ACTIVE TRANSPORTATION RECOMMENDATIONS

FOR

BOX ELDER, SD

presented by the

South Dakota State University
Landscape Architecture Program

in cooperation with the

South Dakota Department of Health

28 APRIL 2023

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<u>Acknowledgments</u>

Introduction

The built environment affects public and personal health. In addition to physical metrics of health such as obesity rates, dietary habits, and steps walked in a day, there are less-tangible indicators of a community's health. These include perceived friendliness, sense of community, and livability. The built environment impacts all of these indicators.

In 2012, the South Dakota Department of Health initiated the Active Transportation Advisory Team (ATAT) to facilitate change in the built environment of South Dakota. In particular, an effort has been made to help communities encourage using alternative means of transportation (such as walking or cycling) for completing daily routines. An outgrowth of the ATAT is the Active Transportation Collaboration project. This project provides resources and expertise to South Dakota communities in developing strategies to improve active transportation.

Recommendations are developed over the course of a 16-week semester by students and faculty from South Dakota State University's Landscape Architecture program. In the case of the present study, representatives from SDSU traveled to Box Elder, South Dakota, in March of 2023 to conduct interviews with key stakeholders within the community. They also conducted an analysis of transportation infrastructure, parks and recreation facilities, and neighborhood composition in the area.

Following this data-gathering process, students developed a series of recommendations touching all aspects of active transportation issues, including the further development of active transportation infrastructure, improvement and expansion of neighborhoods and recreation facilities, placemaking and community identity, and connecting the various subcommunities that exist in Box Elder. By approaching active transportation in this holistic way, a balanced, comprehensive plan for improving public and personal health can be achieved.

These recommendations represent a global shift in how people think of their community. Some recommendations will entail a major investment. By shifting community priorities and identifying existing resources within the community, Box Elder can be an example for other growing communities throughout the region of how to grow and thrive while protecting and celebrating its most precious resource: the people who make up this incredible community.

RECOMMENDATION 1: CREATE A PERSONALIZED IDENTITY

Box Elder is a rural community in close proximity to Rapid City, the urban center of the Black Hills. Box Elder is home to Ellsworth Air Force Base, and the two entities are tightly connected economically and socially. This mutual relationship is integral to the business community, but a perception exists that Box Elder is simply an auxiliary to the base and lacks its own identity and purpose. We recommend that the community form a unique identity, creating separation from the air base and capitalizing on the town's proximity to the Black

Figure 1: Identity signage illustrating community personality

Hills or the city's Children's Museum. The city's motto is currently "Gateway to the Black Hills" and this motto should be manifested physically and graphically in Box Elder's parks, streets, and neighborhoods.

This recommendation is not meant to diminish the current relationship with Ellsworth Air Force Base but rather to develop additional resources with which the city can identify. The city should explore characteristics that focus on its motto while continuing to showcase its strong support of the military. A new identity should meld pride for the military presence along with other personalized traits that define the area. Signage, murals, street banners and more should be used throughout the city to

Figure 2: Mural in Brunswick, Canada, highlights community identity

promote this identity, creating a greater sense of community and belonging for all of Box Elder's residents. Other benefits of this recommendation are increased visitorship and community pride, and a healthier relationship with the Air Force base.

RECOMMENDATION 2: INCORPORATE PLACEMAKING STRATEGIES

Placemaking is a resident-based approach to the planning, design and management of public areas that focuses on building relationships between people and their environment. It gives people a sense of community and belonging to a place. The city is growing vigorously, indicating that many people want to belong to the community.

Currently, there is a lack of signs, banners, or art that would promote this aspiration. In establishing a community identity and incorporating signage and art that align with this identity, Box Elder will achieve a greater sense of community.

This concept is achieved by installing attractions and designs personalized to the city's identity. These should be thoughtfully placed throughout the city's public spaces. Street pole banners, building murals, bench art, paving patterns, and coordinated public greenery are all potential ways to showcase placemaking. These efforts also beautify the city, help residents take pride in their neighborhoods, and help visitors navigate to Box Elder's expanding offering of attractions.

RECOMMENDATION 3: CREATE PERSONALIZED WAYFINDING

Box Elder has many attributes leading to it being a desirable place to visit such as the Air and Space Museum and the construction of the Liberty Plaza development as a new downtown. Personalized wayfinding will help draw visitors in to experience these landmarks. Currently most of the wayfinding for Box Elder is from the South Dakota Department of Transportation, which communicates information but lacks personality and visual interest. Creating personalized wayfinding at the entrances to Box Elder will create and reinforce the identity and image of the city. Wayfinding should be placed along the interstate and highway leading into and out of Box Elder. This will help establish visible boundaries for the city and improve visitor recognition and awareness.

Figure 3: Residential street art in Portland, Oregon

Figure 4: Lively downtown placemaking in Munroe, Ohio

Figure 5: Wayfinding signs in Houston, Texas

Figure 6: Pedestrian-scale wayfinding

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Figure 7: Placemaking strategies on Liberty Boulevard (before and after)

Figure 8: Welcome to Box Elder!

RECOMMENDATION 4: DEVELOP A MAIN CORRIDOR INTO BOX ELDER

Box Elder is developing new infrastructure for a fast-growing city and working with outside entities to develop a more cohesive structure for the city. The entrances to Box Elder are largely dictated by Interstate 90 and Highway 1416. The freeway splits the community into two separate sections. The community should develop a main corridor for vehicular traffic and multimodal traffic that would lead residents and visitors through the center of the city. This would concentrate commercial and multistory residential in one space to build out from. This would also assist in creating a more cohesive city plan for the future.

Highway 1416 is one option for this corridor as it is already a main thoroughfare. Liberty Boulevard is another option for development as it is the location of City Hall and the highly anticipated Black Hills Children's Museum. Developing commercial space and recreational areas along Liberty Boulevard is an appropriate place for further developments such as these and would promote traffic to the developing commercial district.

RECOMMENDATION 5: CREATE AND CONNECT NODES AT PROMINENT LOCATIONS

Nodes are transitional areas between connecting paths or transportation corridors that function as gathering points. They should be implemented at prominent intersections around the city and be designed to enhance Box Elder's imageability and function. A plant palette adapted to Box Elder's climate and geophysical characteristics should be identified as part of this strategy.

Figure 9: Downtown node in Arrowhead, Colorado

Figure 10: Proposed node locations in Box Elder

RECOMMENDATION 6: IMPROVE AESTHETICS TO ENHANCE NATURAL BEAUTY

The community of Box Elder currently has naturally beautiful and diverse landforms. Improving aesthetics will add a lot of character and excitement to the town. These aesthetics can be simple things, like hanging flowers or banners from light posts or further developing buffers between the sidewalks and roads. Even something like planting trees and flowers. Planting more trees would make a substantial difference in how people perceive their surroundings. These options would add lots of color and energy throughout the community.

RECOMMENDATION 7: IMPLEMENT PUBLIC ART AND OTHER ATTRACTIONS

Box Elder is built upon function and ease of transportation. With the interstate and the air force complex located in the community, the city lacks public infrastructure based on visual and artistic appeal. The community should install attractions and public art at public buildings and other nodes. Art installations should also be implemented along major roads, trails, pedestrian paths, and major nodes of the city. This can be done through art programs that allow submissions to have their art displayed or by paying an artist to create something meaningful to the city.

This recommendation will contribute to Box Elder's identity, setting it apart from other communities in the region, drawing in tourists and residents, and stimulating further economic activity and growth.

Figure 11: Banners and flowers beautify the city

Figure 12: Planted boulevards add beauty and function

Figure 13: Public art installation in Sioux Falls

Figure 14: Mural in Charlotte, North Carolina

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Figure 15: Douglas High School with sculptures and murals (before and after)

RECOMMENDATION 8: FURTHER EMBRACE CPTED PRINCIPLES

Box Elder makes substantial efforts to clean and repair areas affected by vandalism and graffiti within the town and has an effective police force with quick response times. Some parks, businesses, and homes in Box Elder have been grafittied, which is expensive to clean up and repair. This can be prevented through simple Crime Prevention through Environmental Design (CPTED) tactics, such as improved public lighting, improving passersby's views into a place, incorporating wayfinding, maintaining public parks and paths, and installing murals and public art (CPTED International). These tactics should be used to inform the design of high-risk areas in Box Elder to prevent undesireable activity at problem locations.

Street Trees and lighting installed

Art installments to dimish actions of vandalism

Signage to signal enterence to city cooridor and motto

Wider streets and boulavards

Wayfinding signage & pedestrian crosswalks

Figure 16: Placemaking and CPTED principles in action

RECOMMENDATION 9: DEVELOP & IMPLEMENT AN URBAN FORESTRY PLAN

Box Elder has isolated neighborhoods with trees. City officials are currently working with outside resources to identify trees and other plant material compatible with the climate and local soil composition. Box Elder's urban tree strategy is currently in its inceptual phase, meaning there are many opportunities to plant more trees along streets and within public parks and plazas. An urban forest decreases the temperature of public spaces during heat waves, assists in maintaining soil integrity, decreases wind intensity, naturally lowers traffic speeds on tree-lined roads, and significantly contributes to a city's aesthetics and image. Box Elder should develop a comprehensive urban forestry plan and continue to prioritize planting trees in public spaces, throughout neighborhoods, and within medians and boulevards.

Figure 17: Box Elder neighborhood with urban forestry plan implemented (before and after)

RECOMMENDATION 10: RECLAIM STORMWATER RUNOFF

Box Elder has infrastructure along Ellsworth and Highway 1416 to manage flash flood stormwater runoff. The proposed master park plan incorporates a well thought out and effective way of managing the floodplain of the creek passing through the town. Box Elder does not currently manage stormwater runoff throughout most of the town. Current drainage practices do not properly reroute water during flood events. Stormwater is allowed to drain into residential areas unequipped to adequately handle the runoff. This stormwater management could be approached in a more visually appealing and ecologically friendly way. Stormwater should be filtered into the ground while transported away from areas at high risk of damage due to flash flooding. Bioswales are vegetated depressions used for the capture, treatment, and infiltration of stormwater runoff. (Bioswales) Bioswales with proper overflow drainage would be particularly helpful in the northern portion of the town around the school . Detention ponds could be constructed for collection of excess run-off. This practice would filter water into the ground while minimizing risk of harm to buildings during an intense rain event. (Green Stormwater Infrastructure)

Figure 18: Rain garden in a parking lot

Figure 19: Bioswale at road intersection

RECOMMENDATION 11: DEVELOP A GREEN CORRIDOR ALONG ELLSWORTH ROAD

Box Elder is already developing a system of paths and trails throughout the city to achieve functioning walkability. The sidewalk along Ellsworth Road does not run the full length of the road. It is interrupted by an unsafe highway interchange and has no enclosure or appeal. This makes walking and biking along this road unsafe and unenjoyable. This is hazardous because this road is the only major connection between the two primary portions of Box Elder. There is a sidewalk running along Ellsworth Road from Heritage Park and Community Gardens to Liberty Boulevard. This should be converted into a Green Corridor.

