 'D' Queue lengths are expected to reach a maximum of 50 feet for the westbound through and left turn movement during the morning peak hour.

Table 10 2029 Alternative 5 Operating Conditions at Missile Drive & Old Happy Jack Road/20th Street (Stop Sign Control)

2029 Traffic Volumes Low Projection	Stop Sign Controlled	Missile Drive & Old Happy Jack Road/20th Street		Eastbound			Westbound			Southbound			Northbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
		AM	v/c ratio	0.06	0.06	0.04	0.28	0.28	0.04	N/A	0.21	0.12	0.04	0.08	N/A
			LOS	C	N/A	B	C	C	A	N/A	A	A	A	A	N/A
			Queue (ft)	25	N/A	25	50	50	25	N/A	0	0	25	0	N/A
		PM	v/c ratio	0.06	N/A	0.06	0.19	0.19	0.19	N/A	0.19	0.10	0.01	0.10	N/A
			LOS	D	N/A	B	C	C	B	N/A	A	A	A	A	N/A
			Queue (ft)	25	N/A	25	25	25	25	N/A	0	0	25	0	N/A

2029 Traffic Volumes High Projection	Stop Sign Controlled	Missile Drive & Old Happy Jack Road/20th Street		Eastbound			Westbound			Southbound			Northbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
		AM	v/c ratio	0.08	0.08	0.04	0.38	0.38	0.05	N/A	0.23	0.12	0.06	0.10	N/A
			LOS	D	N/A	B	D	D	A	N/A	A	A	A	A	N/A
			Queue (ft)	25	N/A	25	50	50	25	N/A	0	0	25	0	N/A
		PM	v/c ratio	0.08	N/A	0.06	0.23	0.23	0.22	N/A	0.21	0.12	0.02	0.13	N/A
			LOS	D	N/A	B	C	C	B	N/A	A	A	A	A	N/A
			Queue (ft)	25	N/A	25	25	25	25	N/A	0	0	25	0	N/A

Table 11 provides the volume to capacity ratio, LOS, and queuing for the Missile Drive intersection with 19th Street associated with Alternative 5 for the year 2029 traffic volumes. The intersection is expected to operate at LOS 'A' for all movements under both of the traffic projection scenarios.

Table 11 2029 Alternative 5 Operating Conditions at Missile Drive & 19th Street

2029 Traffic Volumes Low Projection	Stop Sign Controlled	Missile Drive & 19th Street		Eastbound			Westbound			Southbound			Northbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
		AM	v/c ratio	N/A	N/A	N/A	N/A	N/A	N/A	0.19	0.10	N/A	N/A	0.12	0.07
			LOS	N/A	N/A	N/A	N/A	N/A	N/A	A	A	N/A	N/A	A	A
			Queue (ft)	N/A	N/A	N/A	N/A	N/A	N/A	25	0	N/A	N/A	0	0
		PM	v/c ratio	N/A	N/A	N/A	N/A	N/A	N/A	0.14	0.11	N/A	N/A	0.14	0.08
			LOS	N/A	N/A	N/A	N/A	N/A	N/A	A	A	N/A	N/A	A	A
			Queue (ft)	N/A	N/A	N/A	N/A	N/A	N/A	25	0	N/A	N/A	0	0

2029 Traffic Volumes High Projection	Stop Sign Controlled	Missile Drive & 19th Street		Eastbound			Westbound			Southbound			Northbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
		AM	v/c ratio	N/A	N/A	N/A	N/A	N/A	N/A	0.22	0.11	N/A	N/A	0.15	0.09
			LOS	N/A	N/A	N/A	N/A	N/A	N/A	A	A	N/A	N/A	A	A
			Queue (ft)	N/A	N/A	N/A	N/A	N/A	N/A	25	0	N/A	N/A	0	0
		PM	v/c ratio	N/A	N/A	N/A	N/A	N/A	N/A	0.16	0.12	N/A	N/A	0.18	0.11
			LOS	N/A	N/A	N/A	N/A	N/A	N/A	A	A	N/A	N/A	A	A
			Queue (ft)	N/A	N/A	N/A	N/A	N/A	N/A	25	0	N/A	N/A	0	0

To achieve the LOS 'C' design threshold, additional analysis was conducted to determine the expected LOS and queuing of the Missile Drive intersection with Old Happy Jack Road and 20th Street under traffic signal control. As shown in Table 12, the intersection is expected to operate at LOS 'C' or better for all movements under both of the projection scenarios. Under the high projection scenario, maximum queuing of 125 feet is expected for the southbound movements during the morning peak hour compared to 100 feet under the low traffic projection scenario.

Table 12 2029 Alternative 5 Operating Conditions (Traffic Signal Control)

2029 Traffic Volumes Low Projection	Traffic Signal Controlled	Missile Drive & Old Happy Jack Road/20th Street		Eastbound			Westbound			Southbound			Northbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
		AM	v/c ratio	0.16	N/A	0.02	0.51	0.51	0.03	N/A	0.30	0.30	0.09	0.14	N/A
			LOS	C	N/A	C	C	C	C	N/A	A	A	A	A	N/A
			Queue (ft)	25	N/A	25	75	75	25	N/A	100	100	25	50	N/A
		PM	v/c ratio	0.14	N/A	0.03	0.27	0.27	0.12	N/A	0.31	0.31	0.03	0.21	N/A
			LOS	C	N/A	C	B	B	B	N/A	A	A	A	A	N/A
			Queue (ft)	25	N/A	25	50	50	50	N/A	100	100	25	75	N/A

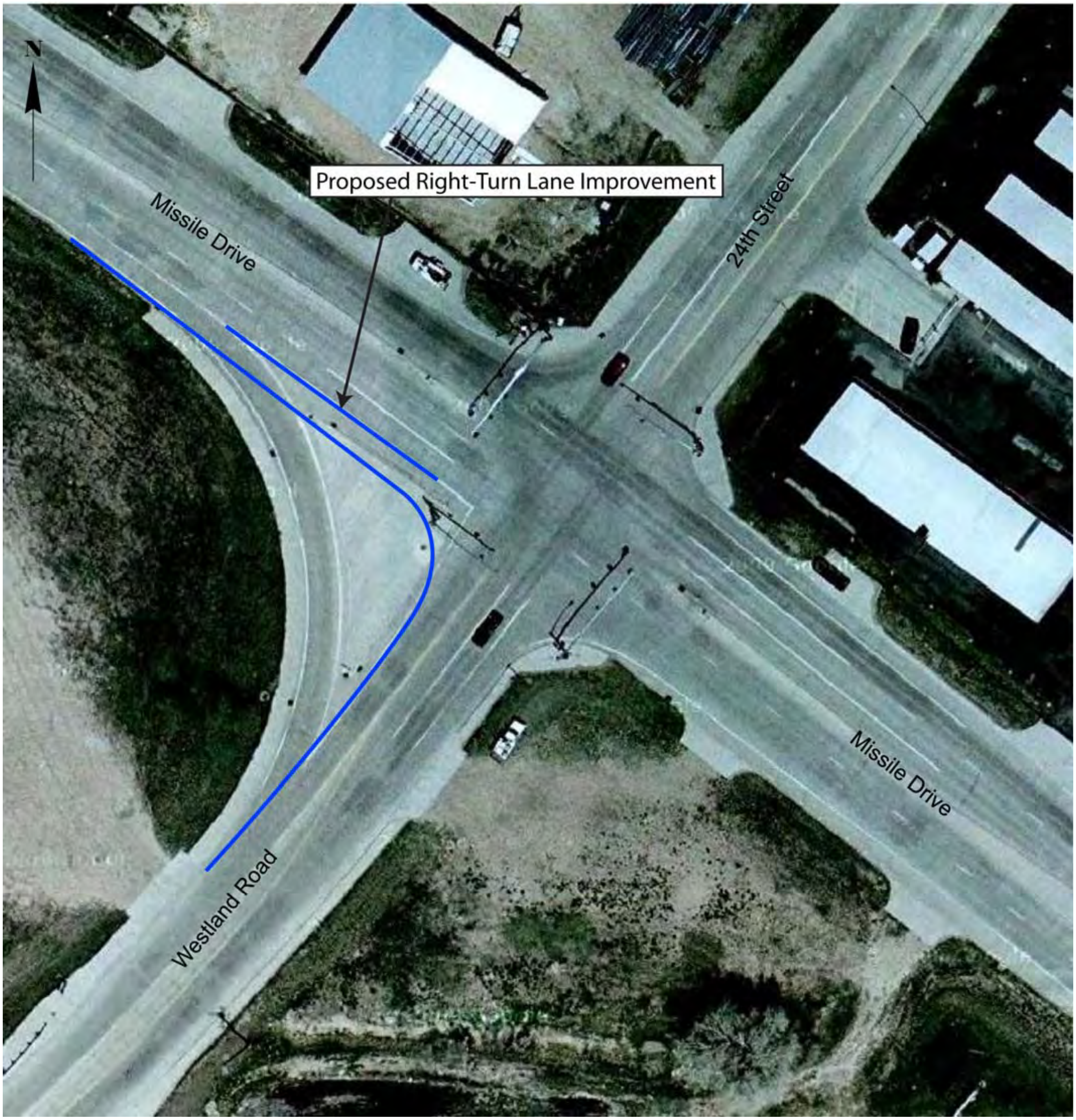
2029 Traffic Volumes High Projection	Traffic Signal Controlled	Missile Drive & Old Happy Jack Road/20th Street		Eastbound			Westbound			Southbound			Northbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
		AM	v/c ratio	0.17	N/A	0.02	0.56	0.56	0.03	N/A	0.32	0.32	0.13	0.17	N/A
			LOS	C	N/A	C	C	C	C	N/A	A	A	A	A	N/A
			Queue (ft)	25	N/A	25	75	75	25	N/A	125	125	50	75	N/A
		PM	v/c ratio	0.11	N/A	0.03	0.30	0.30	0.13	N/A	0.32	0.32	0.04	0.26	N/A
			LOS	C	N/A	C	C	C	C	N/A	A	A	A	A	N/A
			Queue (ft)	25	N/A	25	50	50	50	N/A	100	100	25	75	N/A

According to the City of Cheyenne Road Design Standards, the northbound left-turn lane at 20th Street should provide 75 feet of storage and the southbound left-turn lane at 19th Street should provide 150 feet of storage. The tight spacing between the two intersections does not provide adequate space for these recommended turn lane distances. The available distance between intersections is capable of only providing a 50-foot northbound left-turn lane and a 100-foot southbound left-turn lane, as shown in Figure 19. Right turn lanes along the side street approaches should be 150 feet long. The low volumes for the right-turn movements along Missile Drive do not require a dedicated right turn lane.

Potential Missile Drive & Westland Road/24th Street Intersection Improvement

The channelized right-turn lane on the northwest approach of the Missile Drive intersection with Westland Road/24th Street creates unnecessary pedestrian safety conflicts and serves to discourage pedestrian crossing of the intersection. The existing right-turn lane allows vehicles to maintain a higher speed than a traditional right-turn lane as well as requiring drivers to look back at traffic from the east; the yield control does not provide pedestrians a protected crossing point and significantly increases pedestrian intersection crossing distance as well as encourages higher traffic speeds on both Missile Drive and 24th Street. A traditional right-turn lane, located adjacent to the through movements and operating under signal control provides a more pedestrian friendly intersection, as shown in Figure 20.

Figure 20 Missile Drive/24th Street/Westland Road Intersection with Traditional Right Turn



The intersection was analyzed for both design year traffic projection scenarios with the traditional right-turn lane on the northwest approach. As shown in Table 13, the intersection maintains LOS ‘B’ or better operation for all approaches under both traffic projection scenarios except for the eastbound left turn under the high traffic projection scenario which is expected to operate at LOS ‘C’ during the evening peak period.. Existing storage bay lengths provide adequate space for the expected maximum queue lengths.

Table 13 2029 Operating Conditions with Removal of Channelized Right-Turn Lane

2029 Traffic Volumes Low Projection	Traffic Signal Controlled	Missile Drive & Westland Road/24th Street		Eastbound			Westbound			Southbound			Northbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
		AM	v/c ratio	0.21	0.11	0.01	0.31	0.42	0.11	0.47	0.37	0.14	0.07	0.34	0.04
			LOS	B	B	B	B	B	B	A	A	A	A	B	B
			Queue (ft)	50	50	25	50	75	25	100	100	25	25	75	25
		PM	v/c ratio	0.46	0.24	0.03	0.28	0.32	0.20	0.25	0.33	0.07	0.05	0.51	0.04
			LOS	B	B	B	B	B	B	A	A	A	A	B	A
			Queue (ft)	75	75	25	50	50	50	50	100	25	25	125	25

2029 Traffic Volumes High Projection	Traffic Signal Controlled	Missile Drive & Westland Road/24th Street		Eastbound			Westbound			Southbound			Northbound		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
		AM	v/c ratio	0.25	0.12	0.01	0.38	0.46	0.13	0.55	0.41	0.16	0.08	0.40	0.05
			LOS	B	B	B	B	B	B	A	A	A	A	B	B
			Queue (ft)	50	50	25	50	75	25	100	125	25	25	75	25
		PM	v/c ratio	0.54	0.26	0.04	0.32	0.34	0.24	0.30	0.35	0.07	0.06	0.62	0.05
			LOS	C	B	B	B	B	B	A	A	A	A	B	A
			Queue (ft)	75	75	25	50	50	50	50	100	25	25	150	25

Intersection Recommendations

Over the recent 3-year time period there have only been three reported motor vehicle crashes at the Missile Drive study intersections. Currently, all traffic movements at the study intersections are operating at LOS ‘B’ or better during the peak traffic hours.

By the year 2029, the Missile Drive intersection at 24^{th} Street is expected to continue to operate at LOS ‘B’ or better. It is recommended that the channelized southeast bound right-turn lane be reconstructed to a standard right-turn lane to increase pedestrian safety, reduce pedestrian crossing distance and calm traffic speeds on both Missile Drive and Westland Road.

By the year 2029 the Missile Drive intersection at 19^{th} Street and Old Happy Jack Road with current two-way stop sign traffic control and existing geometry, is expected to have the west and eastbound approaches operating at LOS ‘F’ and LOS ‘E’, respectively during the morning peak hour, while only the eastbound approach is expected to operate at LOS ‘D’ during the evening peak hour under a high traffic projection scenario. In comparison, under the low traffic projection scenario the intersection would still be expected to operate below an acceptable level with the eastbound and westbound approaches at LOS ‘D’ during the morning peak hour.

With traffic signals improvement Alternative 1 (No Build) under existing geometry at the intersection of Missile Drive and 19^{th} Street all traffic movement operation is expected to improve to LOS ‘C’ or better in the year 2029. In comparison, intersection improvement Alternatives 2 and 3 are expected to operate at LOS ‘B’ or better for both intersections under stop-sign control. Alternatives 4 and 5 are expected to operate at LOS ‘C’ or better with the installation of traffic signals at the Missile Drive and Old Happy Jack Road/20^{th} Street intersection. As with any signalized intersection it is recommended that the City monitor traffic volume demand to verify when future traffic signal warrants are satisfied.

The traffic projection sensitivity analysis revealed that the same intersection deficiencies are expected to exist under all of the future intersection improvement alternatives. Although the lower projections allow for slightly improved intersection operation, the same geometric designs are recommended for both traffic projection scenarios.

It is recommended the Missile Drive/19th Street/Old Happy Jack Road intersection be reconfigured as described in Alternative 3. This alternative provides LOS B or better using in year 2029 using two stop controlled T-intersections. It will provide lower maintenance costs than the Signalized intersections. It improves safety by tying the intersections in at close to 90 degrees, providing increased visibility at the intersection. It was also the chosen alternative by the public at the last public open house.

Corridor Beautification and Community Gateway Design

Corridor Beautification and Community Gateway Design

Streetscape Concept

The Missile Drive streetscape concept provides aesthetic improvements to reinforce a sense of gateway and arrival into downtown Cheyenne. The concept provides a sequential landscape that connects Crow Creek, downtown Cheyenne, I-25 and the existing neighborhoods. This approach creates opportunity for Missile Drive to transition into a pedestrian/ bike friendly mixed-use hub. The landscape strategy for Missile Drive includes two landscape types: Cultivated Prairie and Parkway. See Figure 21.

Cultivated Prairie
After exiting I-25 onto Missile Drive, the sequence begins with a landscape that borrows qualities found in the Wyoming short grass prairie. Tall, native, drought-tolerant grass species populate the ROW understory, while drifts of large trees scatter on the periphery. As you approach downtown, pedestrian and bike amenities emerge and trees become more densely planted, as shown in Figure 22.

BNSF Bridge Aesthetic Improvement Options
The proposed aesthetic improvement to the BNSF Bridge enhance, not replace, the bridge. The improvement options provide a general idea for potential aesthetic improvements to the bridge, creating a gateway into downtown, as shown in Figure 23.

The renderings for the BNSF Bridge shown below are conceptual in nature. The final design for enhancing the BNSF Bridge will be contingent on available funding, Rail Road approval, and detailed structural analysis. The detailed analysis will ensure that the enhancements do not compromise the structural integrity of the bridge. If options shown in this plan are not feasible, other lower cost options will be explored. Design elements from the Interchange Design Manual or other enhancement projects could be utilized. Other low cost options such as painting the bridge and installation of gateway features exclusive of the bridge could be investigated.

Parkway
After crossing the BNSF Bridge, the landscape transforms. Shade trees uniformly extend along the medians and roadway edges, while short, drought-tolerant grasses form a carpet below, indicating a shift from Wyoming's prairie habitat seen near I-25 to a more cultivated, parkway environment as you approach downtown, as shown in Figure 24.

Landscaped Medians

This plan proposes medians with landscaping elements that enhance the gateway character of the corridor. The renderings in this plan are a conceptual depiction of how the corridor could look in the future. During final design of this plan, the landscaping details will incorporate best practices to ensure the sustainability of the medians. Final design may also change and will be contingent on available funding for this project.

Square Footage of landscaped area in the median = 21,500 sq ft

Figure 21 Streetscape Improvements Overview

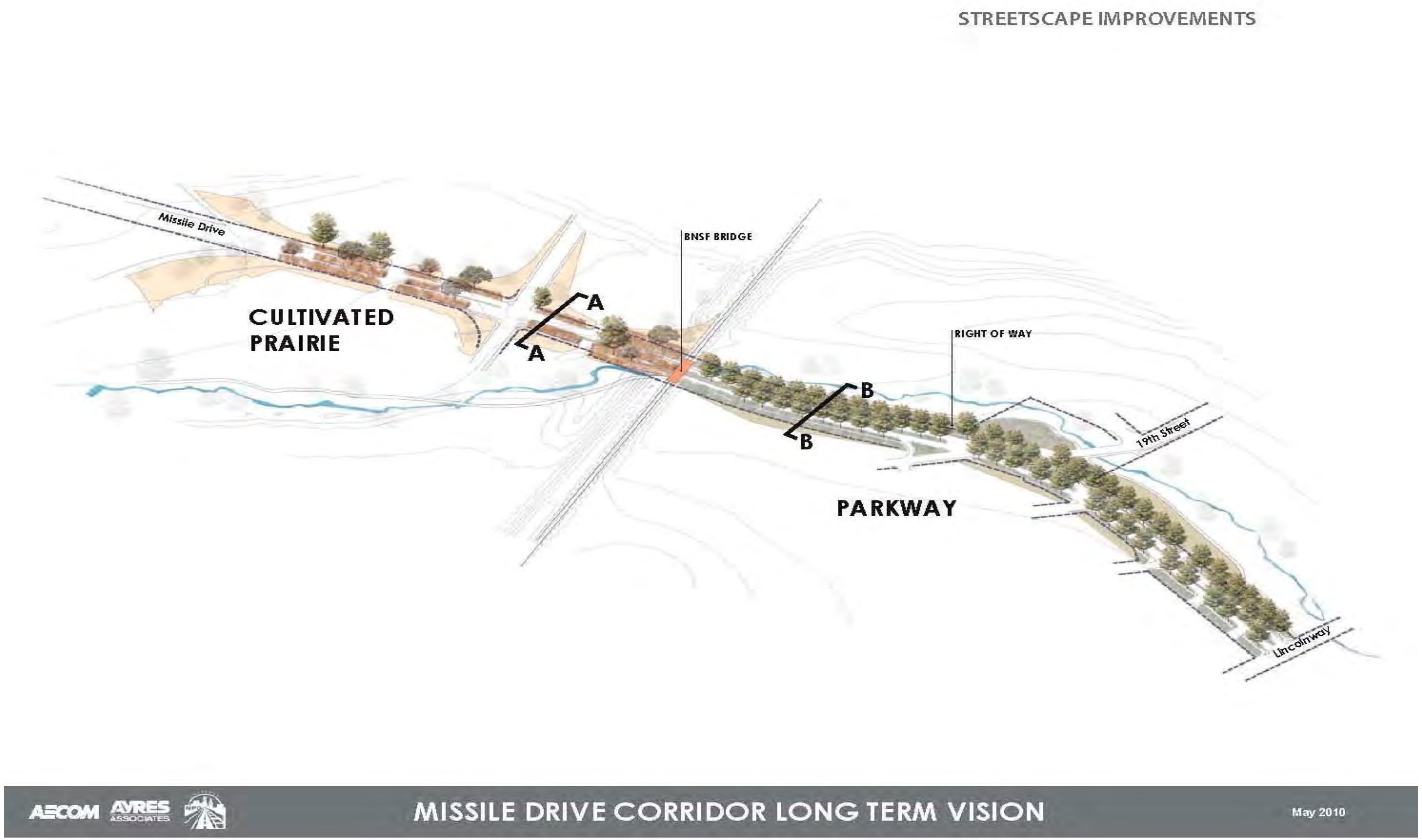
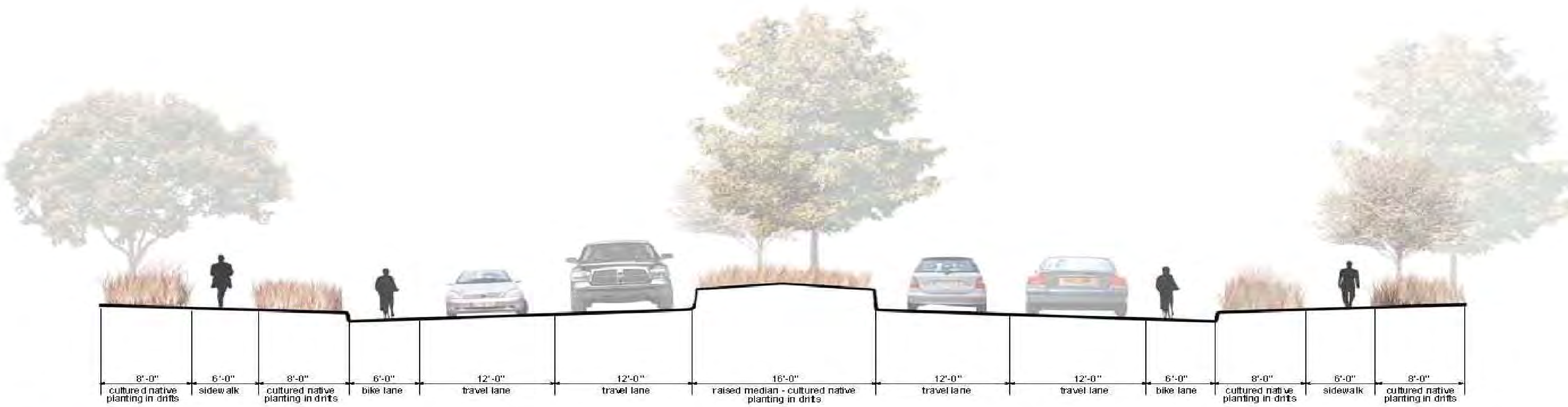


Figure 22 Streetscape Improvements Cultivated Prairie

STREETSCAPE IMPROVEMENTS



A **CULTIVATED PRAIRIE**
NTS

Figure 23 BNSF Bridge Aesthetic Improvement Options

BNSF BRIDGE AESTHETIC IMPROVEMENT OPTIONS

Existing Bridge

Potential streetscape and aesthetic bridge improvements

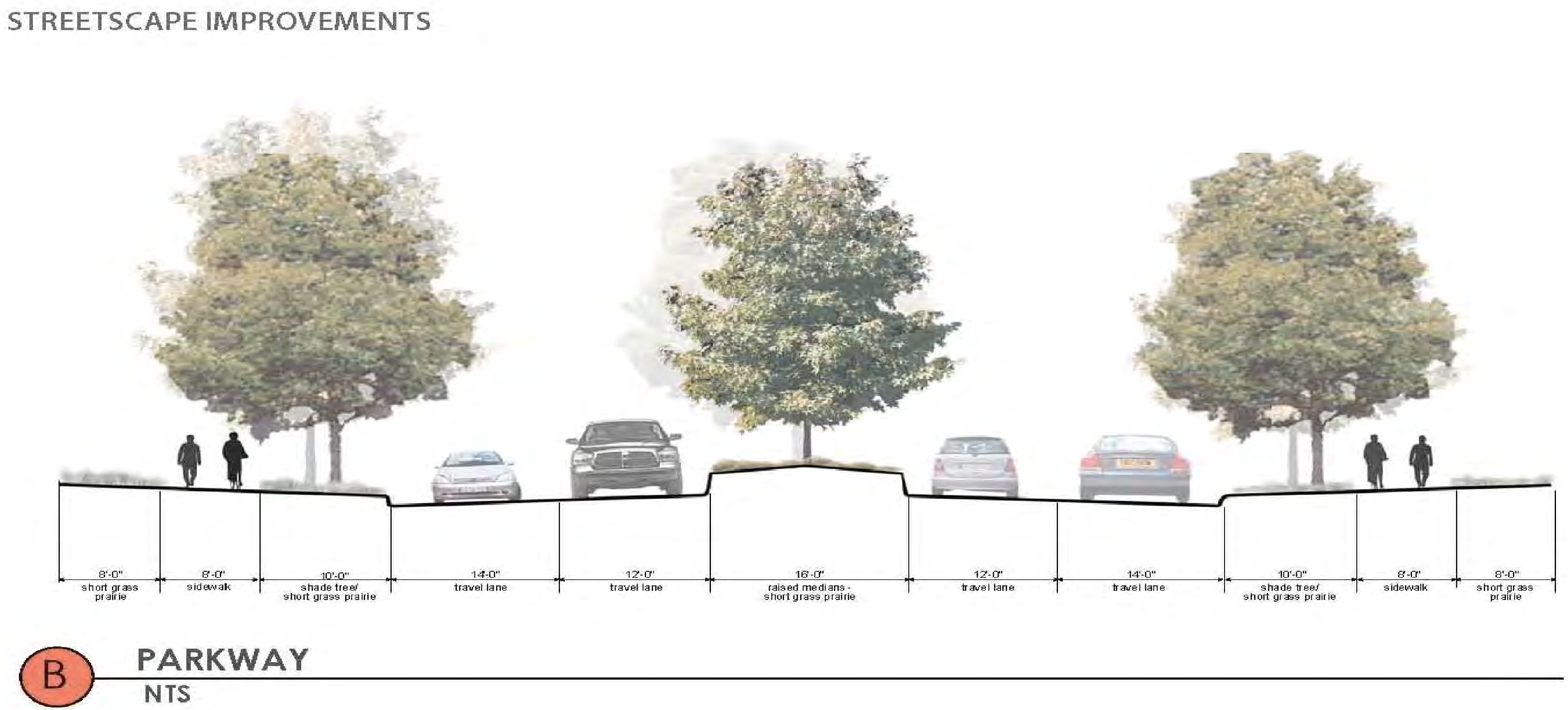
BNSF BRIDGE AESTHETIC CHARACTER CONCEPTS

AECOM AYRES ASSOCIATES

MISSILE DRIVE CORRIDOR LONG TERM VISION

May 2010

Figure 24 Streetscape Improvements Parkway



Engineer's Estimate of Probable Cost for the Conceptual Plan

An engineer's estimate of probable cost for the conceptual plan has been included in Appendix G. The estimate included right-of-way acquisition, roadway improvement, drainage and landscaping. The estimated construction cost for all improvements along the corridor is approximately $4,850,000. The estimated construction cost for only reconfiguring the Missile Drive/19th Street/Old Happy Jack Road intersection is approximately $1,280,000 and the estimate for extending the Greenway along this stretch of Missile Drive is $530,000.

The estimated construction cost for the proposed landscaping is 320,000, if built to the levels depicted in the plan. The estimated yearly maintenance cost for the landscape medians and tree lawns is $0.08 to $0.10 a square foot or $1,670 to $2,080 a year for the Missile Drive Corridor.

Summary and Recommendations

The Missile Drive Corridor Plan recommendations were developed using context sensitive design methods. Traffic analysis, design standards as well as a focus group meeting, a charrette and two public meetings were considered while developing the plan. The plan also includes the existing and proposed land use plan.

1. The free flow right turn at the Missile Drive/24th Street/Westland Road intersection should be removed and replaced with a standard right turn with a 60 foot radius.

2. The Missile Drive/19th Street/Old Happy Jack Road intersection should be reconfigured as two stop controlled T-intersections. The 19th Street leg should be brought straight into Missile Drive.

3. 19th Street should become a two way street between Missile Drive and Snyder Avenue.

4. The existing culverts under 19th Street should be replaced with a two-span CON/SPAN precast arch structure.

5. The existing four 12 foot lane, 6 foot shoulder and 16 foot median typical roadway section should remain from the BNSF railroad to the I-25 Interchange.

6. The typical roadway section from West Lincolnway to the BNSF railroad bridge should have four 12 foot lanes, 2 foot shoulders and 16 foot medians.

7. 8 foot detached sidewalks should be constructed on both sides of Missile Drive from West Lincolnway through the BNSF railroad bridge.

8. 6 foot detached sidewalks should be constructed from the BNSF railroad bridge to the I-25 interchange.

9. A bench would be provided in the west span of the proposed CON/SPAN precast arch structure and in the south cell of the box culvert under Missile Drive near the BNSF railroad Bridge. These benches would be used as underpasses for the propose greenway extension.

10. No significant changes will be made to the profile along Missile Drive.

11. Install landscaping in the medians and tree lawns along the Missile Drive corridor.

12. Reface the BNSF railroad bridge or place a separate gateway feature in front of it to hide the cracks and spalling concrete.

Execution of Recommendations

It is recommended the reconfiguration of Missile Drive/19th Street/Happy Jack Road intersection with replacing the structure over Crow Creek be designed and constructed when funding is available. The other recommendations are not planned for in the next 5 to 10 years, but should be considered as the land is developed or when the City reconstructs Missile Drive.