A Green Corridor involves a vegetated parkway spanning a length between two larger green spaces, functioning as a linear park along a path. This corridor would provide many opportunities for interest and contemplation. It will be more walkable, inviting and purposeful than the current sidewalk. Small offshoot plazas and connections to commercial developments should be integrated with the corridor. It should also be designed to treat and reuse stormwater runoff and to buffer against road and traffic noise.

Figure 20: Ellsworth Road Green Corridor

RECOMMENDATION 12: DEVELOP A COMMERCIAL AND SOCIAL HUB ON ELLSWORTH ROAD

Ellsworth Air Force Base and Box Elder are experiencing unprecedented growth and development. The Air Force Base's presence on Ellsworth Road significantly impacts development and connectivity, effectively splitting the city in half. This problem is compounded by the Interstate overpass and Highway intersections. Implementing a commercial and social hub along Ellsworth Road between Liberty Boulevard and Highway 1416 will connect major neighborhoods and create a city center for Box Elder. Development in this area is restricted due to the base and currently has minimal development connecting the north-east to the south-east regions of Box Elder. This proposed hub should be envisioned as a mixed-use or commercial corridor leading to the new downtown by the Children's Museum development, enhancing the center of the community and making Box Elder more independent and self-sustaining. A commercial hub would provide infill with unique and enticing experiences for those walking through this proposed district (see Figures 24-25).

The pedestrian environment through this hub and along Ellsworth Road is also critical. Attractive and safe pedestrian corridors add to community and economic vitality. As Ellsworth Road continues to develop, paver or stamped concrete sidewalks, planter boxes with seat walls and benches, street trees, and public art should be installed. These can be complemented with pocket parks, sidewalk dining opportunities, and stores with large storefront windows, awnings, and highly articulated facades to draw people in. This will provide a comfortable and aesthetically pleasing environment for shopping, dining, and recreation during all seasons of the year.

RECOMMENDATION 13: PROVIDE NEW RECREATION AND DINING OPPORTUNITIES

The city of Box Elder provides some fun and interesting options for food and entertainment. Unfortunately, most residents feel compelled to travel to Rapid City for most of their dining, shopping, and recreation needs, indicating a perceived lack of suitable opportunities in town. By expanding the business options in Box Elder, the city can generate additional revenue, promote greater interaction between Air

Figure 21: Current Box Elder dining typology

Force personnel and the community, and establish Box Elder as a destination for tourists. Furthermore, local community members would benefit from more convenient access to recreational and dining options. Not only would this attract current residents to spend their money locally, but it

would also attract new residents.

EAFB personnel in particular would benefit from this. New options would entice personnel into the community as a getaway from the base. This would make Ellsworth a more appealing option to choose for Air Force Members when they give their preferences for assignments. New businesses would spur economic development and provide a reason to travel to the city of Box Elder.

Figure 22: Current Box Elder recreation offerings

The Black Hills Children's Museum is a fantastic example of something that will make Box Elder an attraction, generating income from residents outside of Box Elder. As more dining options are considered, care should be taken to ensure they contribute to a lively environment. This includes a focus on sidewalk dining areas, street music and other types of performances, food trucks, farmers markets, and other recreation/dining combinations. More food options and recreational options will only help as outsiders can make a day coming to Box Elder, eating at and interacting with local businesses, creating a city that will economically thrive. Figure
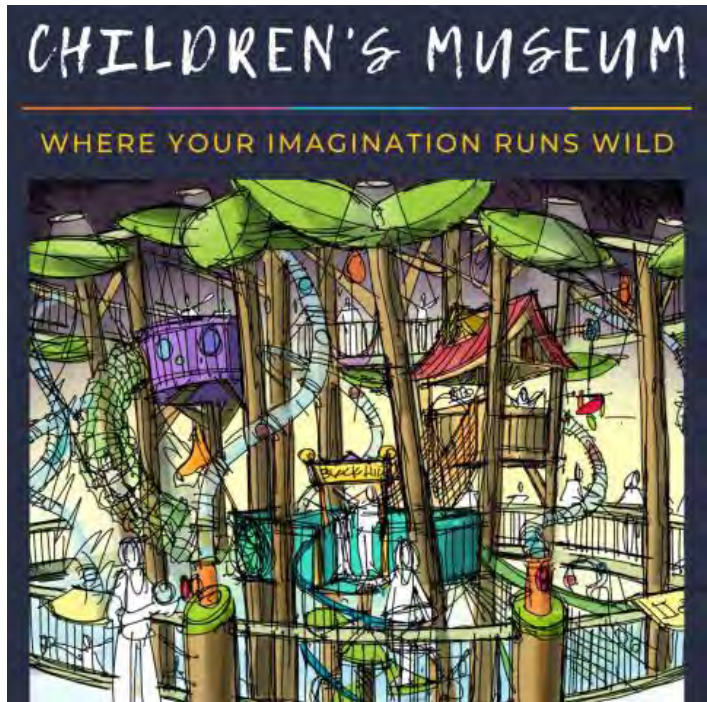
Figure 23: Black Hills Children's Museum adds attraction to the city