Appendix A

Missile Drive Corridor Fact Sheet

Missile Drive Traffic Fact Sheet

- **Traffic Volumes**

  Missile Drive
  - Existing daily traffic volume: 6,600 to 7,600 vehicles
  - 20 year traffic growth projection: 9,000 to 16,000 vehicles

  19th Street
  - Exiting daily traffic volume: 2,700 vehicles
  - 20 year traffic growth projection: 5,800 vehicles

- **Intersection Peak Traffic Period Operation**

  Missile and 24th-Westland Intersection
  - Currently all movements operate at Level of Service C or better
  - 20 year projection is expected to have all movements continue to operate at Level of Service C or better

  Missile Drive and 19th – Old Happy Jack Road Intersection
  - Currently all movements operate at Level of Service C or better
  - 20 year projection is expected to have some movements operating at Level of Service E.

- **Traffic Safety**

  - Over 5 year period from 2003 through 2007
    - 19 reported crashes (about 4 per year)
    - 6 crashes occurred at 24th –Westland intersection with Missile Drive
    - 3 crashes occurred at 19th –Old Happy Jack Road intersection with Missile Drive
    - 17 occurred during daylight time period
    - 9 occurred during 3:00 to 6:00 pm time period
    - 6 occurred during months of June and July

Appendix B

Focus Group Meeting

Missile Drive Focus Group

Meeting Notes

March 16, 2009

Five area residents along with a representative of the UP Railroad participated in the meeting.

Meeting Purpose: to identify the long-range development potential of the corridor.

It was agreed that change in the corridor has been very slow

Major concerns of the participants were:

- Do not take land from the park
- Local flooding and drainage issues
- Roadway is a heavy trucking route
- Do not eliminate Old Happy Jack Road business access to Missile Drive
- Continuous changes in City 'red tape' discourages development
- Short weaving distance for traffic turning left between Westland and I-25 interchange ramps
- Impact of extending 20th Street to Missile Drive on concrete accessibility and neighborhood street system between 19th and 20th streets

Future considerations include:

- Improve roadway amenities
- Enhance Greenway and connect to Warren Air Force base, new Freedom Elementary school or Bunk House development
- Enhance and increase parklands
- Do not degrade access to concrete plant
- New development potential could include an airport or hospital campus
- It may be hard to become a mixed use development corridor as current development is primarily light industrial/business
- Changing Old Happy Jack to a pedestrian/bike trail would be OK due to railroad tunnel constraints
- Railroad conducts structural adequacy checks on tunnel and overpass, enhancement of abutments should be Ok to consider for gateway treatment
- Median landscaping would be a good improvement

Appendix C

Design Charrette

Missile Drive Corridor Charrette

March 17, 2009

Group 1 Notes

Facilitator: Jeremy Call, EDAW

Future Land Use: What will the corridor land use be like in 30-50 years?

- PlanCheyenne is a good starting point, and for the most part provides a likely scenario for this district's future. West Lincolnway will continue to be "motel row" with some new restaurants and retail moving in to support the growing hotel industry, which would likely leave the Missile Drive Corridor as mostly office and service commercial. It is not a prime area for retail or restaurants.
- The major driver for land use change is not the roadway re-design but future re-development east of I-25 due to the potential Air Force Base closure, NCAR, a new hotel or hospital, or residential community. A new hospital would result in support medical and technical offices and possibly restaurants being located east of the I-25 interchange.
- Residential is not likely in this district of the City, as it has continually trended towards commercial, office, service commercial. Existing mobile home subdivisions will likely convert to commercial oriented uses. Two exceptions are where the older single-family residential neighborhoods could become higher density mixed use (office/residential) as downtown moves west (Ames, Dillon, Snyder Avenues) and northeast of the Missile Drive/I-25 interchange (though constrained by railroad uses). West of Snyder will continue to transition from residential to office.
- A supermarket could be a possibility, perhaps on the northeast corner of the I-25 interchange, as this district is underserved by grocers.
- The Back 40 property – west of the Cheyenne Ice Rink – provides the greatest new industrial / commercial land use opportunity.
- Morandin and Costello property owners do not have a vision for new development on their vacant properties, but are open to ideas and office makes sense. There has been little marketing activity.
- Maintaining the commercial viability of the Ready-Mix concrete plant and corresponding access is a priority for the property and business owners.
- The railroad spur down Reed Avenue could be removed, providing a re-development impetus for downtown office/mixed use.

Road Character and Realignments

- The I-25 interchange and West Lincolnway form bookends to the corridor, and should be acknowledged through streetscapes, signage, and urban design opportunities.
- None of the 19th Street/Missile Drive intersection alternatives were endorsed. Most felt that the one-way conversions of 20th Street and 19th Street at Missile Drive complicated the alternatives. Why not merge the one-way streets together at Ames, Snyder or Reed Avenue (especially if railroad spur were to be vacated)? This would simplify the intersection and allow 19th Street to be straightened to approach Missile Drive at a perpendicular.
- The Dey Avenue/19th Street intersection needs to provide adequate turning radii for Ready Mix concrete trucks to access the business. Approximately 60 trucks per day exit/enter the site.
- The group described the future character of Missile Drive as a "boulevard" or "complete street" with bike lanes, plentiful landscaping and street trees, vehicular and pedestrian lighting, crosswalks, planted median, and bus stops.
- Lengthy debate regarding closing the Happy Jack Tunnel to vehicles. While closing the tunnel would provide safety benefits, the group reached consensus that leaving it open would benefit businesses and development opportunities. The tunnel does not seem to be a natural bike/ped route or sightline in the larger greenway and Missile Drive context.

Greenway

- Goal: create a gateway to downtown. The greenway is a defining characteristic, and the lack of park, pedestrian and bike facilities suggest a sterile and auto-dominated city image.
- Funding is available to build the greenway trail from MLK Park to I-25.
- Safety, homelessness and transients are a significant constraint for park and greenway users. The homeless shelter on West Lincolnway, the facilities at MLK Park, underpasses, railroads (all transients jump the railroad before it enters security at the AFB) and the City greenway properties make this area heavily used by transients.
- Bike lanes and sidewalks would not be needed on southbound Missile Drive south of the RR tunnel, as users should reach the greenway. Adequate cross-connections are essential to allow users to reach the greenway.
- Additional bike/ped facilities are needed on 17th Street and 18th Street between Missile Drive and the Cheyenne Ice Rink and Mini-Golf Course.
- Bike/ped facilities are needed north of the railroad tunnel to I-25.
- The strip of MLK Park adjacent to Missile Drive is sterile – provide pedestrian amenities like sculpture, trees, display gardens, dog walk, farmers market, or other eye-catching linear features that could be enjoyed by both park users and vehicles on Missile Drive.
- A concept plan has been prepared by the City for Pat Griffin Park as part of the hotel development. Need to obtain a copy of this plan from the City (Teresa Moore).
- Lighting along the trail should be different than vehicular lighting.
- The concrete wall along the Ready Mix plant should be screened with ornamental trees or vines
- The segment from Westland Rd to 19th Street should remain in a natural character as a natural retreat between the two parks.
- A new 19th Street / Missile Drive intersection should accommodate a below-grade trail crossing

Group 2 Notes

Facilitator: Sreyoshi Chakraborty, Cheyenne MPO

<u>Land-use</u>

Sreyoshi's Notes

- High Intensity development at the I-25/ Missile Interchange, to utilize it as an activity area. Opportunity for greater use of land is possible due to realignment of the interchange (by WYDOT), which frees up land for other uses.

- Developments west of I-25 would comprise of a mixed-use employment campus character. This would include the Holdings property, CRMC and NCAR campus.

- The residential/ trailer park areas should see a turnover in the next few years and have the potential to be developed as hotels.

- The BNSF corridor is seen as a great potential for the future. If this corridor could be utilized as an Amtrak or a light rail corridor for the city, then there is potential for high-density development along this corridor, potentially in the form of a TOD. This is the NE corner of Missile Drive and is seen more desirable for residential use that blends in with the downtown character.

Nikki's Notes:

- Question on what you can do with unused old interchange at I-25 and Missile?
  - Will be a clear zone
  - Can put bushes (low)
  - Minimal obstructions
  - 30' away from road – clear zone
  - Maintenance problem – be willing to see or trade
  - Ex – motels, restaurants
  - Enterprise car rental along Missile are encouraging businesses
  - Storage units
  - Gas stations are problematic (can't bury gas tanks in area)

- Cheyenne planning perspective
  - Benefits come for measuring amounts of traffic and traffic projections
  - Missile Dr. remains aesthetically sleepy and run down
  - Hospital has SW of interchange – corporate business park

- Missile drive connects military base with downtown
- What about the trailer park and three other residential properties along Missile
- Some feel that trailer park will be consumed as traffic increases, and Missile becomes commercial and upscale residential

- What if RR is moved?
  - Will probably never move
- Amtrak wanting to come through in the future
- Maybe RR is a good divider line
- Character areas of use ~ 3 main character areas
  - North of Missile Dr. and east of RR (more residential – mixed use – attractive for downtown workers like batch plant)
  - South of Missile and east (commercial)
  - West of RR (highway, mostly commercial – hotels, restaurants, etc.)
  - City of Cheyenne is expanding

<u>Road Character and Realignments</u>

Sreyoshi's Notes:

- Should be built to an urban arterial standard with a boulevard look. Current road lacks character or any sense of place. Seems like a sea of asphalt, lacks sidewalks and other amenities along the road. Should at a minimum have sidewalks, landscaped median and traffic calming features to prevent people from speeding and to make it more inviting.

- Lighting, and visual themes that are more human scale should be used for this corridor.

- 24th Street is not anticipated to be problematic because of low intensity uses along it. 24th Street is too wide, till Snyder. The intersection of 24th and Missile however lacks character. 24th leads into an old residential neighborhood, eventually leading to the Capitol Building. However, the 24th and Missile intersection fails to provide a visitor a sense of arrival. We felt that an urban design feature such as a water feature along with the greenway or a roundabout at the intersection will provide some character to this area and also provide a nice gateway feature into town.

- Missile and 19th design works fine, however drainage issues at 19th and Missile need to be resolved while redesigning it.

Nikki's Notes:

- 24th Street might be problematic – more local use – seems OK
- What about Missile or Westland as access to downtown? (most likely traffic route is down Missile)
- First impression coming in on Missile is a sea of asphalt
  - Not eye appealing, not enticing, needs to invite people into the City
  - Pershing St. example
  - Like Full Blvd. idea…like the planning concept plan
  - Jeff said lots of extra land devoted to automobile sales?
  - Something more "human scale" with the lights, not the big highway lights that are there now
  - Make business friendly
  - Need to slow drivers down
- 24th Street – entry to capitol and current hospital
  - How do we make a comfortable characteristic for 24th Street?
  - Need something to appeal/buffer to separate commercial/mobile home and residential
  - Maybe narrow 24th St. to make more appealing
  - Look at other consultants proposal…rendering that was completed in proposal stage
  - Need a visual cue to say "this is the way to the capital"
  - Make it appealing
  - Roundabout at Missile and 24th to give improvement, direction to capitol
- Old Happy Jack short-cut, worthwhile road
  - Serve a lot of local use__
  - Or maybe close it?
  - Short-cut and bypass when train is on RR
  - Roundabout idea is liked for Old Happy Jack and 19th
  - Option 1 is liked

Greenway

Sreyoshi's Notes:

- Possible destinations to connect the existing greenway – Warren AFB, Happy Jack Road, Freedom Elementary School, Little America, Original City Cornerstone. The original city cornerstone might be a nice landmark point to connect the greenway to. Preservation Planner indicated that the cornerstone exists in the property that WYDOT would now give away as a result of the interchange reconfiguration.

- Enhancements at MLK Park, along the greenway are required. A unifying theme for the entire greenway corridor is required, maybe through lighting, native vegetation and landscaping treatments. Also, this greenway theme can be the unifying element for the whole corridor. The greenway should also serve as a connector for various uses along the corridor.

- The greenway crossing design under Missile to the other side of the Crow Creek needs to be figured out for ensuring that it continues to the destinations mentioned above.

Nikki’s Notes:

- Enhances "gateway to City" concept
- Good access from west of I-25 to City
- Pedestrian lights through park area
- Need unification of the greenway along the creek (aesthetics)
- Like the greenway concept

Group 3 Notes

Facilitator: Andy Dana, Ayres Associates

Land Use

- Residential throughout the corridor is a strong possibility if a greenway connection is provided
- Provide land use that will slow traffic down; currently Missile Drive is perceived as a short cut but there isn't enough distance to necessitate a shortcut.
- Goal: create a gateway that indicates once you hit Missile Drive you are in Cheyenne. Provide a nice progression into downtown; create an experience
- Back 40 Development is a huge opportunity; currently the Cheyenne Events Center has poor access and this development could complement the Events Center through access and use
- Encourage high density multi-family mixed use development in the employment campus area
- Provide mixed use with an office emphasis in the commercial emphasis area
- Create a buffer of green space between these zones
- Provide green space and commercial uses in the industrial area that complements potential hotel development
- Small retail; no big box
- Create gateways at Missile Dr and I-25, and Missile and Lincolnway

Road Character and Realignments

- Provide pedestrian amenities like sculpture, trees, sidewalk and bike lanes
- Provide several stop lights so you have a chance to observe around you
- Reconfigure all roads to connect into existing downtown grid
- Signalize 19th and Happy Jack to reduce traffic speed
- Roundabout option is reasonable for cost, efficiency and traffic volume

Greenway

- Connect MLK Park to Happy Jack
- Provide on-grade connections throughout the greenway
- Maximize safety issues (the culvert for example)

Appendix C

Notes From Second Public Meeting

MEMORANDUM

To:	Sreyoshi Chakraborty, Project Manager – Cheyenne MPO
From:	Andrew Dana, Project Manager – Ayres Associates
Date:	March 5, 2010 — Project No.: 32-1394.00
Re:	Missile Drive Second Open House

On February 16, 2009 the second open house for the Missile Drive Corridor project was held in the Sunflower room of the Laramie County Library for the purpose of presenting and reviewing the project progress. The project team presented a phased land use alternative, the preferred corridor improvement, and five intersection alternatives for the intersection of Old Happy Jack Road/19th Street/Missile Drive.

Alternative 1 – Existing Condition
Alternative 1 is a no-build alternative. There will not be any improvements to the intersection or the culverts. (See Figure 1)

Alternative 2 – 19th Street Reconfiguration (A)
Alternative 2 improves the 19th Street/Old Happy Jack intersection by creating 2 T-intersections that tie into Missile Drive at close to 90 degrees. 19th Street would use the existing culverts over Crow Creek. (See Figure 2)

Alternative 3 – 19th Street Reconfiguration (B)
Alternative 3 improves the 19th Street/Old Happy Jack intersection by creating 2 T-intersections that tie into Missile Drive at close to 90 degrees. 19th Street would be straightened and new culverts would be installed at Crow Creek. This alternative was presented as the preferred alternative (See Figure 3)

Alternative 4 – 19th Street Closed & 20th Street Extended
Alternative 4 would remove the 19th Street intersection with Missile Drive. 20th Street would be extended to Missile Drive and tie into Old Happy Jack Road. This alternative would require a bridge be constructed over Crow Creek. (See Figure 4)

Alternative 5 – 19th Street Reconfigured & 20th Street Extended
Alternative 5 improves the 19th Street intersection by straitening 19th Street and installing new culverts at the Crow Creek crossing. 20th Street would be extended to Missile Drive and tie into Old Happy Jack Road. This 20th Street would require a bridge be constructed over Crow Creek. (See Figure 5)

Based upon the input from the attendees, as well as from the questionnaires the majority of the people preferred Alternative 3. They also want to see the area landscaped to improve the appearance of the corridor.