26 on page 16 highlights areas where dining and recreation are currently concentrated (in red) and those portions of the city that would be best served by new dining and recreational opportunities (in yellow).
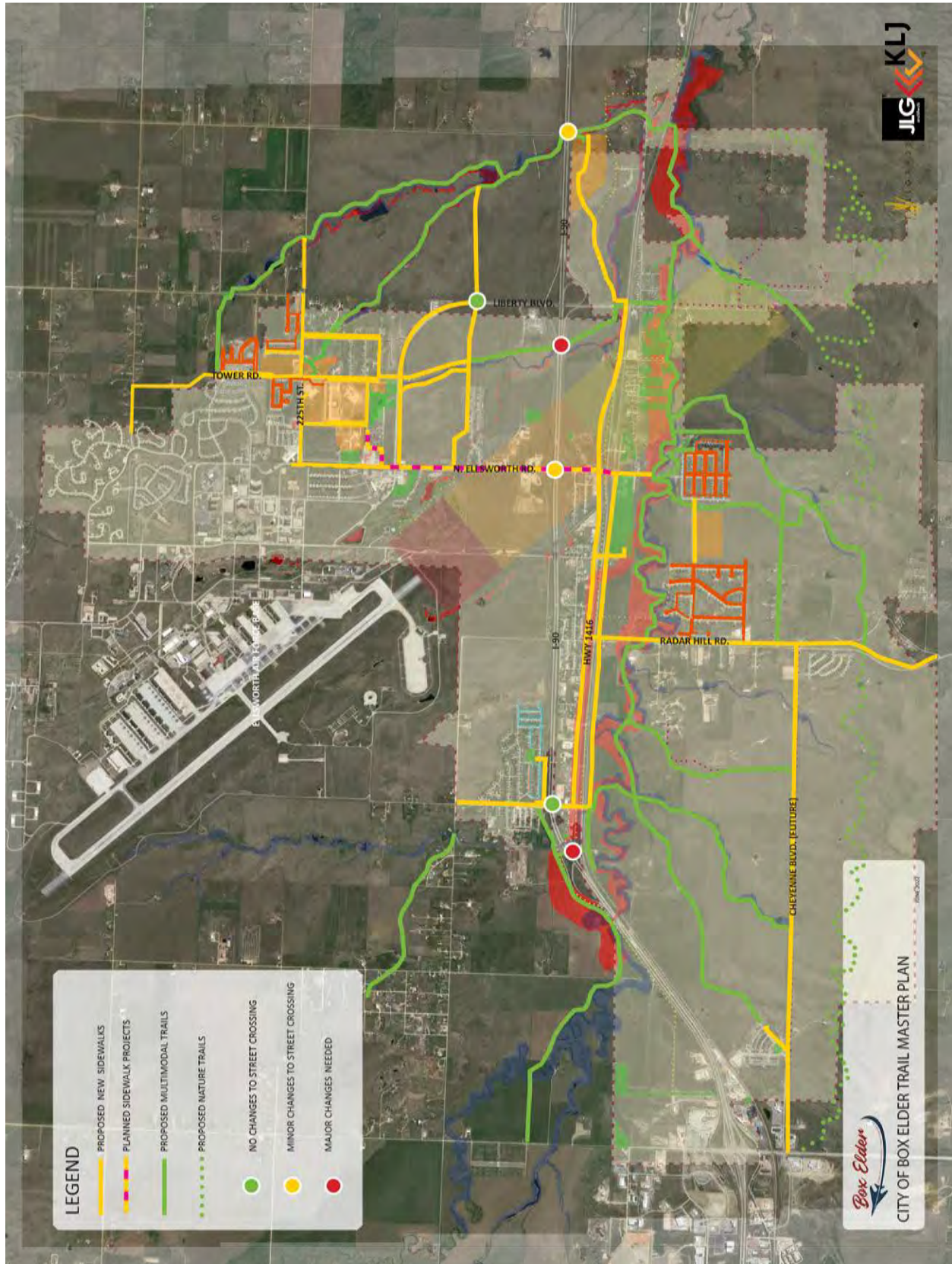
Figure 24: Current trails master plan by Tallgrass Landscape Architecture
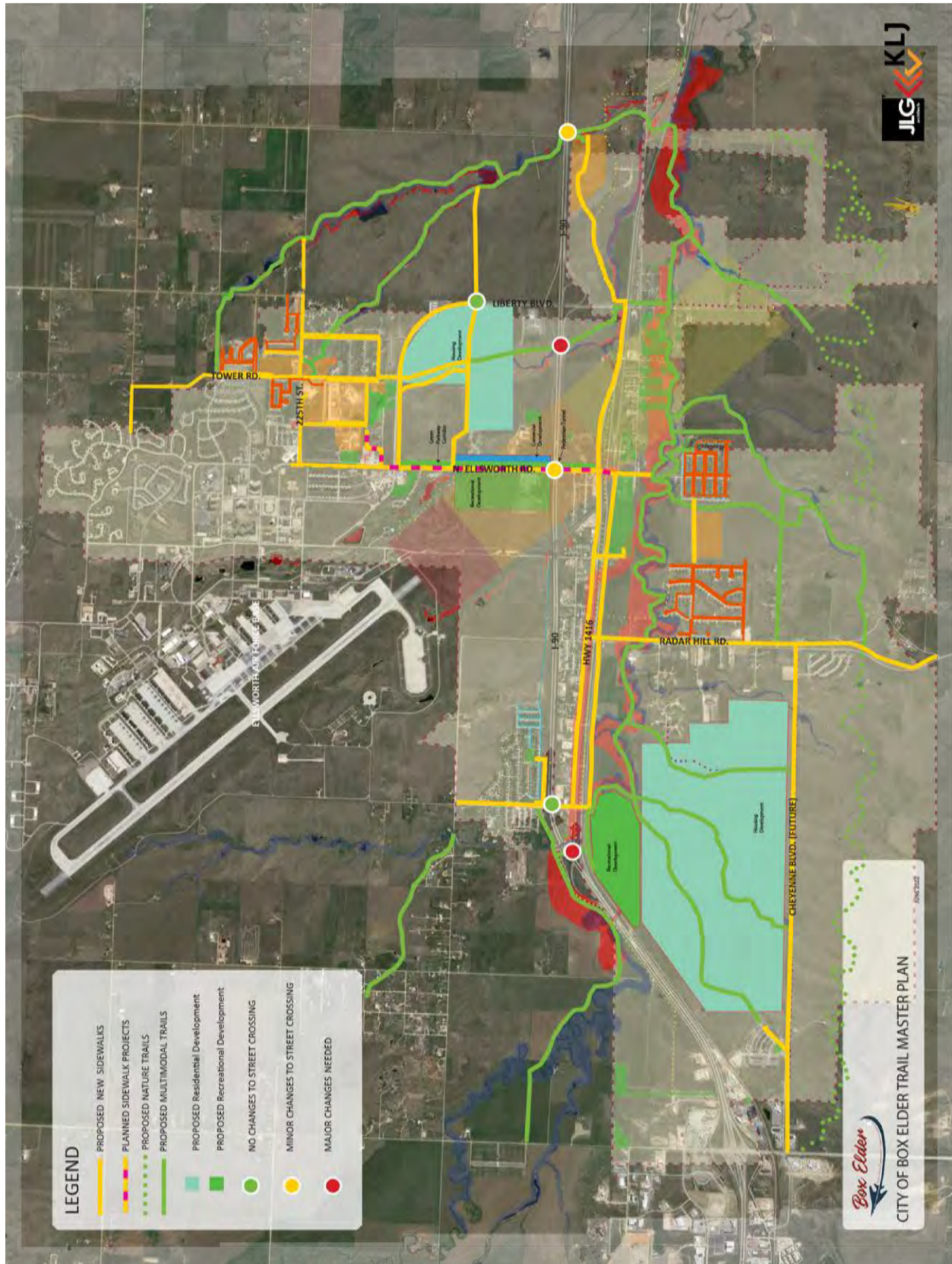
Figure 25: Proposed additions to current trails and parks master plan
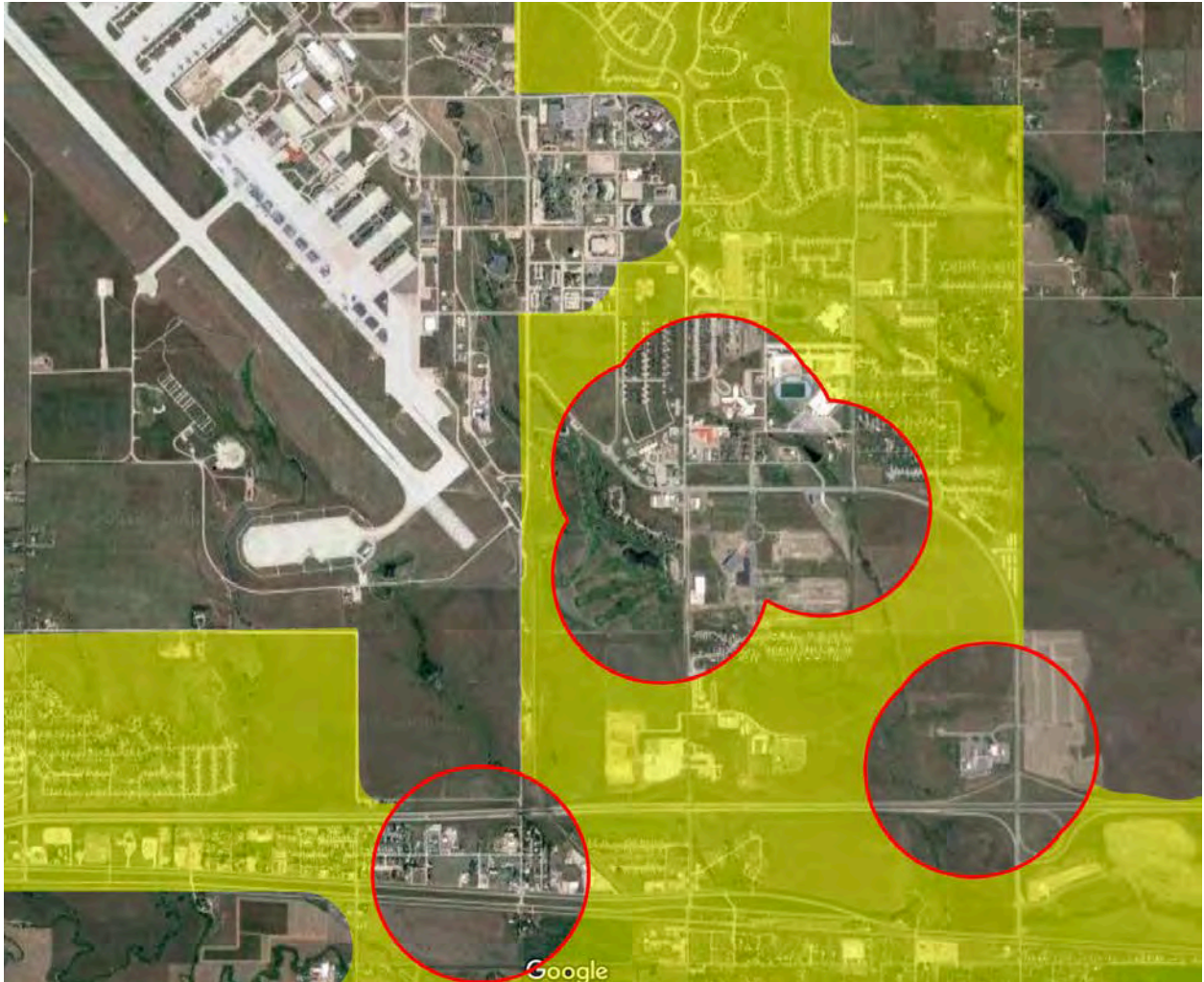
Figure 26: 0.5-mile walking distance from current dining and recreation in Box Elder

RECOMMENDATION 14: CREATE A FARMERS MARKET OR PARK NEAR EXIT 63

Box Elder is growing rapidly and expanding its residential, commercial, and recreational zones. The city of Box Elder is split by a wide-open expanse between the developments near Rapid City and the rest of Box Elder. Exit 63 is centrally located in this open space and could be developed into a residential and commercial area. This development should include a large market with outdoor and indoor possibilities and a recreational area (see Figure 25 on page 15). The recreation area could incorporate a dog park, trails, playgrounds, rest areas, and shelters, among other things. In-door and outdoor sport courts would encourage community gatherings and increase public health. This would encourage travelers to stop on their way through South Dakota and would also serve as a valuable recreation area for current and future residents of Box Elder.

RECOMMENDATION 15: SAFELY CONNECT THE COMMUNITY ACROSS THE EAFB NOISE CONTOUR ZONE

Ellsworth Air Force Base is an integral part of the Box Elder community. While there are certain restrictions around the base to ensure the safety of the citizens, some things can be done to add to the beautification of the community. The implementation of parks, trails, and other outdoor activities will integrate the Air Force base more into Box Elder. It is also important

Figure 27: Trails linking Box Elder through the noise contour zone

to clearly communicate with residents and stakeholders what the noise contour is and why restrictions on development are necessary.
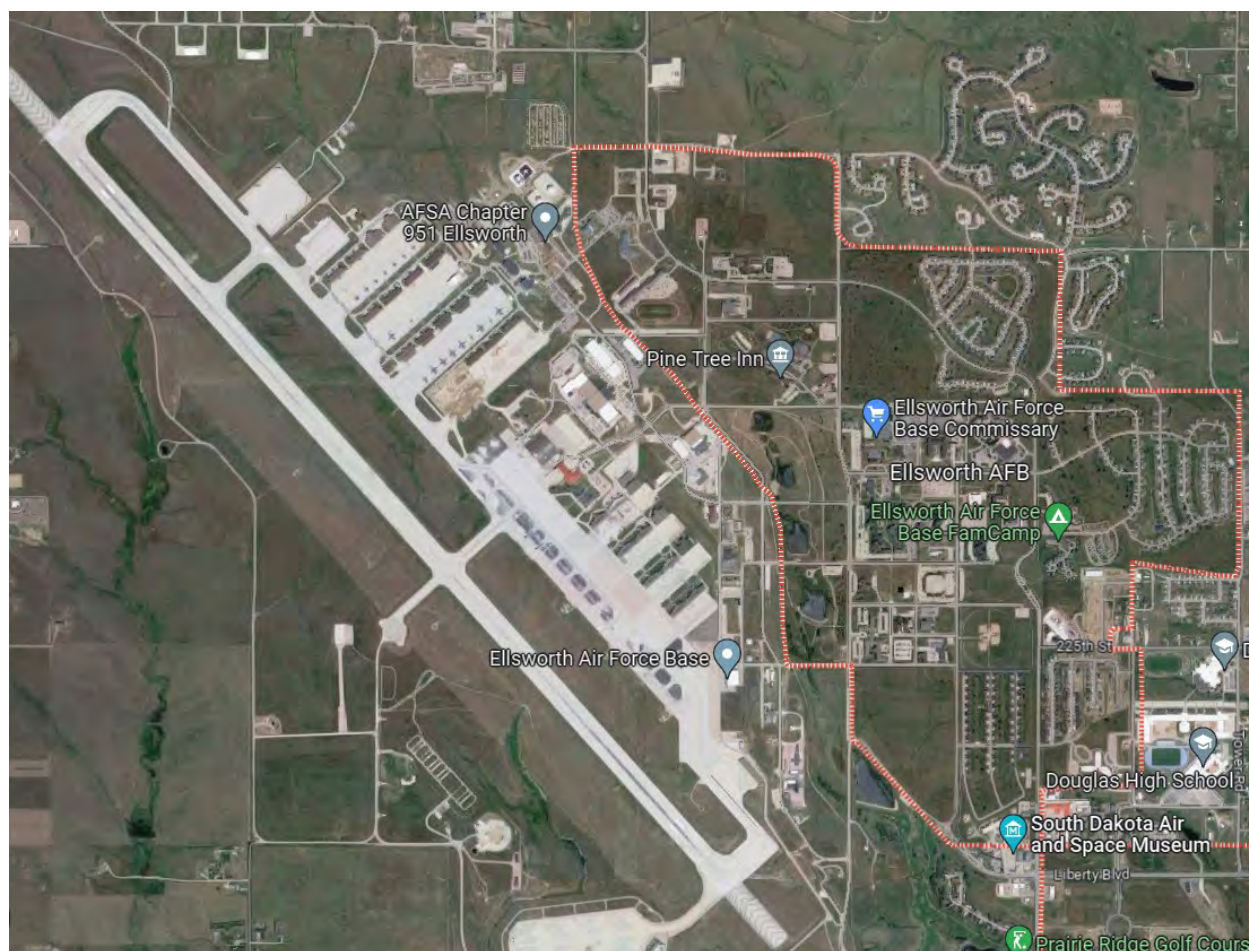
Figure 28: Ellsworth Air Force Base adjacent to Box Elder

Public parks and open spaces in the city of Box Elder are highly popular due to the excellent maintenance and care they receive. Currently, the city hosts public events and meetings on a regular basis. While the activities held by the city of Box Elder are fantastic and should keep being held, we recommend that even more events are held that invite residents as well as outsiders to Box Elder.

These events could vary in scale and audience but should inspire community involvement and gathering. These events could be held at the town hall, the schools, or at a public park. This will build a sense of community among its residents as well as be attractive to outsiders. It communicates that Box Elder is the place to be. A sense of community builds pride which inspires residents to take better care of the community and be more involved. These events would need to be organized by government and public officials or departments.

Figure 29: A great community event Box Elder is already holding

Figure 30: Community movie nights should be affordable, inclusive and age-appropriate

Figure 31: Farmers and festival markets create community ties and economic benefits

RECOMMENDATION 17: ENHANCE COMMUNICATION WITH ELLSWORTH AIR FORCE BASE

The contribution of Ellsworth Air Force Base is felt by the military's involvement and presence within the community. We propose to improve communication between the City of Box Elder and the Air Force base. This will facilitate the conversation of how to form a more symbiotic relationship between the community of Box Elder and the base's service members. The city's AFB communications liaison position is currently empty, and it should be filled as soon as possible. This individual should focus on working with the base public affairs personnel to help create bridges between the two communities and further enhance relations. In addition, these key personnel at the city and the base can help to creatively address the concerns and impacts created by the base's presence in the community, including development restrictions due to the noise contours and ccident potential zones and how the community can help meet social, economic, and housing needs of base personnel.

Figure 32: EAFB noise contour zone

Figure 33: Meetings between community and military stakeholders

Figure 34: Accident potential zones

RECOMMENDATION 18: CREATE A SCREENING BUFFER AT ELLSWORTH AIR FORCE BASE

The Air Force Base embedded within Box Elder plays a crucial role in the community's development and enhances Box Elder's identity. However, the influence the Air Force base plays on Box Elder is significant and should be addressed. The implementation of a buffer would allow the base to act independently and add to the aesthetics of Box Elder. This would improve the relationship between Box Elder and the Air Force base as some negative impacts would be mitigated and base security would be increased.

The main idea of having a buffer is to visually screen views of the Air Force Base. The buffer would be implemented near the accident potential zone to decrease noise pollution and moderate viewsheds in the open landscape near the base. The buffer will be implemented through the use of macro-vegetation, including a mix of deciduous and coniferous trees. The deciduous trees provide seasonal interest, noise reduction, and summertime visual interest, while the coniferous trees provide year-round viewshed mitigation, air and noise pollution reductions, and wind abatement.
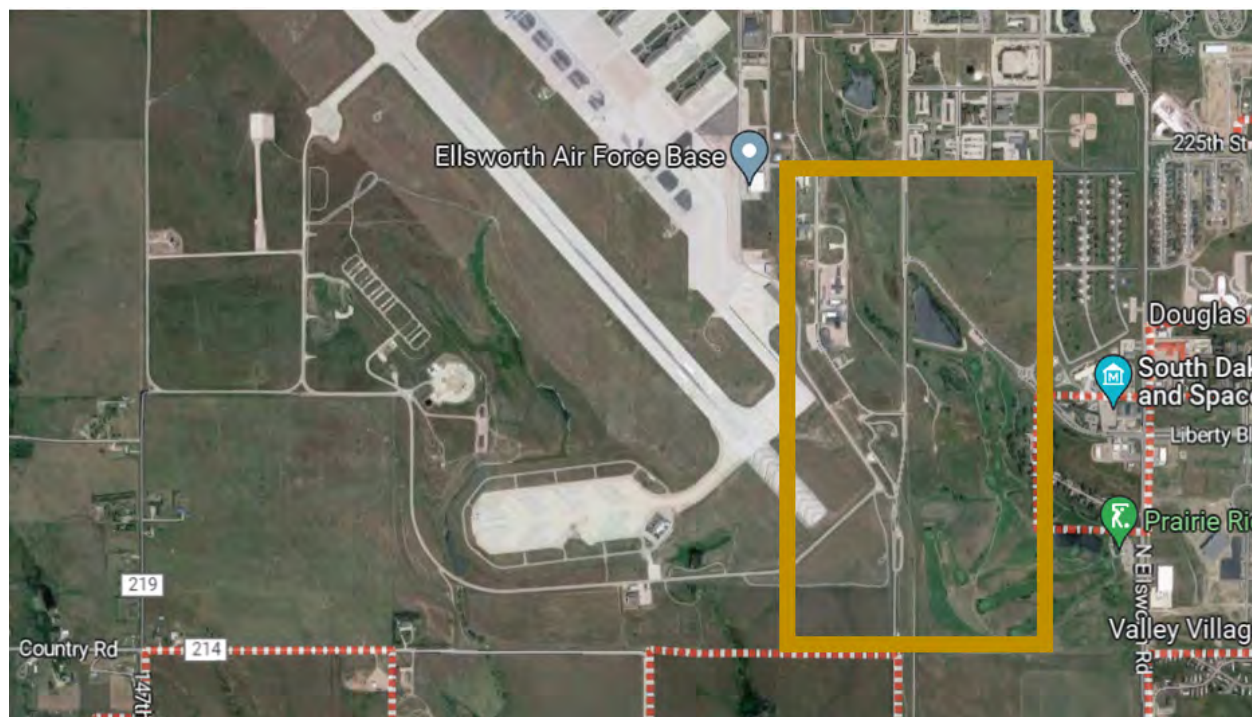
Figure 35: Proposed EAFB screening buffer zone

Figure 36: Proposed EAFB screening buffer zone

RECOMMENDATION 19: UTILIZE INTERSTATE 90 TO PROMOTE BOX ELDER

Interstate I-90 currently acts as both the main conduit into Box Elder and a barrier that splits the city in half. The interstate is also a prime location to promote Box Elder Black Hills visitors. Most of the current views from the interstate into the city are currently underutilized.

The views that visitors have from the interstate consists primarily of trailer parks, light industrial areas, and undeveloped areas. Most of these views do not encourage visitors to stop in Box Elder. Displacing these land uses is not a realistic solution, because removing people from their homes will harm the city rather than improve it. Viewshed management practices such as planting a combination deciduous and coniferous tree along the Interstates easement will help to mitigate drivers views of industrial and blight areas. Intentional planting draws visitors into town.

The current development plan for Box Elder will create several views that would encourage visitors. These views include the Community Park, Alpha-Omega development, and Liberty Plaza. Using vegetation to frame views of these amenities will improve Box Elder's draw to visitors. It also acts as a form of wayfinding to help visitors navigate to city attractions.
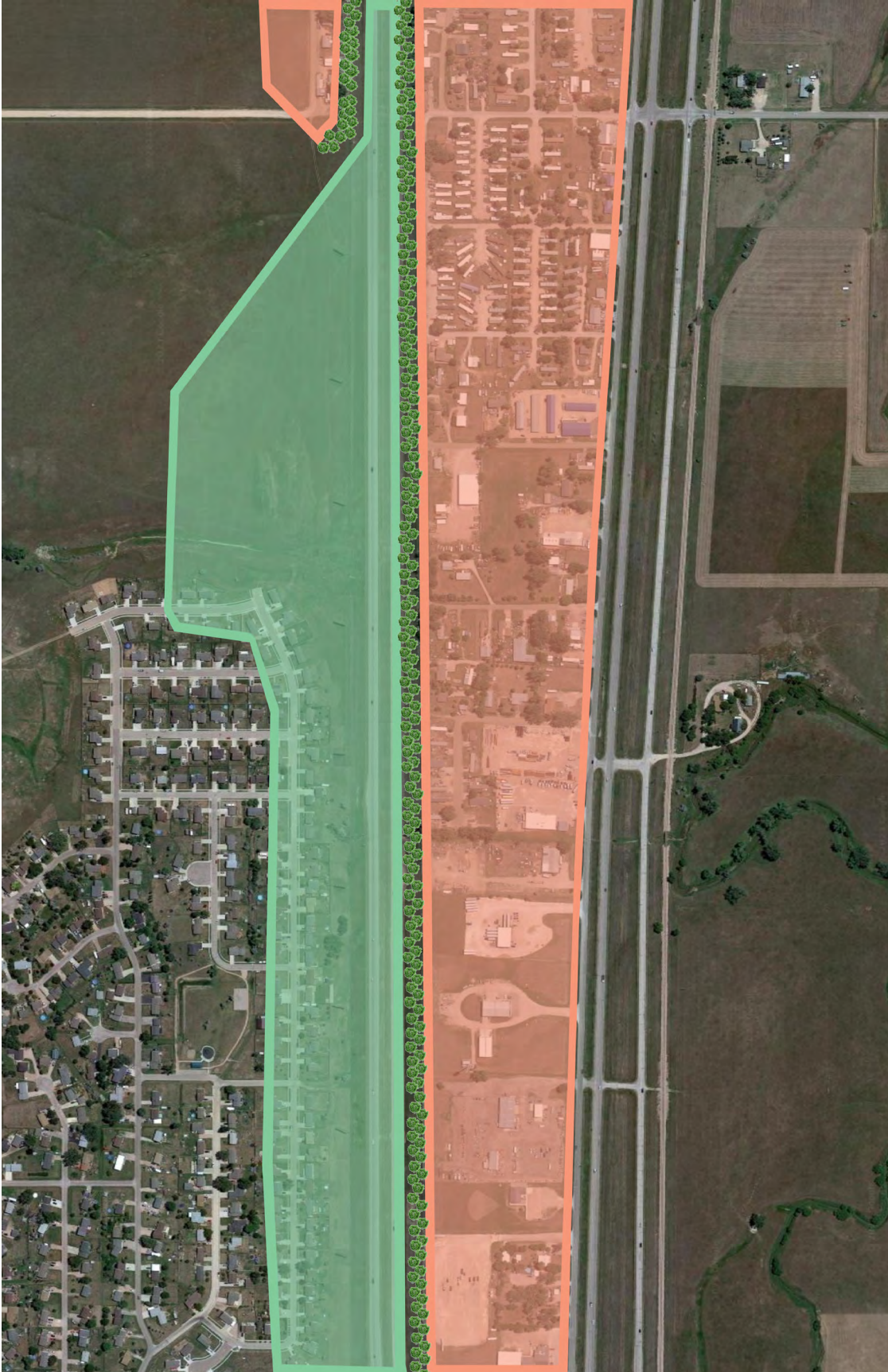
Figure 37: Visual resource management along the I-90 corridor

Figure 38: Framing views from I-90 to the new community park

There is a proposed multi use trail utilizing an underpass beneath the interstate. The existing underpasses are not attractive or conducive to pedestrian and bicycle traffic. They lack amenities for these forms of traffic like sidewalks or methods to mitigate the impact of the interstate. A combination of shrubs and flower should be planted along the entrances to the underpass. This will encourage connectivity between the north and south sides of the city and promote pedestrian and bicycle circulation.