3433 Oakwood Hills Parkway ● Eau Claire, WI 54701-7698 ● 715.834.3161 ● Fax: 715.831.7500 ● www.AyresAssociates.com

Approximately 20 people attended the public open house for the Missile Drive Corridor project. Four of the attendees turned in comment forms. The following is a summary of the answers to questions on the comment form.

1. Does the proposed land use meet the needs of the area in the future? If not what changes would you like to see with the proposed land use?
   a. Yes – None
   b. Yes, very good plan
   c. I like the 2 way traffic on 19th street for most alternatives. My office is at 1102 W 19th Street. It is amazing how much traffic travels the wrong way on 19th Street. How can we move the schedule up? I like the landscaping and the greenway.

2. Please rank the 19th Street/Old Happy Jack Road intersection alternatives in order of your preference, with 1 being the best and 5 being the worst.

Alternative 1 – Existing Condition	_,5,5,5
Alternative 2 – 19th Street Reconfiguration (A)	_,4,2,3
Alternative 3 – 19th Street Reconfiguration (B)	1,1,1,1
Alternative 4 – 19th Street Closed & 20th Street Extended	_,2,4,4
Alternative 5 – 19th Street Reconfigured & 20th Street Extended	_,3,3,2

3. What elements of the proposed plan do you like?
   a. Traffic, ped., greenway improvements
   b. Improved appearance, improved islands

4. What elements of the proposed plan do you dislike?
   a. None

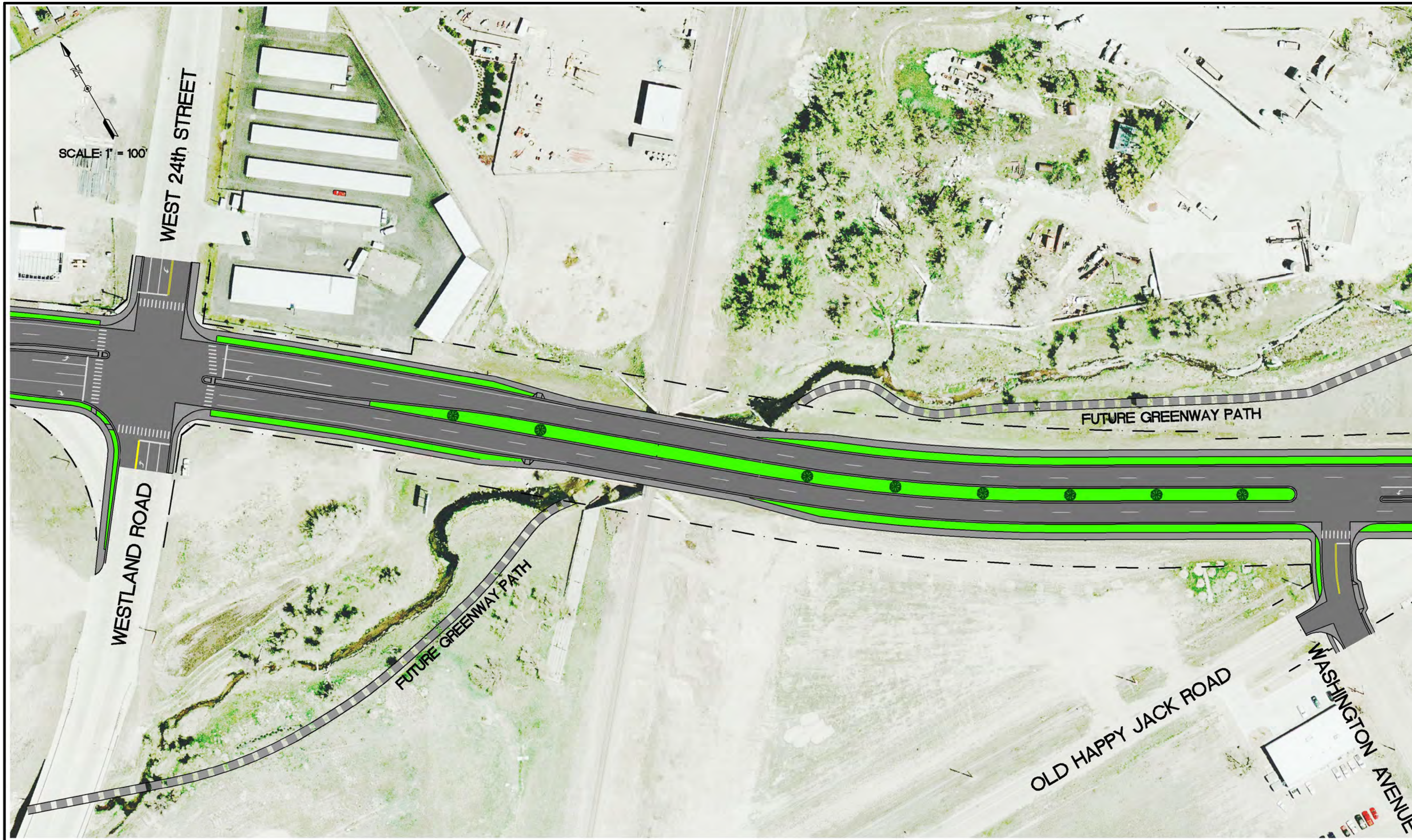
5. What improvements would you like to see for pedestrians and bicyclists?
   a. Proposed plan more than adequate
   b. Greenway

6. General Comments.
   a. A very good plan and visionfor the west side of the community. The big challenge will be adequate funding and a method of dealing with the blight property issue. I do like the link to the West Lincolnway improvements. Again the issue there is the blight zone problems that are holding this area back.

Appendix D

Corridor Layout

MISSILE DRIVE - CORRIDOR IMPROVEMENT PROJECT



MISSILE DRIVE - CORRIDOR IMPROVEMENT PROJECT

AYRES ASSOCIATES

MISSILE DRIVE - CORRIDOR IMPROVEMENT PROJECT

SHEET 3 OF 4

MISSILE DRIVE - CORRIDOR IMPROVEMENT PROJECT

AYRES ASSOCIATES

SHEET 4 OF 4

Appendix E

Crash Details

INTERSECTION CRASH STATISTICS

AYRES ASSOCIATES

INTERSECTION: Missle Drive & Old Happy Jack Road / 19th Street
MUNICIPALITY: Cheyenne COUNTY: Laramie STATE: WY
PERIOD: 3 YEARS 0 MONTHS FROM: 1/1/2005 TO: 12/31/2007

PROJECT ID: 32-1402.00 | PREPARED BY: TLH | DATE: 2/17/2009

INTERSECTION CHARACTERISTICS

TRAFFIC CONTROL: MINOR STOP CONTROLLED
INTERSECTION AADT (2007): 8,075
NUMBER OF LEGS: 4
POSTED SPEED MAJOR: 30
POSTED SPEED MINOR: 30

CRASH STATISTICS

CRASH FREQUENCY & SEVERITY				
YEAR	PDO	INJURY	FATAL	TOTAL
2005	1	0	0	1
2006	0	0	0	0
2007	1	0	0	1
TOTAL	2	0	0	2
PERCENT	100.0%	0.0%	0.0%	100.0%
YEAR AVG.	0.67	0.00	0.00	0.67

ROAD CONDITIONS		%
DRY	2	100.0%
WET	0	0.0%
SNOW	0	0.0%
ICE	0	0.0%
OTHER	0	0.0%
TOTAL	2	100.0%

CRASH RATES	per MEV
CRASH RATE	0.23
INJURY CRASH RATE	0.00
FATAL CRASH RATE	0.00

CRASH TYPE		%
ANGLE	2	100.0%
REAR-END	0	0.0%
HEAD-ON	0	0.0%
SS-SAME	0	0.0%
SS-OPPOSITE	0	0.0%
PEDESTRIAN	0	0.0%
BICYCLE	0	0.0%
FIXED	0	0.0%
NOT FIXED	0	0.0%
DEER	0	0.0%
OVERTURN	0	0.0%
OTHR/UNKN	0	0.0%
TOTAL	2	100.0%

LIGHT CONDITIONS		%
DAY	2	100.0%
DARK	0	0.0%
TOTAL	2	100.0%

DAY AND TIME							
DAY OF WEEK	*EARLY MORNING* 12:00 AM TO 5:59 AM	*AM PEAK* 6:00 AM TO 9:59 AM	*MIDDAY* 10:00 AM TO 2:59 PM	*PM PEAK* 3:00 PM TO 6:59 PM	*LATE EVENING* 7:00 PM TO 11:59 PM	TOTAL	
MONDAY	0	1	0	0	0	1	Weekday
TUESDAY	0	0	0	0	0	0	
WEDNESDAY	0	0	0	0	0	0	
THURSDAY	0	0	0	0	0	0	
FRIDAY	0	0	0	0	0	0	
SATURDAY	0	0	0	0	0	0	Weekend
SUNDAY	0	0	1	0	0	1	
TOTAL	0	1	1	0	0	2	

INTERSECTION CRASH DATA

AYRES ASSOCIATES

INTERSECTION: Missle Drive & Old Happy Jack Road / 19th Street
MUNICIPALITY: Cheyenne COUNTY: Laramie STATE: WY
PERIOD: 3 YEARS 0 MONTHS FROM: 1/1/2005 TO: 12/31/2007

PROJECT ID: PREPARED BY: TLH DATE: 2/17/2009

CRASH DETAILS

REF. NUMBER	LABEL	DATE	DAY OF WEEK	TIME OF DAY	SEVERITY	MANNER OF COLLISION	ACCIDENT TYPE	LIGHT COND.	ROAD COND.
510004	1	7/3/2005	SUNDAY	10 AM	PDO	ANGLE	MV IN TRANS.	DAY	DRY
719324	2	11/12/2007	MONDAY	8 AM	PDO	ANGLE	MV IN TRANS.	DAY	DRY

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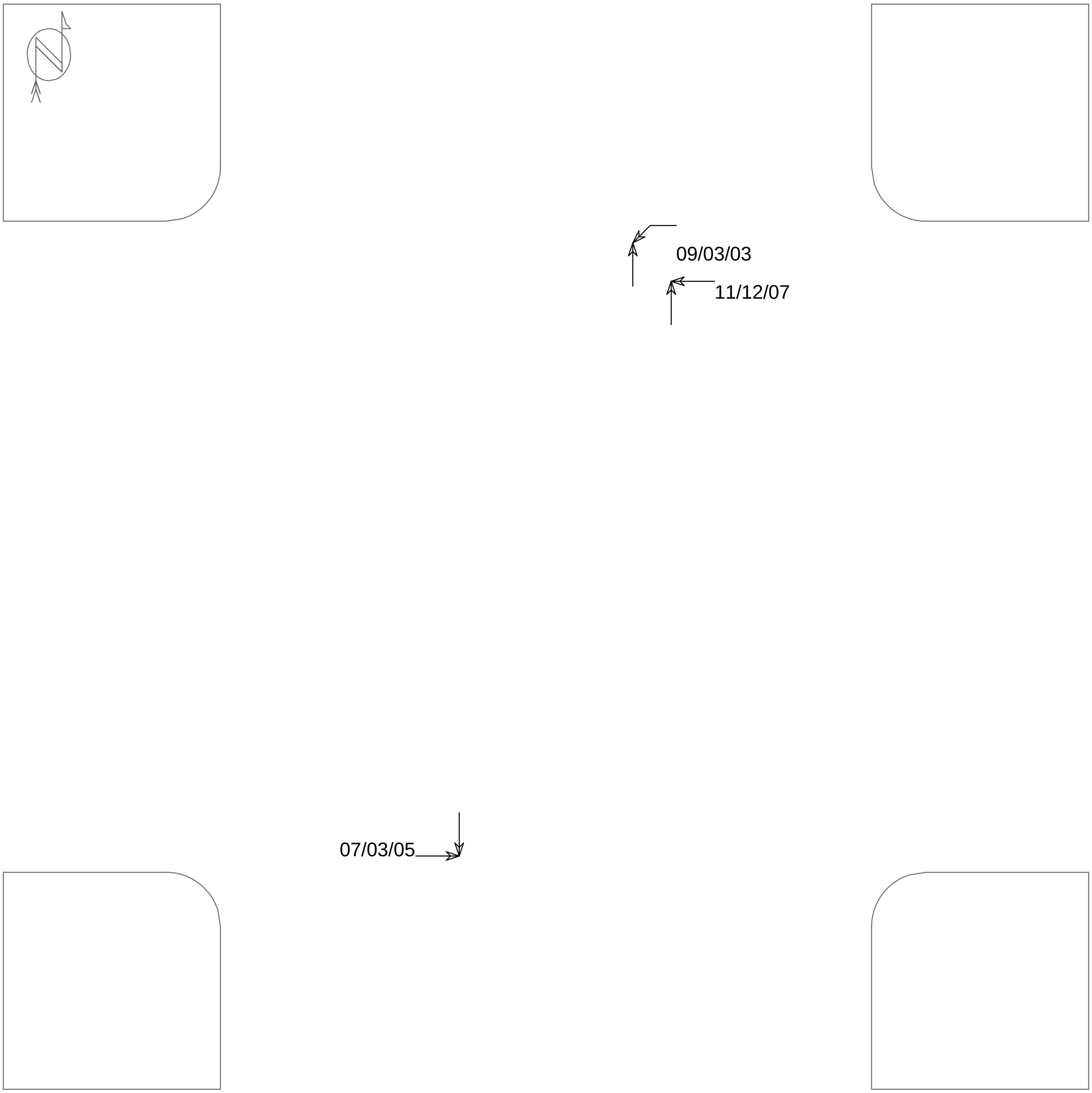
Missle Dr & 19th St + Old Happy Jack

3 Accidents — 01/01/03 - 12/31/07



(clear filter), (0) accidents with insufficient data for display

Straight
Stopped
Unknown
Backing
Overtaking
Sideswipe

Parked
Erratic
Out of control
Right turn
Left turn
U-turn

Pedestrian
Bicycle
Injury
Fatality
Nighttime
DUI

Fixed objects:
General
Signal
Tree
Pole
Curb
Animal

3rd vehicle
Extra data

INTERSECTION CRASH STATISTICS

AYRES ASSOCIATES

INTERSECTION:	Missle Drive & Westland Road / 24th Street						
MUNICIPALITY:	Cheyenne		COUNTY:	Laramie		STATE:	WY
PERIOD: 3	YEARS	0	MONTHS	FROM:	1/1/2005	TO:	12/31/2007

PROJECT ID:	32-1402.00	PREPARED BY:	TLH	DATE:	2/17/2009

INTERSECTION CHARACTERISTICS

TRAFFIC CONTROL:	MINOR STOP CONTROLLED	POSTED SPEED MAJOR:	30
INTERSECTION AADT (2007):	17,400	POSTED SPEED MINOR:	30
NUMBER OF LEGS:	4		

CRASH STATISTICS

CRASH FREQUENCY & SEVERITY				
YEAR	PDO	INJURY	FATAL	TOTAL
2005	0	1	0	1
2006	0	0	0	0
2007	0	0	0	0
TOTAL	0	1	0	1
PERCENT	0.0%	100.0%	0.0%	100.0%
YEAR AVG.	0.00	0.33	0.00	0.33

ROAD CONDITIONS		%
DRY	1	100.0%
WET	0	0.0%
SNOW	0	0.0%
ICE	0	0.0%
OTHER	0	0.0%
TOTAL	1	100.0%

CRASH RATES	per MEV
CRASH RATE	0.05
INJURY CRASH RATE	0.05
FATAL CRASH RATE	0.00

CRASH TYPE		%
ANGLE	0	0.0%
REAR-END	1	100.0%
HEAD-ON	0	0.0%
SS-SAME	0	0.0%
SS-OPPOSITE	0	0.0%
PEDESTRIAN	0	0.0%
BICYCLE	0	0.0%
FIXED	0	0.0%
NOT FIXED	0	0.0%
DEER	0	0.0%
OVERTURN	0	0.0%
OTHR/UNKN	0	0.0%
TOTAL	1	100.0%

LIGHT CONDITIONS		%
DAY	1	100.0%
DARK	0	0.0%
TOTAL	1	100.0%

DAY AND TIME							
DAY OF WEEK	*EARLY MORNING* 12:00 AM TO 5:59 AM	*AM PEAK* 6:00 AM TO 9:59 AM	*MIDDAY* 10:00 AM TO 2:59 PM	*PM PEAK* 3:00 PM TO 6:59 PM	*LATE EVENING* 7:00 PM TO 11:59 PM	TOTAL	
MONDAY	0	0	0	0	0	0	Weekday
TUESDAY	0	0	0	0	0	0	
WEDNESDAY	0	0	0	1	0	1	
THURSDAY	0	0	0	0	0	0	
FRIDAY	0	0	0	0	0	0	
SATURDAY	0	0	0	0	0	0	Weekend
SUNDAY	0	0	0	0	0	0	
TOTAL	0	0	0	1	0	1	

INTERSECTION CRASH DATA

AYRES ASSOCIATES

INTERSECTION:	Missle Drive & Westland Road / 24th Street						
MUNICIPALITY:	Cheyenne			COUNTY:	Laramie	STATE:	WY
PERIOD: 3	YEARS	0	MONTHS	FROM:	1/1/2005	TO:	12/31/2007

PROJECT ID:	PREPARED BY: TLH	DATE: 2/17/2009

CRASH DETAILS

REF. NUMBER	LABEL	DATE	DAY OF WEEK	TIME OF DAY	SEVERITY	MANNER OF COLLISION	ACCIDENT TYPE	LIGHT COND.	ROAD COND.
517823	1	11/16/2005	WEDNESDAY	3 PM	INJ	REAR-END	MV IN TRANS.	DAY	DRY

K:\32140200\Traffic\Crash Data\[MissleDr&WestlandRoad_Cras

0

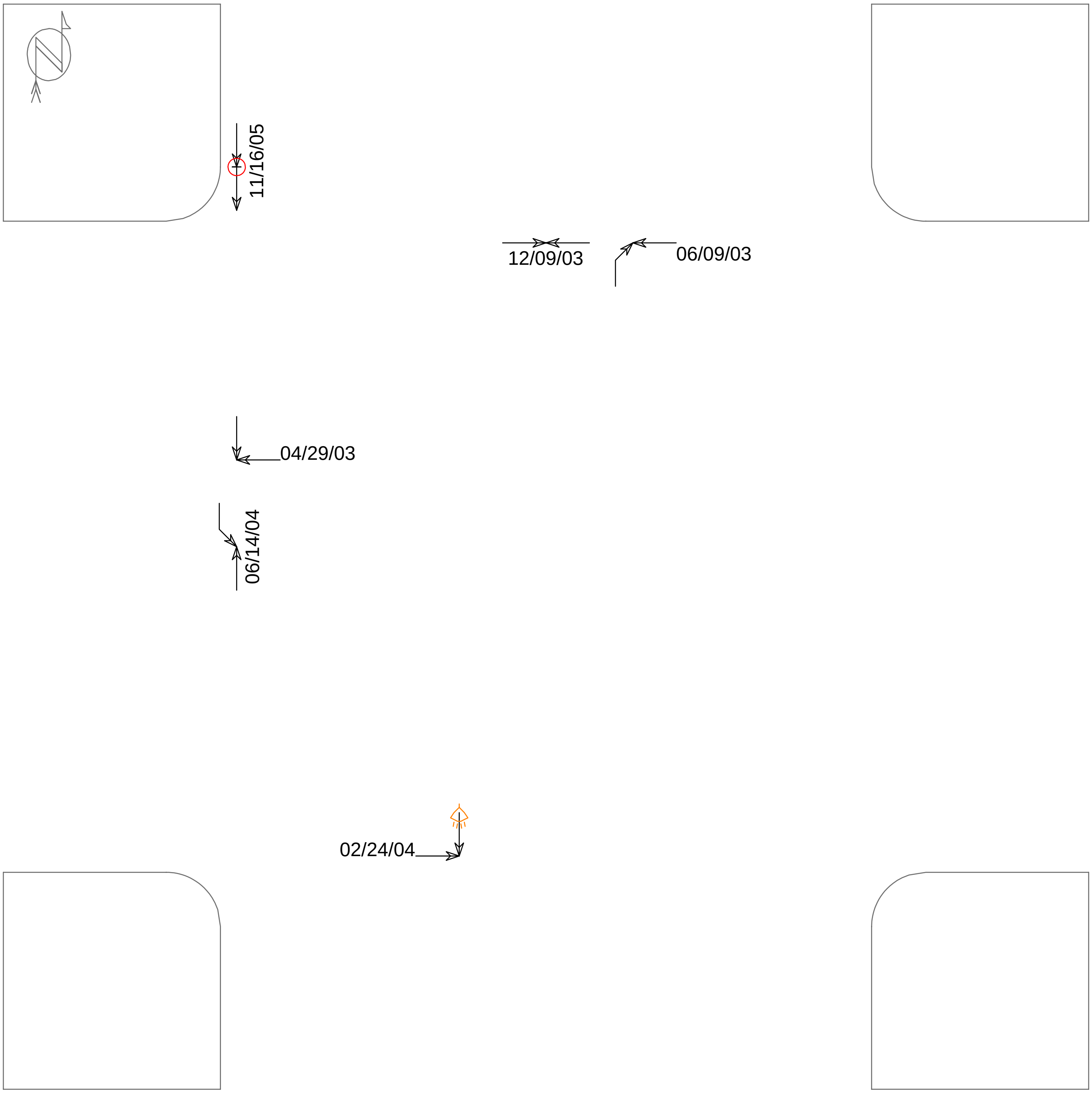
0

INTERSECTION CRASH DATA

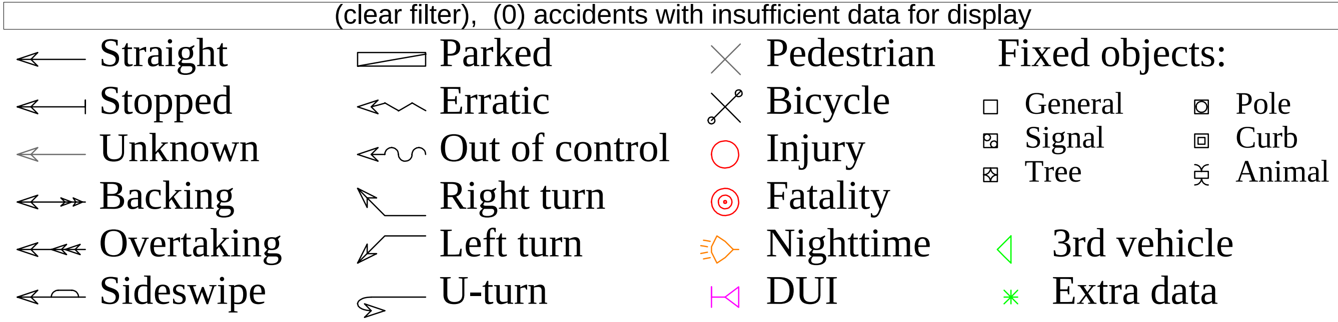
Missle Drive & Westland Road / 24th Street

Missle Dr & Westland + 24th St

6 Accidents 01/01/03 - 12/31/07

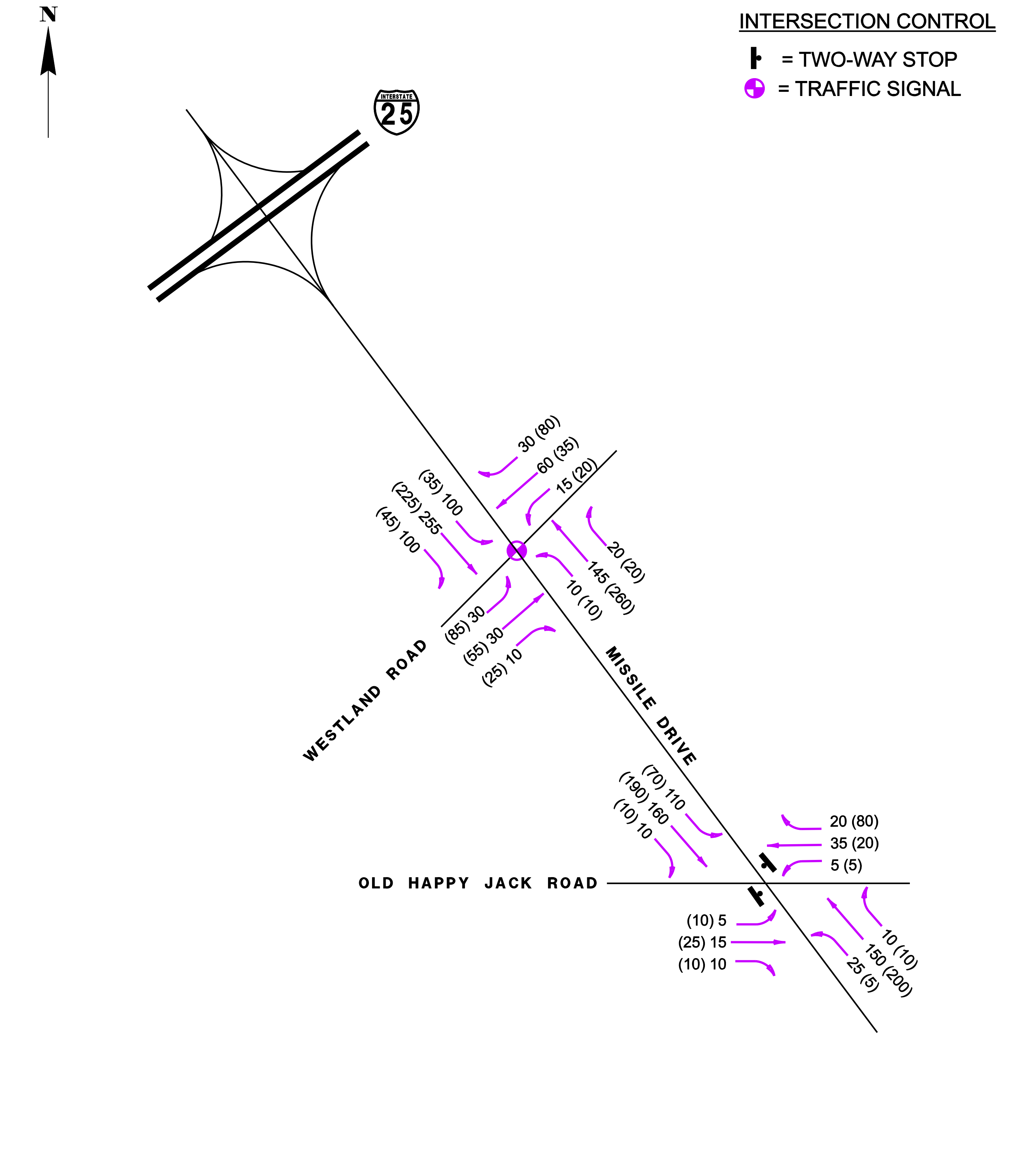


(clear filter), (0) accidents with insufficient data for display

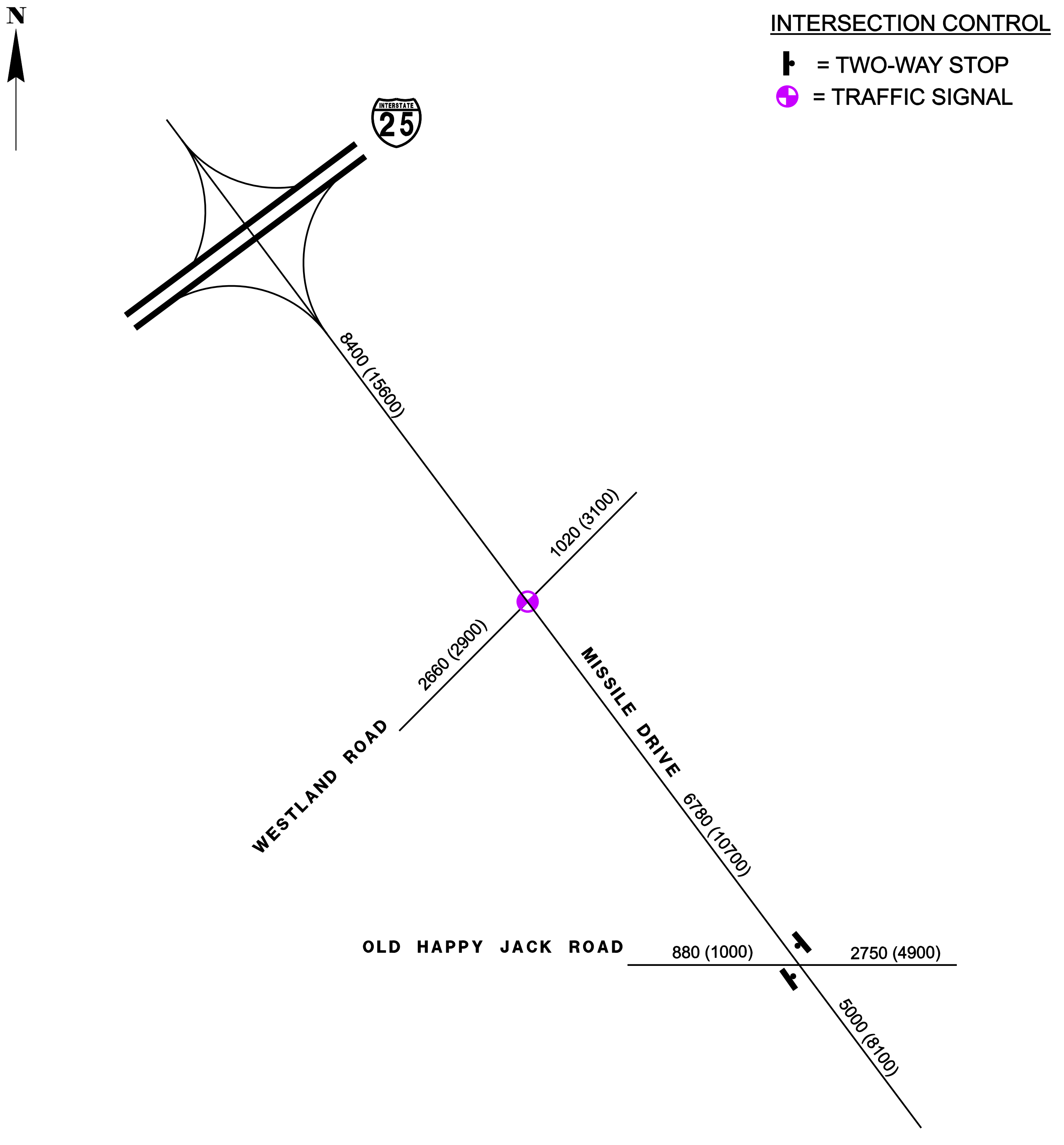


Appendix F

Traffic Volumes



AYRES ASSOCIATES	MISSILE DRIVE CORRIDOR STUDY	XXX = AM PEAK HOUR (XXX) = PM PEAK HOUR
PROJECT NO. 32-1394.00 MAY 2010	EXISTING PEAK HOUR TRAFFIC	