Figure 39: Pedestrian and cyclist underpass for I-90

Figure 40: Location of pedestrian underpass (Tallgrass Landscape Architecture comprehensive parks and circulation plan)

Box Elder should petition the South Dakota DOT to implement a design like Oregon's I-84 Graham Road Bridges. This will significantly improve the connectivity between the north and south sides of Box Elder. This presents two options: A) widening the bridge to allow room for multi-use paths or B) creating a retaining wall for the slopes of the underpasses that would provide room for paths on the sides of the road. With the retaining wall method there is an opportunity to improve the walkability of the underpass by decorating the retaining wall. An example of this is the Sanpitch Dragon in Gunnison, Utah.

The main interstate exits into Box Elder are currently Exit 63 and Exit 67. With the development of Cheyenne Boulevard and the Alpha-Omega development, Exit 61 will also become a major entrance into Box Elder. The western approach to Exit 63 and the eastern approach to Exit 67 are convenient and legible access points to Box Elder. Accessing Exit 67 from the west, however, is more challenging, and there is no access to the city at all via Exit 63 from the east. This significantly reduces Box Elders's freeway presence.

The South Dakota DOT is currently working on redesigning Exit 63 and has introduced six options (Proposal 1a/b, 2a/b, 3a/b) It is important that Box Elder remains involved with the design

Figure 41: I-84 Graham Road Bridges, Oregon DOT

Figure 42: The Sanpitch Dragon in Gunnison, Utah

of the new exit. The new exit will impact the current residents and the city's future growth. Box Elder should push for the adoption of either proposal 2a or 3a, which will connect the new exit to the south side of Highway 1416. These proposals will not displace houses and impact the adjacent commercial district the least. Box Elder should discourage the DOT from adopting proposal 1a or 1b which connects the new exit to West Gate Road. Building the exit here will displace several people from their homes and decrease walkability by adding two new intersections.

Exit 67 does not require a complete rebuild to become more useable. Petitioning the South Dakota DOT to redesign the Exit 67 sign to include diagrams would allow visitors to more easily understand how the partial clover exit works. This will increase the safety and function of the exit because fewer people will make U-turns on Liberty Boulevard. Building a roundabout on the intersection of Liberty Boulevard and Highway 1416 will also improve the functionality and safety of Exit 67. It will allow visitors to Liberty Boulevard a smoother transition to turn around.

With further research and planning Box Elder can transform the interstate from a barrier into a conduit of city improvements. It will increase commerce by encouraging visitors to stop in the city. Redesigning key aspects of the interstate will also increase the connectivity between the north and south sides of the city and improve walkability in the city.

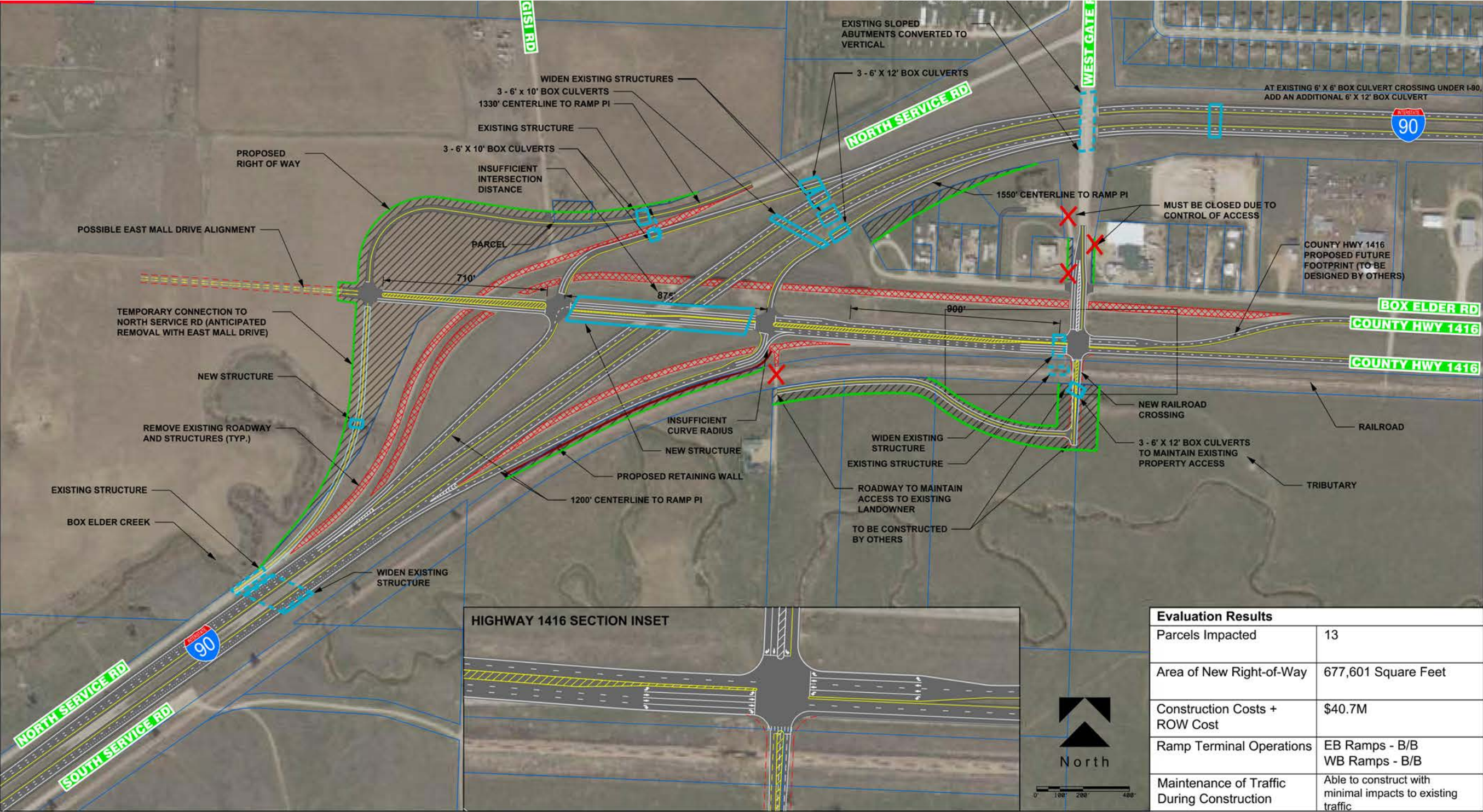*Figure 43: Exit 63 on Interstate 90 provides no eastbound access*

Figure 44: Exit 67 on Interstate 90 is overly complicated

Figure 45: Proposed wayfinding signage for Exit 67 (eastbound)

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Figure labels and annotations:

- WIDEN EXISTING STRUCTURES
- 3 - 6' x 10' BOX CULVERTS
- 1330' CENTERLINE TO RAMP PI
- EXISTING STRUCTURE
- 3 - 6' X 10' BOX CULVERTS
- INSUFFICIENT INTERSECTION DISTANCE
- PROPOSED RIGHT OF WAY
- POSSIBLE EAST MALL DRIVE ALIGNMENT
- PARCEL
- 710'
- 875'
- TEMPORARY CONNECTION TO NORTH SERVICE RD (ANTICIPATED REMOVAL WITH EAST MALL DRIVE)
- NEW STRUCTURE
- REMOVE EXISTING ROADWAY AND STRUCTURES (TYP.)
- EXISTING STRUCTURE
- BOX ELDER CREEK
- WIDEN EXISTING STRUCTURE
- INSUFFICIENT CURVE RADIUS
- NEW STRUCTURE
- PROPOSED RETAINING WALL
- 1200' CENTERLINE TO RAMP PI
- 3 - 6' X 12' BOX CULVERTS
- 1550' CENTERLINE TO RAMP PI
- MUST BE CLOSED DUE TO CONTROL OF ACCESS
- AT EXISTING 6' X 6' BOX CULVERT CROSSING UNDER I-90, ADD AN ADDITIONAL 6' X 12' BOX CULVERT
- WEST GATE
- NORTH SERVICE RD
- EXISTING SLOPED ABUTMENTS CONVERTED TO VERTICAL
- I-90
- COUNTY HWY 1416 PROPOSED FUTURE FOOTPRINT (TO BE DESIGNED BY OTHERS)
- BOX ELDER RD
- COUNTY HWY 1416
- COUNTY HWY 1416
- 900'
- NEW RAILROAD CROSSING
- RAILROAD
- WIDEN EXISTING STRUCTURE
- EXISTING STRUCTURE
- ROADWAY TO MAINTAIN ACCESS TO EXISTING LANDOWNER
- TO BE CONSTRUCTED BY OTHERS
- 3 - 6' X 12' BOX CULVERTS TO MAINTAIN EXISTING PROPERTY ACCESS
- TRIBUTARY
- NORTH SERVICE RD
- SOUTH SERVICE RD
- I-90

HIGHWAY 1416 SECTION INSET

North

Evaluation Results	
Parcels Impacted	13
Area of New Right-of-Way	677,601 Square Feet
Construction Costs + ROW Cost	$40.7M
Ramp Terminal Operations	EB Ramps - B/B WB Ramps - B/B
Maintenance of Traffic During Construction	Able to construct with minimal impacts to existing traffic

I-90 EXIT 63

FEASIBLE OPTION 2a: COUNTY HIGHWAY 1416 DIAMOND INTERCHANGE (SOUTH HWY 1416 SECTION) FIGURE 9

FELSBURG HOLT & ULLEVIG

South Dakota I-90 Exit 63 Interchange Modification Study

Figure 46: Option 2a maintains neighborhood character and improves walkability

118324-01   January 19, 2020

I-90 EXIT 63

FEASIBLE OPTION 1a: WEST GATE ROAD DIAMOND INTERCHANGE (SOUTH HWY 1416 SECTION)