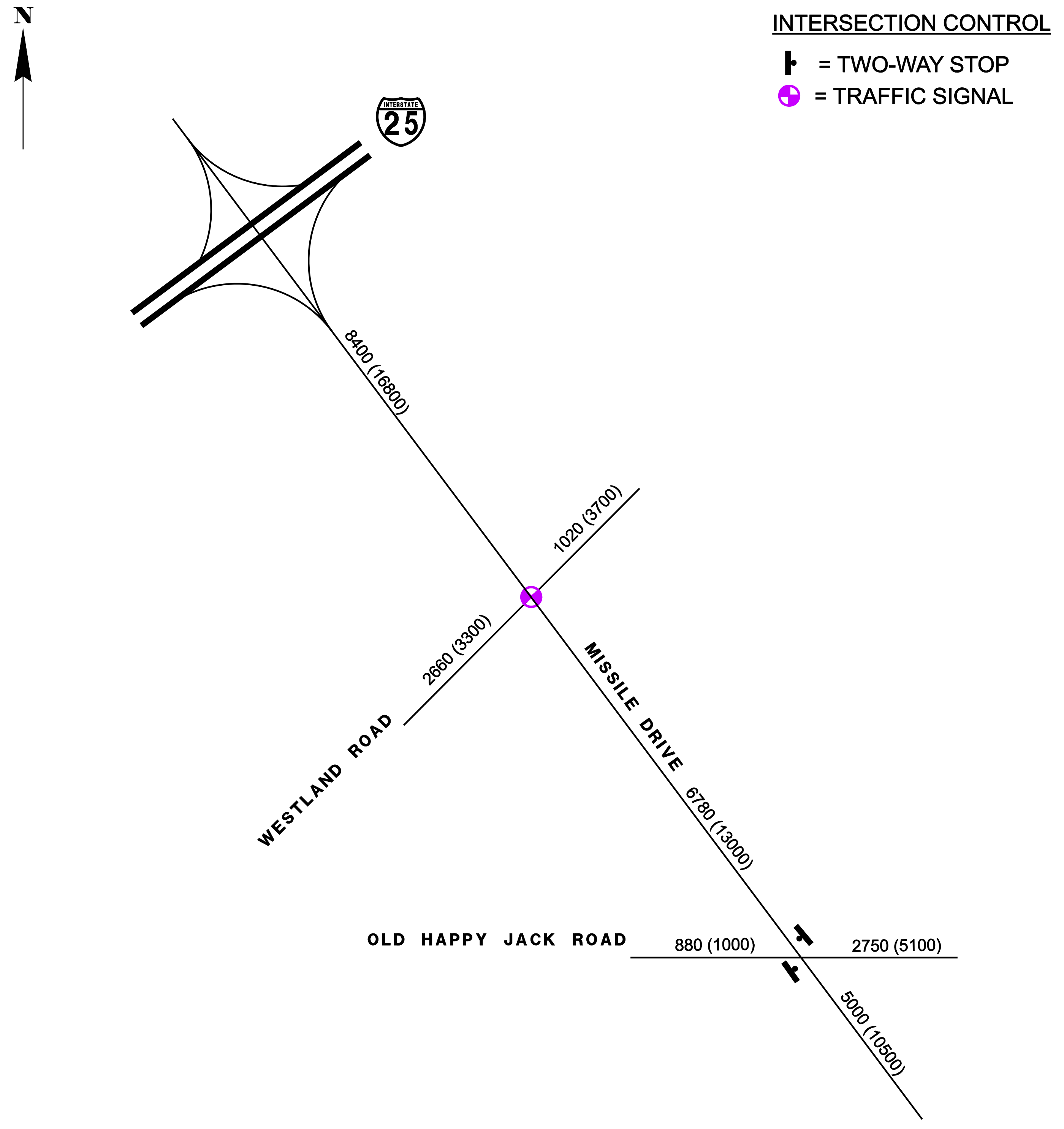
AYRES ASSOCIATES

MISSILE DRIVE CORRIDOR STUDY

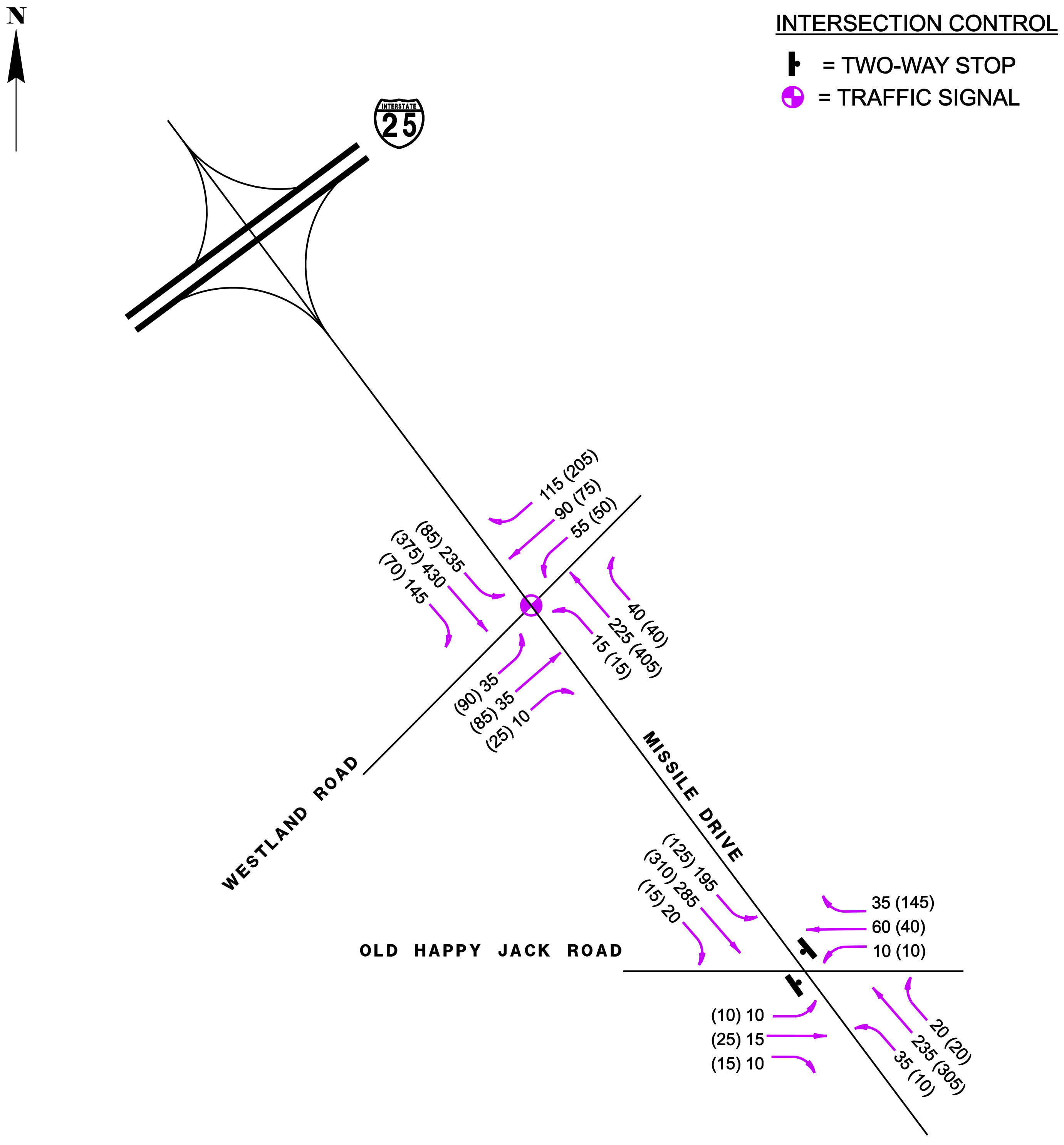
XXX = EXISTING ADT
(XXX) = 2029 ADT

PROJECT NO. 32-1394.00
MAY 2010

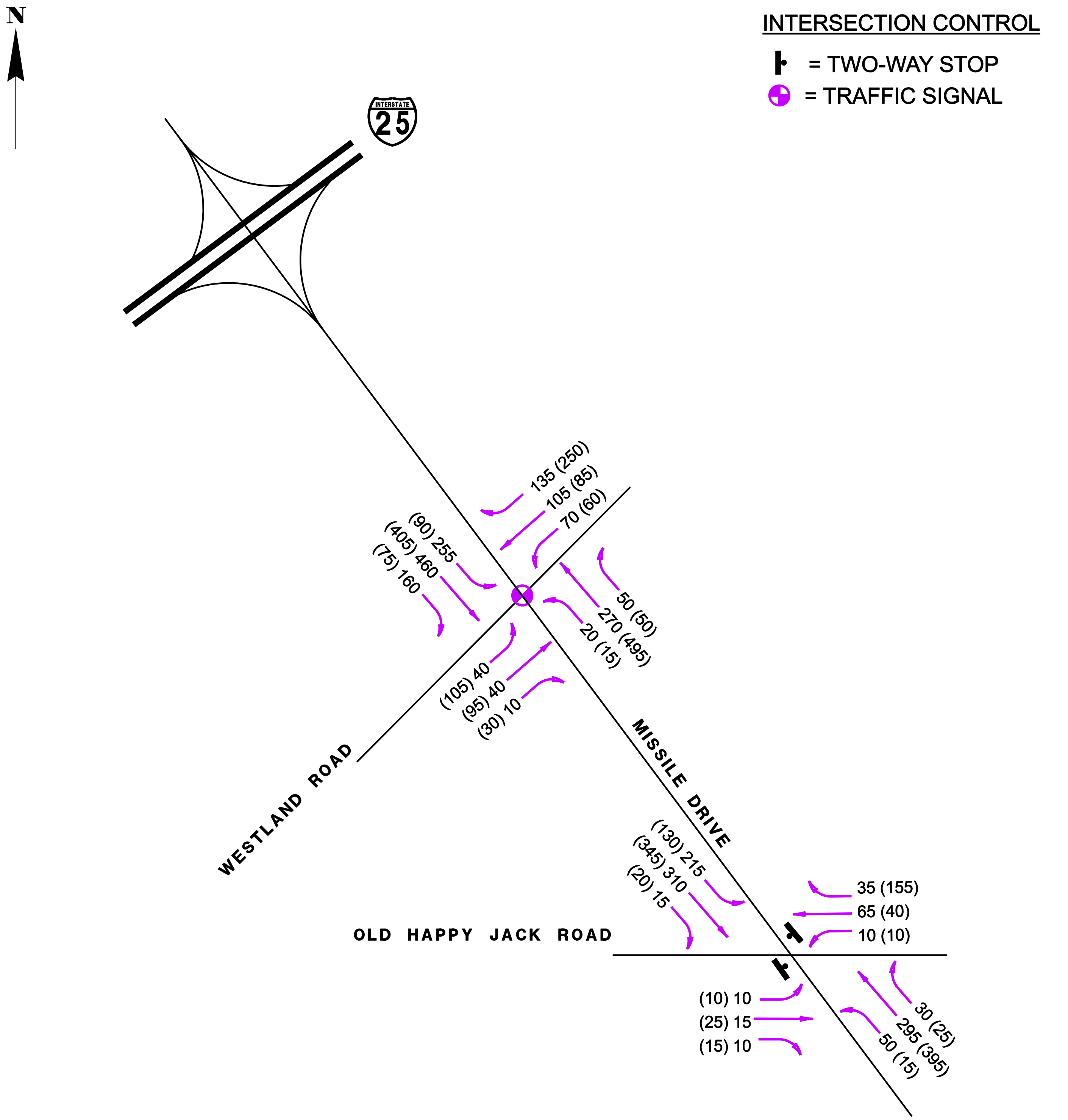
CHEYENNE ROADWAY NETWORK ADT
LOW PROJECTION



AYRES ASSOCIATES	MISSILE DRIVE CORRIDOR STUDY	XXX = EXISTING ADT (XXX) = 2029 ADT
PROJECT NO. 32-1394.00 MAY 2010	CHEYENNE ROADWAY NETWORK ADT HIGH PROJECTION	



AYRES ASSOCIATES	MISSILE DRIVE CORRIDOR STUDY	XXX = AM PEAK HOUR (XXX) = PM PEAK HOUR
PROJECT NO. 32-1394.00 MAY 2010	FUTURE (2029) PEAK HOUR TRAFFIC LOW PROJECTION	



AYRES ASSOCIATES

MISSILE DRIVE CORRIDOR STUDY

XXX = AM PEAK HOUR
(XXX) = PM PEAK HOUR

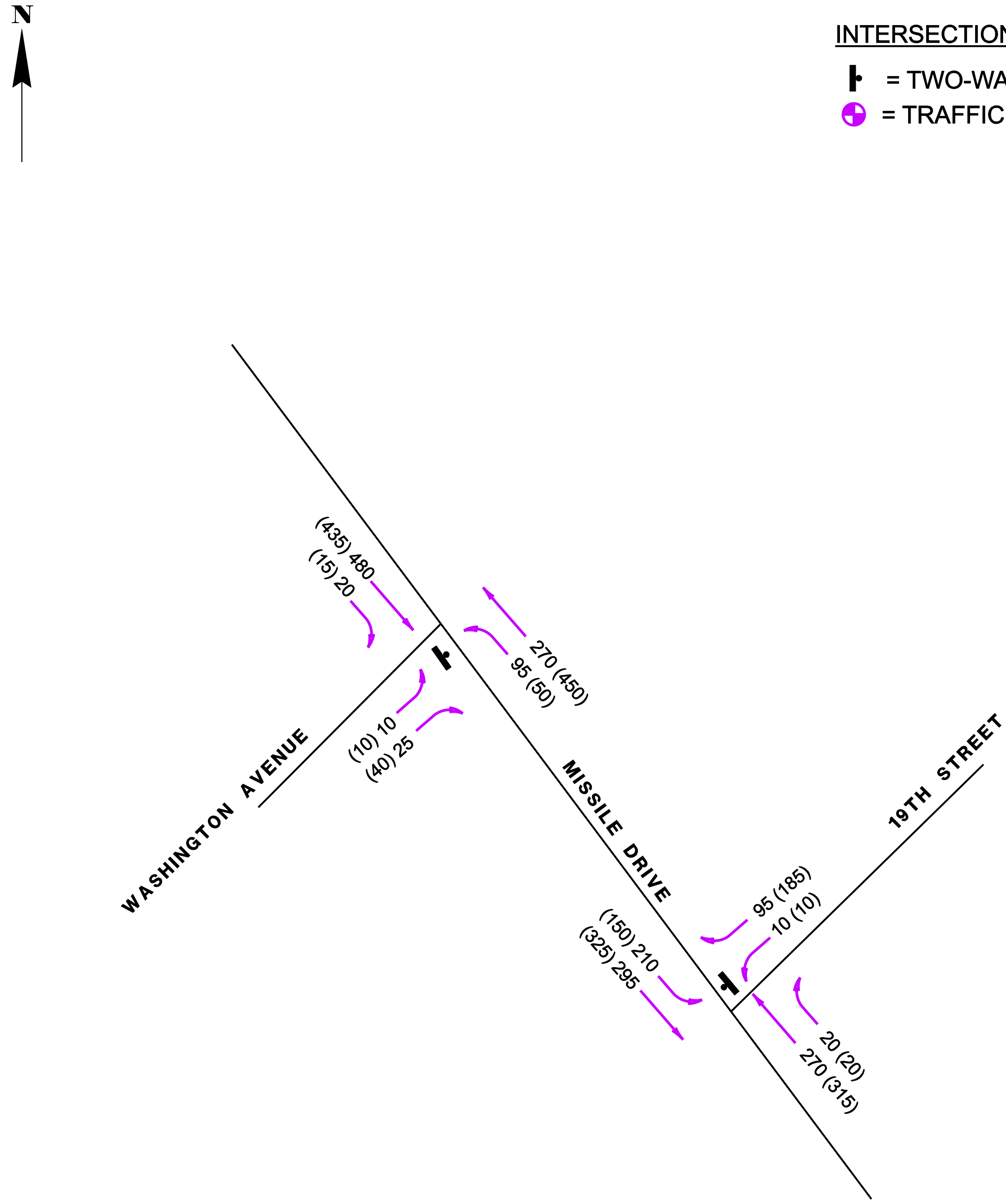
PROJECT NO. 32-1394.00
MAY 2010

FUTURE (2029) PEAK HOUR TRAFFIC
HIGH PROJECTION

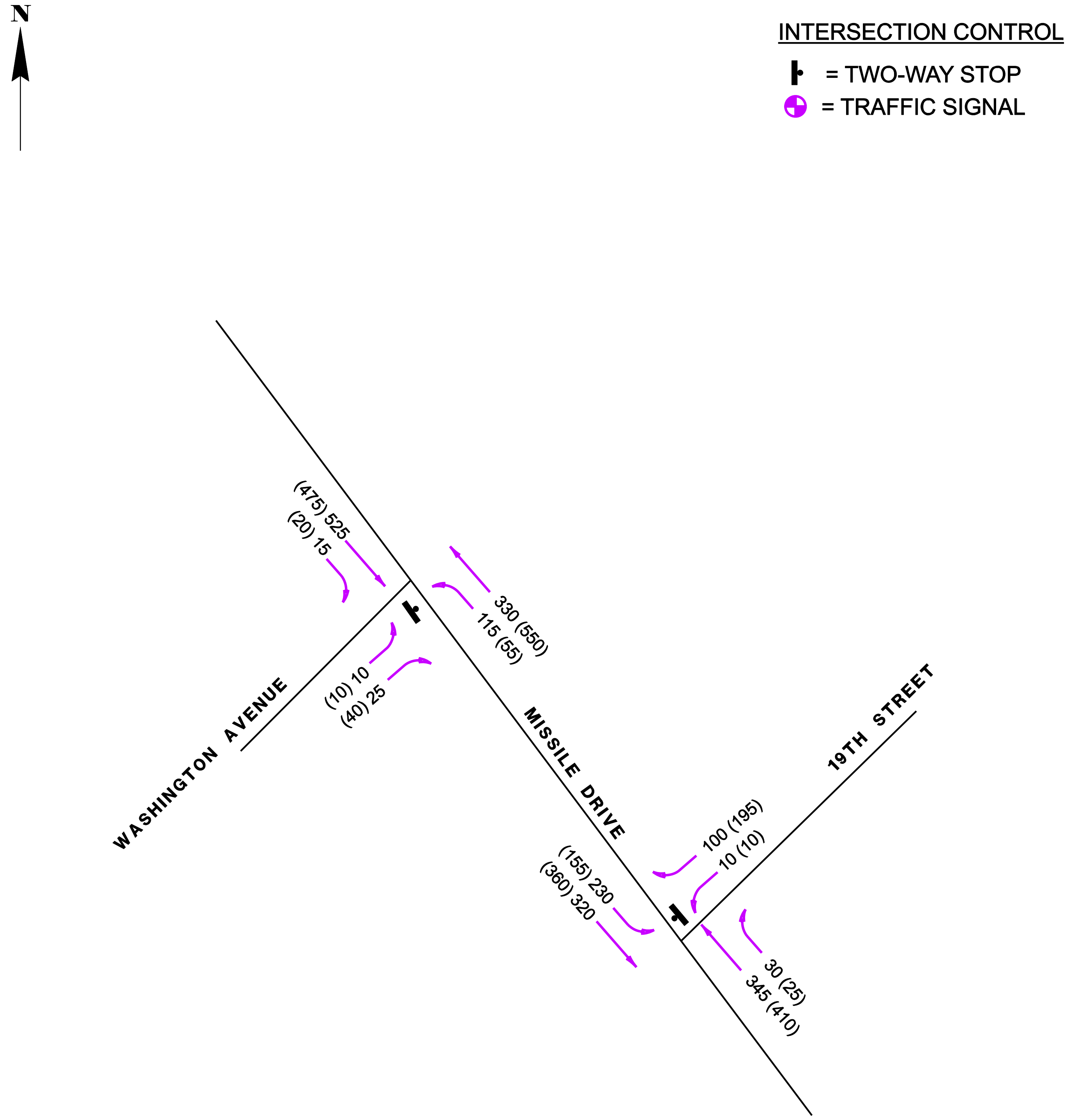
INTERSECTION CONTROL

= TWO-WAY STOP

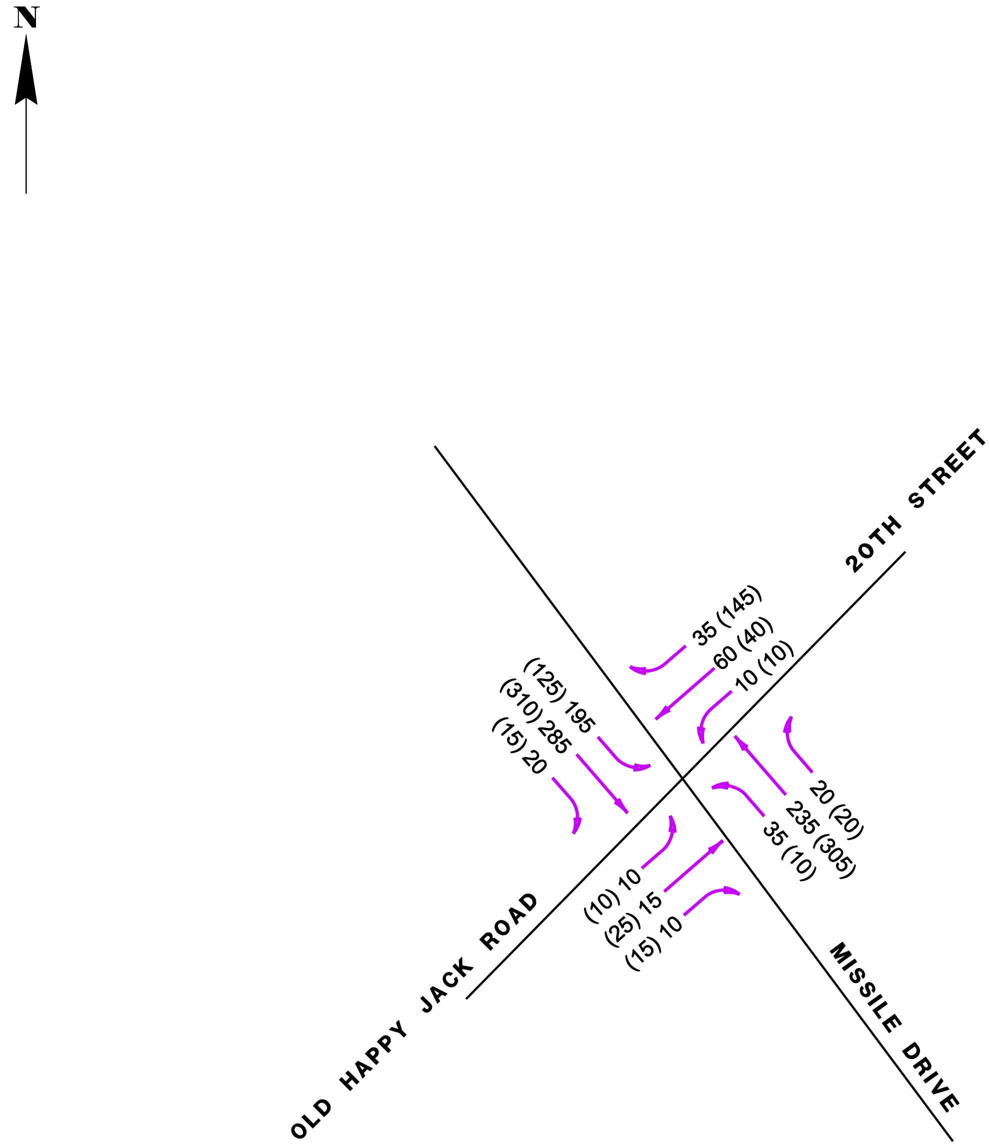
= TRAFFIC SIGNAL



AYRES ASSOCIATES	MISSILE DRIVE CORRIDOR STUDY	XXX = AM PEAK HOUR (XXX) = PM PEAK HOUR
PROJECT NO. 32-1394.00 MAY 2010	ALTERNATIVE 2 & 3 2029 TRAFFIC VOLUMES LOW PROJECTION	



AYRES ASSOCIATES	MISSILE DRIVE CORRIDOR STUDY	XXX = AM PEAK HOUR (XXX) = PM PEAK HOUR
PROJECT NO. 32-1394.00 MAY 2010	ALTERNATIVE 2 & 3 2029 TRAFFIC VOLUMES HIGH PROJECTION	