FELSBURG HOLT & ULLEVIG

FIGURE 6

South Dakota I-90 Exit 63 Interchange Modification Study

Figure 47: Option 1a proposes threats to walkability and existing neighborhoods

118324-01   **January 19, 2020**
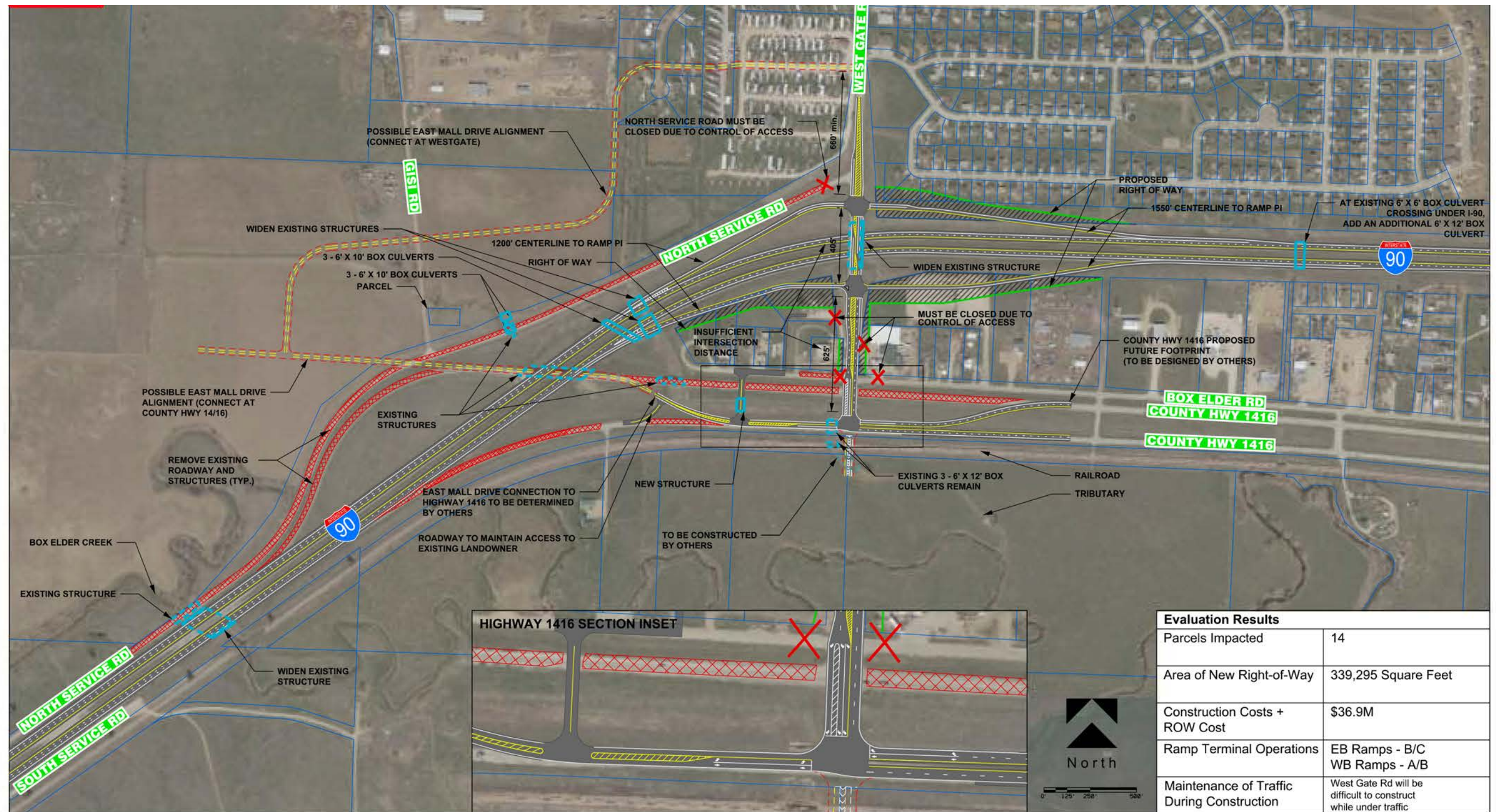
RECOMMENDATION 20: REDESIGN HIGHWAY 1416 TO IMPROVE SAFETY AND FUNC-TION

Highway 1416 running east and west through Box Elder, less than a thousand feet south of I-90, provides one of the main arterial roads that visitors and locals alike use to navigate the city. The properties along this highway also form a large part of visitor's first impression of Box Elder. The current design of Highway 1416 encourages drivers to drive quickly through Box Elder, focusing on their destination rather than slowing down and discovering the place that they are driving through. Drivers use Box Elder Road to access the many businesses along the north side of the highway. This means drivers must make a conscious effort to stop at one of the businesses along the highway rather than being able to stop on the spur of the moment. This decreases the viability of the commercial districts along the highway.

To improve driver experience and increase the accessibility of businesses and parks off the highway, major changes need to be made. Box Elder should partner with the county to redevelop the Stretch of Highway 1416 within the city limits. This will improve the aesthetics and function of the highway. After the Highway is redeveloped Box Elder should petition the county for management of the new section of road.

One change that will vastly improve circulation is to condense the north and south of the highway into the space currently occupied by the east bound lanes. This will improve connections between Box Elder Road and Highway 1416 by providing more separation between them. This would allow them to have distinct intersections from one another. This solution allows businessese to stay where they are and maintain connection to either road. It also allows additional development between the two roads.

A second option is to combine the highway with Box Elder Road. The new road will function as an arterial boulevard rather than a highway. This option decreases the number of intersections, thus increasing the walkability of the area. It will also improve the accessibility of the businesses along this stretch of road.

Regardless of how Highway 1416 is reconstructed a roundabout should be built on the intersection of Liberty Boulevard and Highway 1416. The roundabout will slow traffic while also providing an entrance into the city along the highway. This will help visitors feel they are entering a community rather than a subdivision. The roundabout will also provide visitors with another opportunity to stay in Box Elder.
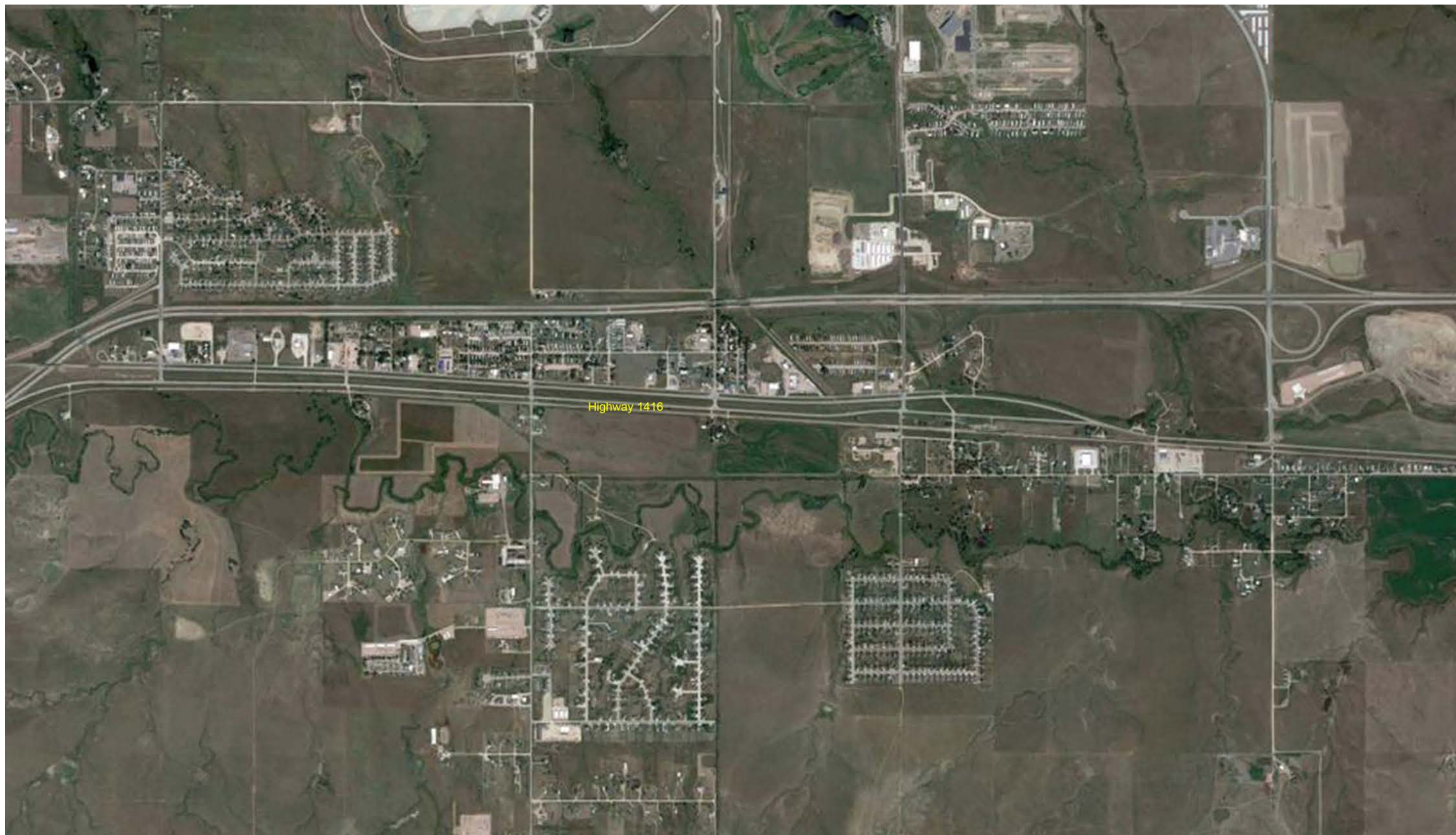
Figure 48: Highway 1416 current condition, a divided highway with separated frontage road

Figure 49: One alternative is to condense Hwy-1416 to the south and develop the space between the highway and Box Elder Road as parks, recreation, and commercial land uses

Highway 1416

Figure 50: Another alternative is to combine Box Elder Road with Hwy-1416 and bring businesses up to the new frontage

A traffic light should be installed at the intersection of South Ellsworth Road and Highway 1416. This will improve the safety and efficiency of the intersection by replacing the confusing stop signs that currently control traffic. The traffic light will also improve walkability along South Ellsworth Road by providing crosswalks for pedestrians and cyclists can use to cross the highway.

Redesigning Highway 1416 will have the long-term benefits of increasing local and visitor interaction with the commercial zone adjacent to it.
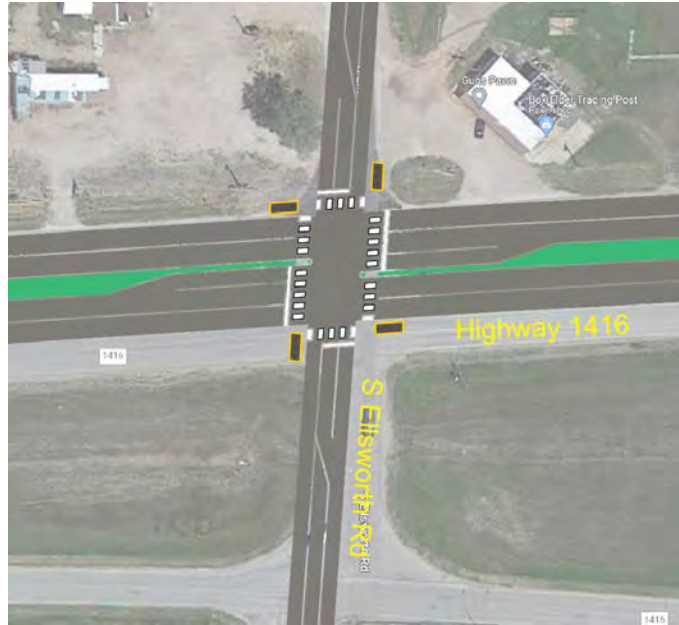

Figure 51: Proposed changes to S. Ellsworth Rd @ Highway 1416

Figure 52: The intersection of S. Ellsworth Road and Highway 1416

RECOMMENDATION 21: IMPROVE CONNECTIONS BETWEEN BOX ELDER'S NEIGHBORHOODS

Box Elder is a geographically large city whose neighborhoods are disconnected and often separated by large, undeveloped fields. The city has a population of 13,123 and is growing at a rate of 3.25%. This means that while Box Elder currently has a large amount of undeveloped land it will soon be filled in with new developments. As the city expands it is important to improve the current connections that exist between the neighborhoods and build new roads to accommodate future development.