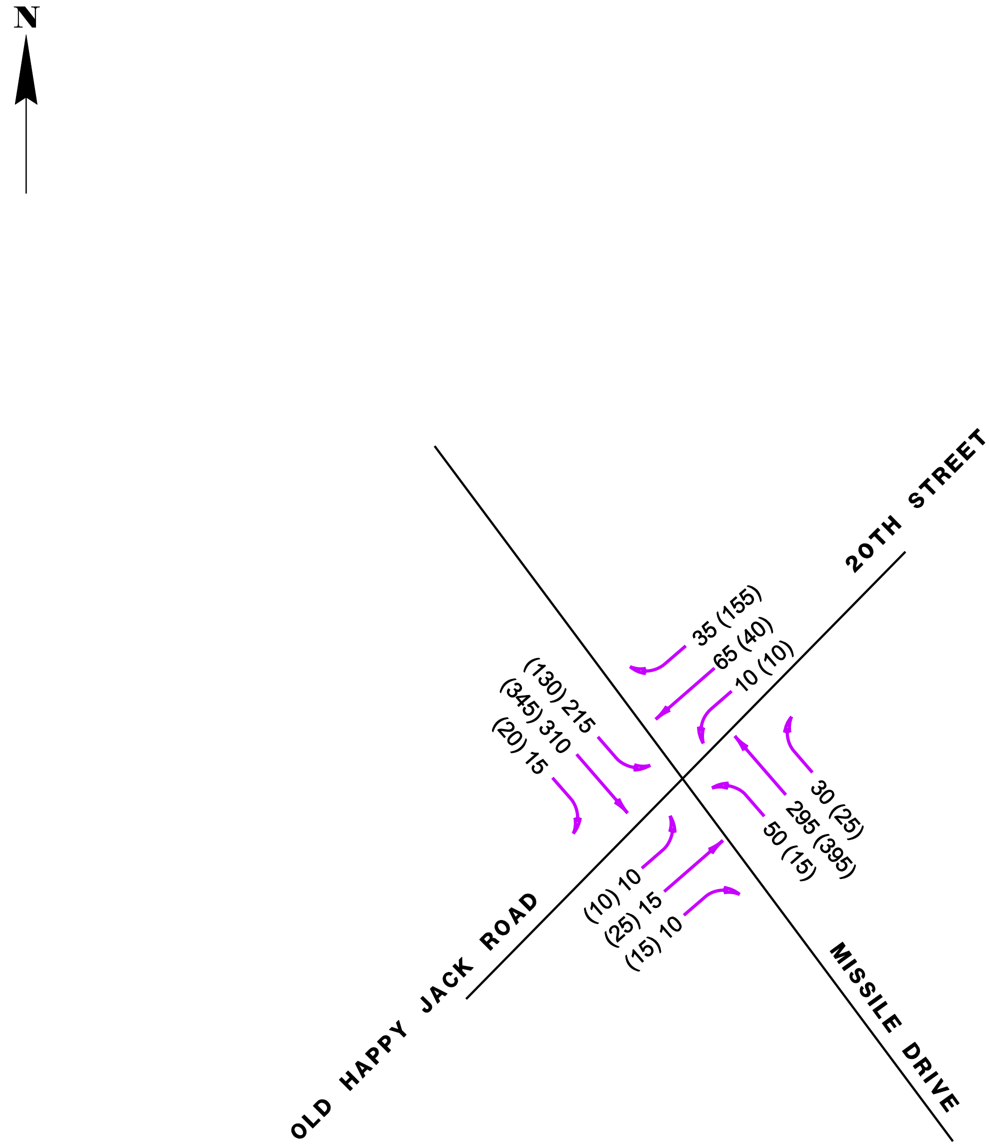
AYRES ASSOCIATES

MISSILE DRIVE CORRIDOR STUDY

XXX = AM PEAK HOUR
(XXX) = PM PEAK HOUR

PROJECT NO. 32-1394.00
MAY 2010

ALTERNATIVE 4 2029 TRAFFIC VOLUMES
LOW PROJECTION



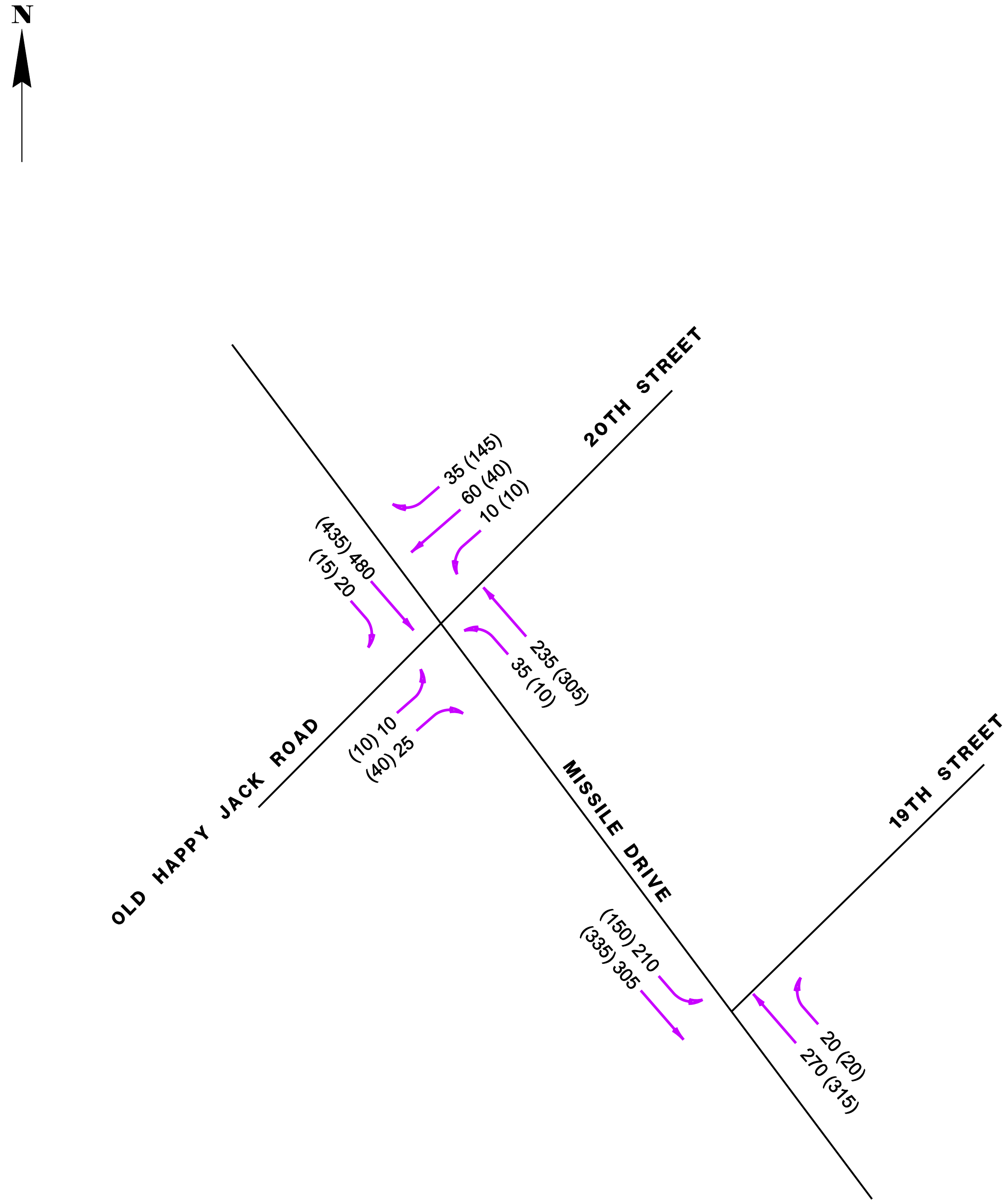
AYRES ASSOCIATES

MISSILE DRIVE CORRIDOR STUDY

XXX = AM PEAK HOUR
(XXX) = PM PEAK HOUR

PROJECT NO. 32-1394.00
MAY 2010

ALTERNATIVE 4 2029 TRAFFIC VOLUMES
HIGH PROJECTION



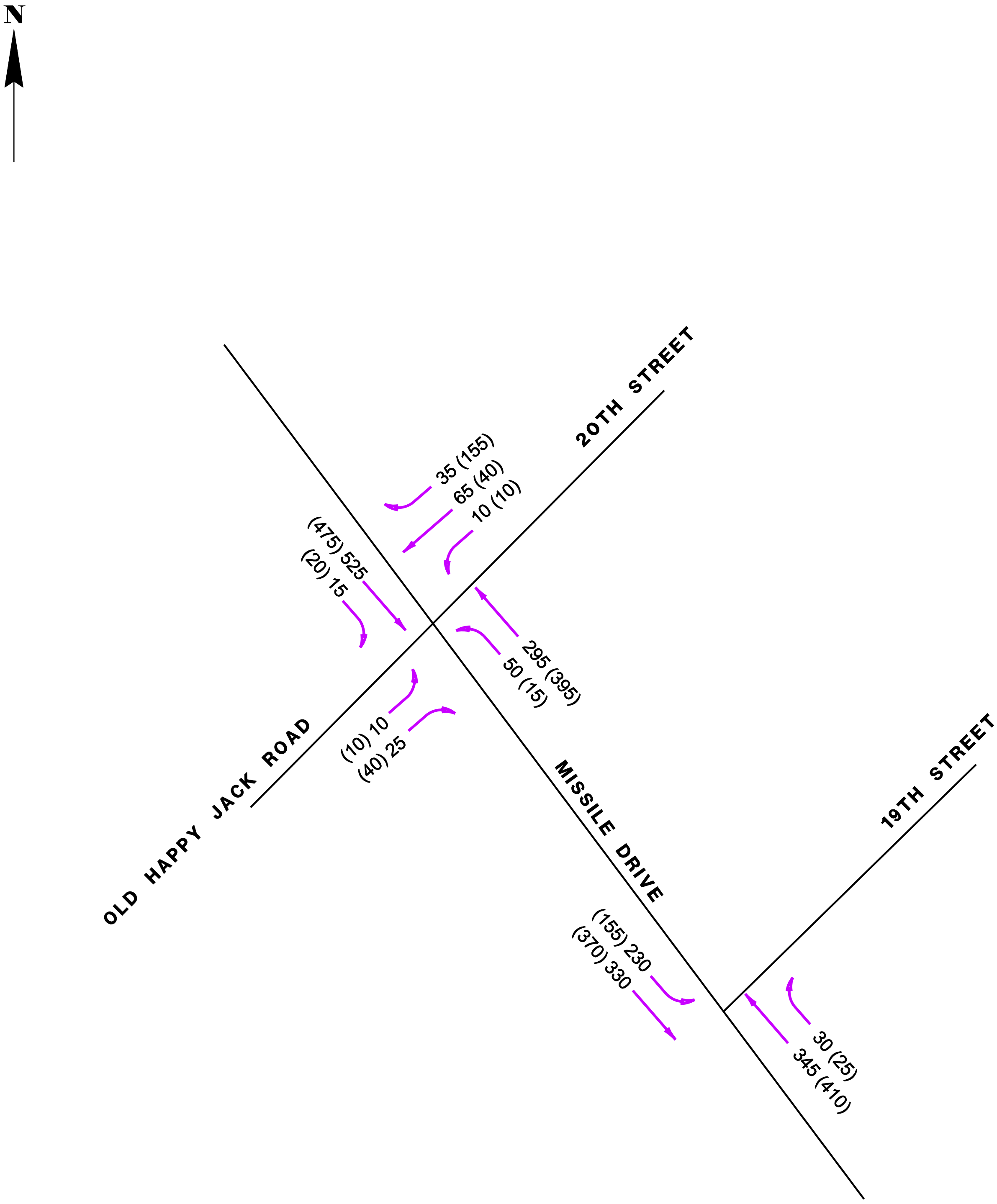
AYRES ASSOCIATES

MISSILE DRIVE CORRIDOR STUDY

XXX = AM PEAK HOUR
(XXX) = PM PEAK HOUR

PROJECT NO. 32-1394.00
MAY 2010

ALTERNATIVE 5 2029 TRAFFIC VOLUMES
LOW PROJECTION



AYRES ASSOCIATES

MISSILE DRIVE CORRIDOR STUDY

XXX = AM PEAK HOUR
(XXX) = PM PEAK HOUR

PROJECT NO. 32-1394.00
MAY 2010

ALTERNATIVE 5 2029 TRAFFIC VOLUMES
HIGH PROJECTION

Appendix G

Engineers Estimate of Probable Cost

Reconstruction of Missile Drive

Location: Missile Drive Corridor - West Lincolnway to I-25 Interchange

Assumptions:

- Complete Reconstruction of Corridor and Realignment of Concord/Logan Intersection
- 6" Asphalt Pavement
- Crushed Base Grading "W" (8")
- No Additional Right-of-Way Is Required
- Existing Pavement Is Concrete With Asphalt Overlay

Item Description	Unit	Unit Price	Estimated Quantity	Cost
Removing Pavement	SY	$3.36	34893	$117,240
Removing Curb and Gutter	LF	$4.77	5262	$25,100
Sawcut Pavement	LF	$4.00	1073	$4,292
Remove Existing Sidewalk	SY	$13.51	650	$8,782
Remove Guardrail at BNSF Bridge	LF	$3.90	340	$1,326
Surfacing (6" Plant Mix Bit. Pvmt.)	TON	$87.00	9251	$804,837
Crushed Base Grading "W" (8")	TON	$17.00	15706	$267,002
24" Curb & Gutter Type A	LF	$24.37	16113	$392,674
Curb Turn Fillet	SF	$2.50	5602	$14,005
Concrete Sidewalk	SF	$5.09	40120	$204,211
Concrete Sidewalk (Median Ramp)	SF	$5.09	143	$728
Commercial Approach	SF	$3.00	7265	$21,795
Guardrail at BNSF RR	LF	$40.00	340	$13,600
Paved Median	SF	$15.00	8480	$127,200
Remove and Replace Signal Pole	EA	$15,000.00	1	$15,000
Sub Total				**$2,017,791**
Miscellaneous Other Items 25%				$504,400
19th Street Intersection Realignment	LS	1280000	1	$1,280,000
Landscaping	LS	$320,680.00	1	$320,680
ROW	ACRE		1	$0
Mobilization	LS	$202,000.00	1	$202,000
Total				**$4,324,871**
Say				**$4,320,000**

Realignment of 19th Street/Old Happy Jack Intersection

With Replacement of Crow Creek Culverts with a Two-Span CON/SPAN Pipe Arch Structure

Location: Missile Drive/19th Street/Old Happy Jack Road Intersection

Assumptions:

- Complete Reconstruction of Intersection and Culverts Over Crow Creek
- 6" Asphalt Pavement
- Crushed Base Grading "W" (8")
- No Additional Right-of-Way Is Required

"- CON/SPAN Pipe Arch Structure Consists of a 48 Foot and a 42 Foot Span

Item Description	Unit	Unit Price	Estimated Quantity	Cost
Remove Existing Surfacing	SY	$3.36	11900	$39,984
Remove Existing Curb & Gutter	LF	$4.77	284	$1,355
Sawcut Concrete/Asphalt Cutting	LF	$4.00	545	$2,180
Remove Existing Sidewalk	SY	$13.51	520	$7,025
Remove Existing 5 Culvert Structure	EA	$10,000.00	1	$10,000
Surfacing (6" Plant Mix Bit. Pvmt.)	TON	$87.00	199	$17,313
Crushed Base Grading "W" (8")	TON	$17.00	327	$5,559
24" Curb & Gutter Type A	LF	$24.37	242	$5,898
Curb Turn Fillet	SF	$2.50	260	$650
Concrete Sidewalk	SF	$5.09	693	$3,527
Commercial Approach	SF	$3.00	328	$984
Surfacing (6" Plant Mix Bit. Pvmt.)	TON	$87.00	992	$86,304
Crushed Base Grading "W" (8")	TON	$17.00	1564	$26,588
24" Curb & Gutter Type A	LF	$24.37	932	$22,713
Concrete Sidewalk	SF	$5.09	5520	$28,097
CON/Tech Pipe Arch	LS	$680,000.00	1	$680,000
Guardrail	LF	$40.00	240	$9,600
Sub Total				**$947,776**
Miscellaneous Other Items 25%				$236,900
ROW	LS	0	0	$0
Mobilization	LS	95000	1	$95,000
Total				**$1,279,676**
Say				**$1,280,000**

Streetscape Construction Estimate

Construction Estimates for both Prairie and Parkway landscape types are provided. These estimates are very preliminary, and are provided for general budgeting purposes only.

CULTIVATED PRAIRIE

DESCRIPTION	QUANTITY	UNIT COST	UNIT	TOTAL
Cultured Native Plantings	12,800	$8.00	SF	$102,400
Mulch	12,800	$0.75	SF	$9,600
Fine Grading	12,800	$0.25	SF	$3,200
Planting Medium	1,420	$13.00	CY	$18,460
Trees	55	$550.00	EA	$30,250
Irrigation	12,800	$1.50	SF	$19,200
TOTAL				$183,110

PARKWAY

DESCRIPTION	QUANTITY	UNIT COST	UNIT	TOTAL
Drought Tolerant Grasses	8,000	$3.00	SF	$24,000
Mulch	0	$0.75	SF	$0
Fine Grading	8,000	$0.25	SF	$2,000
Planting Medium	890	$13.00	CY	$11,570
Trees	160	$550.00	EA	$88,000
Irrigation	8,000	$1.50	SF	$12,000
TOTAL				$137,570

GRAND TOTAL	$320,680

Landscape Median Maintenance Estimate

Based upon estimates provided by the City of Fort Collins, anticipated maintenance costs for upkeep to the landscape medians, excluding equipment and material replacement or repair costs is approximately $0.08 to $0.10 a square foot annually. Based upon the total square footage of median proposed, the maintenance costs for the Missile Drive medians will be in the range of $1,670 to $2,080 annually. These are very preliminary estimates, and are provided for general budgeting purposes only.

Structure Life Cycle Cost Estimate

A Life Cycle Cost analysis was performed to determine the most cost effective alternative over time. The life cycle cost was determined through an “Equivalent Uniform Annual Cost” (EUAC) analysis. The EUAC method was used because the cost of each alternative is spread over different time frames. The interest rate was assumed to be 5%. The results are as follows:

ALTERNATIVE	EUAC
Two-span CON/SPAN precast arch structure	$35,904
Five-cell cast-in-place concrete box culvert structure	$46,992
Single-span prestressed concrete deck girder bridge	$60,280
Two-span concrete haunched slab bridge	$64,938
Two-span prestressed concrete deck girder bridge	$66,308

Appendix H

City Council Resolution

Approved as to form only:
ECR
Date: 6-9-10

RESOLUTION NO. 5222

ENTITLED: "A RESOLUTION ACKNOWLEDGING RECEIPT OF AND APPROVING THE 'MISSILE DRIVE CORRIDOR PLAN' PREPARED BY AYRES ASSOCIATES FOR THE CHEYENNE METROPOLITAN PLANNING ORGANIZATION."

WHEREAS, the Cheyenne Metropolitan Planning Organization (MPO) had programmed in its FY '08 and '09 Unified Planning Work Program to conduct a study of the Missile Drive corridor; and

WHEREAS, the Cheyenne MPO hired Ayres Associates to prepare the *Missile Drive Corridor Plan*; and

WHEREAS, the Missile Drive corridor is a gateway to downtown Cheyenne from I-25; and

WHEREAS, there is great economic development potential along this corridor extending from the North Range Business Park to downtown Cheyenne; and

WHEREAS, there is a need to provide for safe and efficient mobility for all modes of transport and preserve and enhance the Crow Creek wetland area with the expansion of the greenway system along this corridor; and

WHEREAS, the plan looked at future land use and redevelopment options and streetscape improvements to promote economic development adjacent to the corridor; and

WHEREAS, the plan analyzed design alternatives for the reconstruction of the 19th Street and Missile Drive intersection which included drainage improvements to address the floodplain issues; and

WHEREAS, the *Missile Drive Corridor Plan* was prepared with citizen participation received from two public meetings, a focus group, a design charrette, the MPO website and numerous communications through the U.S. and electronic mail, and newspaper advertisements; and

WHEREAS, the City Planning Commission held a Public Meeting on June 7, 2010, and accepted public comments, and recommended the approval of *Missile Drive Corridor Plan* to the City Governing Body; and

WHEREAS, the *Missile Drive Corridor Plan* is a guide for future development and redevelopment that provides for the safety of all users, connectivity of the roadway network, and more efficient infrastructure; and

WHEREAS, the Cheyenne MPO Citizen's Advisory and Technical Committees have reviewed the *Missile Drive Corridor Plan* and have recommended its approval.

NOW, THEREFORE, BE IT RESOLVED BY THE GOVERNING BODY OF THE CITY OF CHEYENNE, WYOMING:

THAT, the City of Cheyenne Governing Body hereby acknowledges receipt of and approves the "*Missile Drive Corridor Plan*" dated May, 2010 prepared by Ayres Associates.

BE IT FURTHER RESOLVED, that the Governing Body recommends that the "*Missile Drive Corridor Plan*" be used as the guideline for the design and reconstruction of Missile Drive Corridor and the 19th Street intersection once funding is secured.

PRESENTED, READ AND ADOPTED THIS 28th **DAY OF** June **, 2010.**

Richard L. Kaysen, Mayor

(Seal)

ATTEST:

Carol Intlekofer

Carol Intlekofer, City Clerk