The current infrastructure in Box Elder is not equipped to handle the increasing population and demand. This means that many of the city's arterial and secondary roads need to be improved to be able to support the city in the future. The main roads that need to be improved are Tower Road, Radar Hill Road, Radar Hill Drive, West Gate Road, Line Road, 225th Road, and Ellsworth Road. Ellsworth Road needs to be updated with sidewalks. It also needs roundabouts where it intersects with Liberty Boulevard and 225th Street. The roundabouts will slow traffic and improve safety and security for the entries into Ellsworth Air Force Base.

Figure 53: Proposed roundabout at Liberty Boulevard and Ellsworth Road
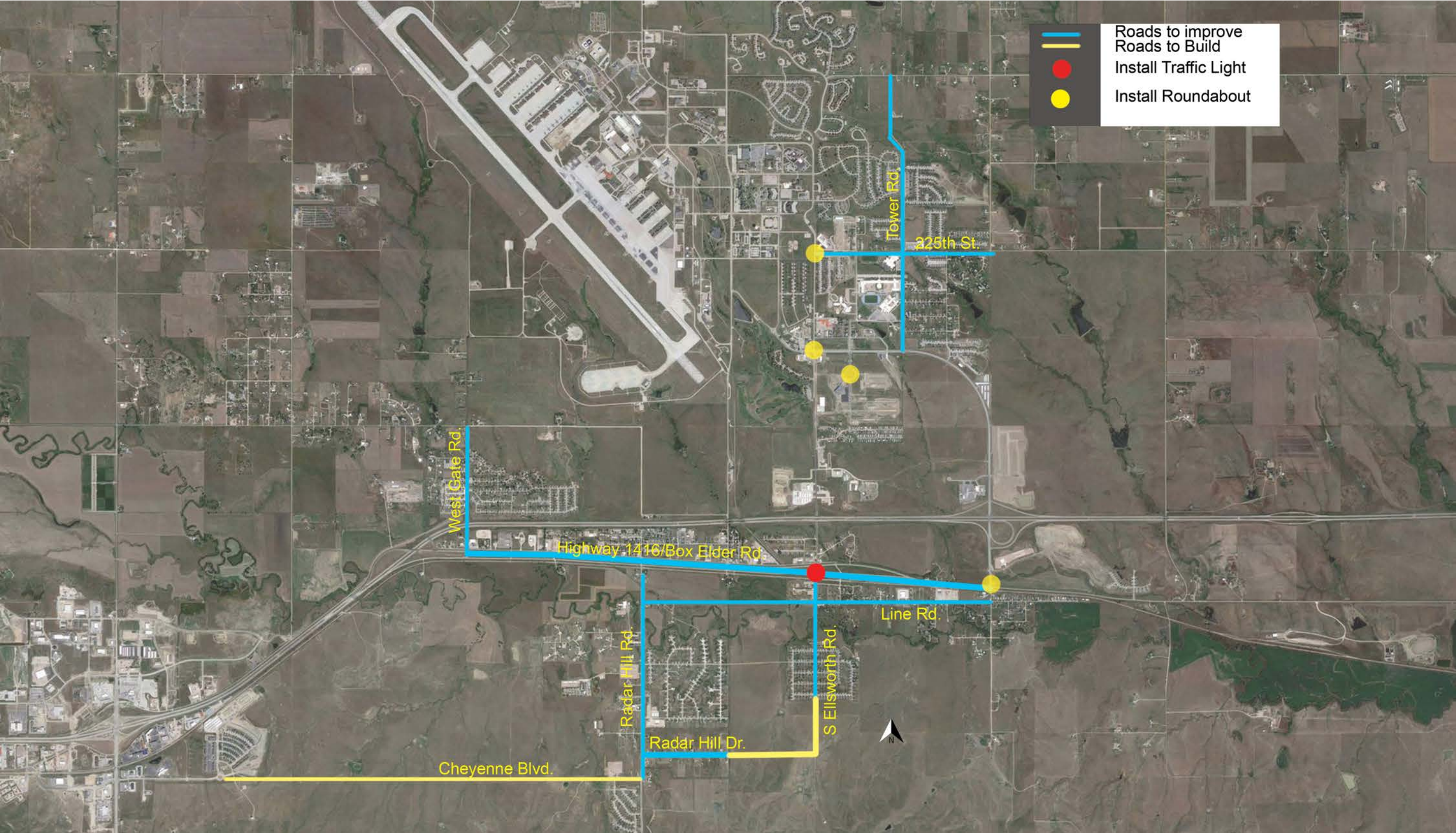
Figure 54: Road improvement plan

The other roads mentioned above should be widened to include center turning lanes. The turning lanes will allow traffic to freely move rather than stopping for left-turning vehicles. This will be important as Box Elder grows and the demand on the arterial and secondary roads continues to increase. These roads also should have sidewalks installed. The sidewalks will remove pedestrians from the vehicle environment and ditches. This will improve pedestrian safety and comfort.

Issaquah-Pine Lake Road - Three Lane Section w/ Center Turn Lane
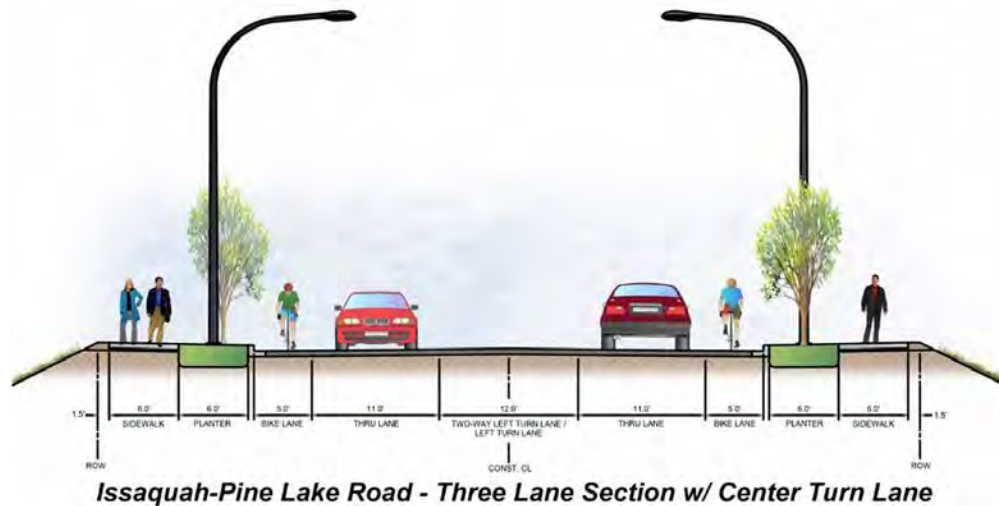
Figure 55: Improved road (section view) incorporating active transportation
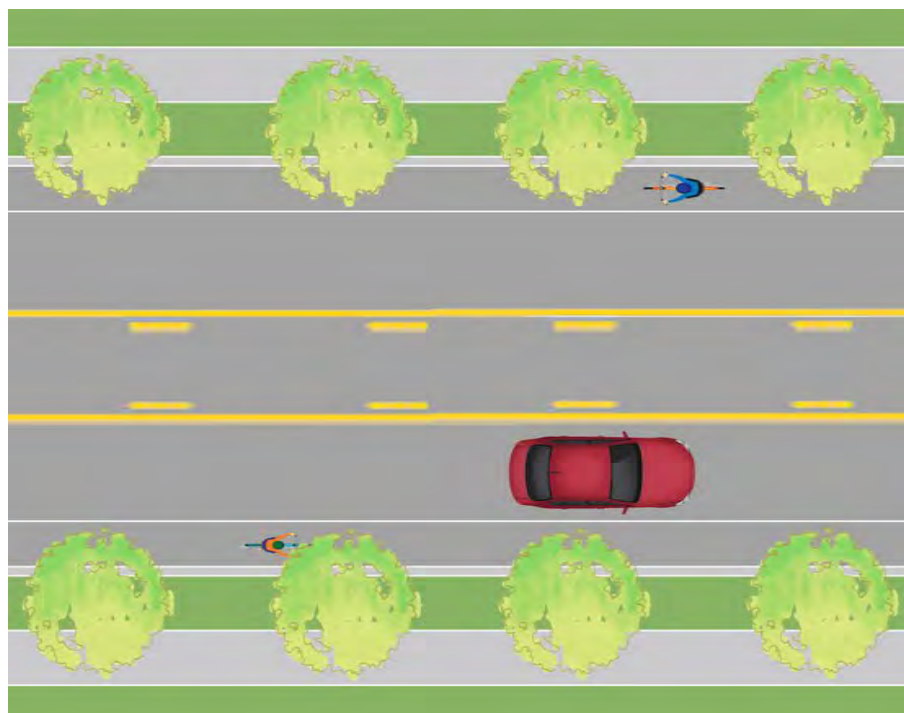
Figure 56: Improved road (plan view)

Several new road connections will provide the foundation on which the new community will be built. Connecting Cheyenne Boulevard to Radar Hill Road should be a priority. This will connect the neighborhood off Cheyenne Boulevard to the rest of Box Elder. Currently residents of this community need to use the interstate to access the rest of the city, which decreases their sense of belonging.

Connecting Radar Hill Drive to South Ellsworth Road is also important to the future development of Box Elder. This will allow alternative routes for residents to use in the event of road construction. It will also provide an opportunity to create an activity node that will draw people in from multiple neighborhoods. Creating parks and other places for people from different neighborhoods to interact with each other will help build a sense of community for the Box Elder residents.

Figure 57: A popular after-school hangout for teens and children

The roundabout in the Liberty Plaza development currently acts as a loop road rather than a roundabout. This is unsafe for both pedestrians and vehicles. Existing crosswalks lead pedestrians into the center of the roundabout, crossing the road where the drivers are distracted introducing conflict between cars and pedestrians. The parallel parking along the outside of the roundabout. To improve this roundabout parallel parking and bike path should be removed from the roundabout. This will decrease the number of factors that drivers need to pay attention to. The crosswalks that attach the pedestrian paths to the center of the roundabout should also be removed to further simplify the roundabout design to improve the safety and function of it. To improve pedestrian safety near the roundabout, vertical landscape elements like statues, large boulders, or trees should be added to slow traffic and provide interest. Lighting should be added to the roundabout and pedestrian paths to improve pedestrian safety and extend the usefulness of the adjacent areas.

Figure 58: Liberty Plaza roundabout improvements (before and after)

RECOMMENDATION 22: IMPROVE MAINTAINABILITY OF NEIGHBORHOOD STREETS

Narrow streets, such as those found in many Box Elder neighborhoods, can lead to a greater sense of driver awareness and a more personal experience among residents. Tighter spaces naturally lead to reduced driving speeds, protecting pedestrians and creating shorter crossing distances. When streets are too narrow, maintenance vehicles do not have enough room to operate safely if street parking is everywhere. Walkability is harmed due to ve-

Figure 59: Choker on Red Dale Road in Rapid City

hicles parking on sidewalks and boulevards. Addressing neighborhood street parking will help improve the functionality of these streets while maintaining a safe environment.

There are a variety of traffic-calming methods that can be used. Chokers provide pedestrians with a shorter crossing distance and define parallel parking zones by restricting road width mid-block. Curb extensions provide the same functions but are installed at intersections instead of mid-block. Speed ramps and tables increase driver awareness of pedestrians by raising the crosswalk to sidewalk height, making pedestrians more visible while they cross. Street trees provide a physical barrier between road and sidewalk and create a rhythm along the street, naturally slowing drivers by increasing their perception of travel speed.

The city should partner with developers or neighborhoods to implement these strategies. Simple changes such as trees, benches,

Figure 60: Curb extensions on a busy intersection

Figure 61: Curb extensions on a residential intersection

and light poles will separate the pedestrians and vehicles by deterring vehicles from driving on the sidewalks. Removing parallel parking spots and replacing them with landscaped bump outs will create designated parking zones. In addition, parallel parking should only be allowed on one side of the street, this will widen the traffic zone for maintenance vehicles while providing additional residential parking.

RECOMMENDATION 23: CONNECT EXISTING NEIGHBORHOODS WITH SIDEWALKS

In the city of Box Elder many residential neighborhoods contain sidewalks. However, in districts near or across Hwy 1416 there is a distinct lack of sidewalks. Implementing more sidewalks in these areas will help tie the community together, both physically and socially.
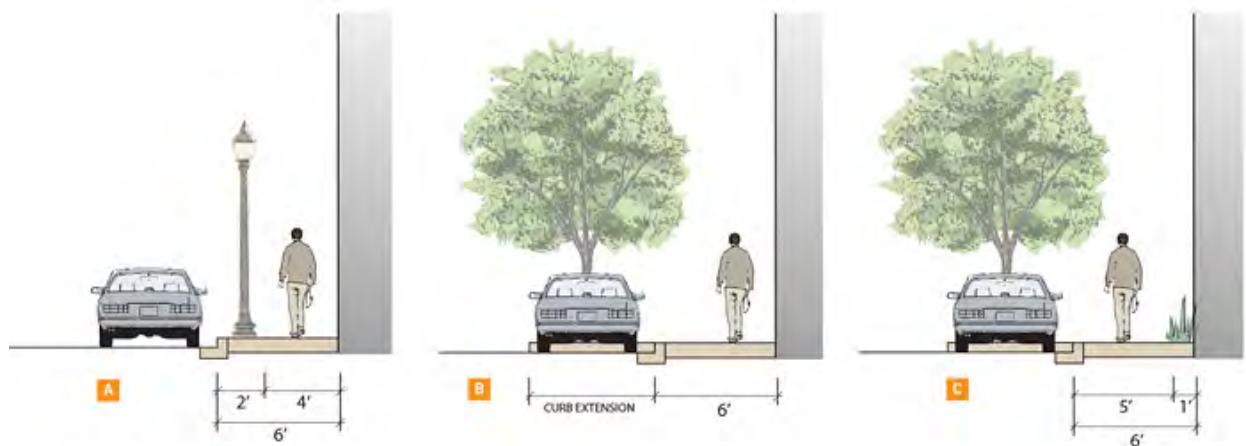
Constrained Sidewalks: 6 Feet

Three options for designing a 6 foot wide sidewalk (on alleys):
a) Retain a minimum 4 foot throughway, and use narrow elements such as streetlights or bollards in the edge zone;
b) Retain a 5 to 6 foot throughway, and add street trees on curb extensions in the parking lane with
c) optional 1 foot wide planter in the frontage zone.

Figure 62: Sidewalk design options

The sections above show the implementation of a boulevard from the street and the sidewalk with plantings of trees. It was noted that plant palettes are limited in Box Elder. Trees that can withstand the climatic conditions should be implemented to better serve the community and the aesthetics.

The people this would benefit are those who live and/or work along Box Elder Road as they would have a safer walking route and promote walking instead of driving. Sidewalks will also make these neighborhoods more desireable and will raise property values for businesses and residences. It also aids those who have disabilities or who otherwise have difficulty navigating without a vehicle, including the aged and the very young. This promotes inclusivity and equity while improving quality of life for all.

RECOMMENDATION 24: MAKE INTERSECTIONS SAFER

Box Elder features many intersections that were safe and comfortable to walk in, making the neighborhoods a desirable place to raise a family. However, the need for more desirable intersections could improve the community's intersections for walkability. The city lacks street trees and adequate speed limit signage to slow traffic speeds and increase driver awareness. The implementation of these components would make neighborhoods safer and increase the walkability as the aesthetics and safety would be better suited for walking.

Safer intersections improve the pedestrian walking experience Safer intersections should be placed in all residential neighborhoods and Highway 1416 intersections. At a minimum, crosswalks,

pedestrian crossing signs and tree-lined boulevards should be implemented. This would make noticeable changes in the residential neighborhoods, making them more attractive and functional. With this layout residents would benefit from safety and increase visuals as they commute throughout the city. All residents and visitors would be positively affected by the implementation of safer intersections.

Increased sidewalks and street trees will naturally slow traffic, which can be of concern to some drivers accustomed to traveling as fast as they like through town. However, these elements will improve safety, reduce pedestrian/vehicle conflicts, and improve Box Elder's image and appeal.

Figure 63: Typical Highway 1416 intersection in Box Elder
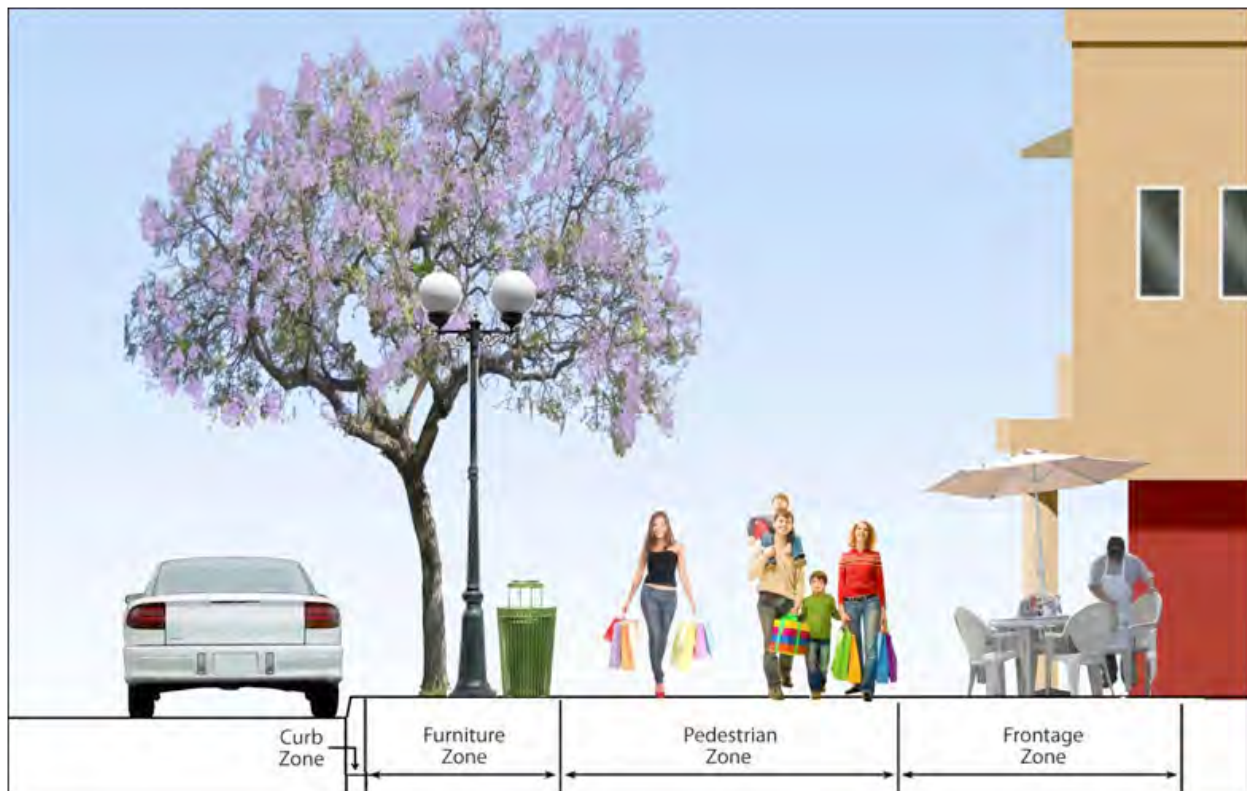
Figure 64: Sidewalks in a commercial district

RECOMMENDATION 25: INSTALL ADDITIONAL PEDESTRIAN CROSSINGS ACROSS I-90

I-90 is a critical transportation corridor for Box Elder. Currently, Ellsworth and Liberty pass provide great options for people to safely cross I-90. Implementing additional pedestrian travel options will make the community safer and more efficient.

Pedestrian crossings provide a safe passage for pedestrians, which reduces the risk of accidents and fatalities. There is also a huge convenience factor that goes into the installation of a pedestrian overpass. These crossings also provide a shared space for people to interact and connect with one another, which can strengthen community bonds and bring about a sense of belonging. Naturally it will also decrease traffic because more people will opt to walk or bike across.

Figure 65: Pedestrian overpass across a freeway

Figure 66: Cyclists safely cross a freeway

RECOMMENDATION 26: IMPLEMENT A CITY-WIDE TRAIL NETWORK

A trail system is a great way to keep the community active and contribute to a community's desirability to work and live. Box Elder has farflung neighborhoods and a bike-friendly trail system will begin to connect them together. The current parks comprehensive plan includes a trail network. This should be a priority for implementation, and the phases recommended in the plan make sense.

The trail system should include vistas of the existing landscape, vegetative plantings, and resting areas in important areas to maximize the experience for the user. The trail system is important because of the identity Box Elder is trying to create and make the community a household name instead of an extension of Rapid City. The trail system will enable residents to be more physically active and offer recreational opportunities to explore Box Elder.

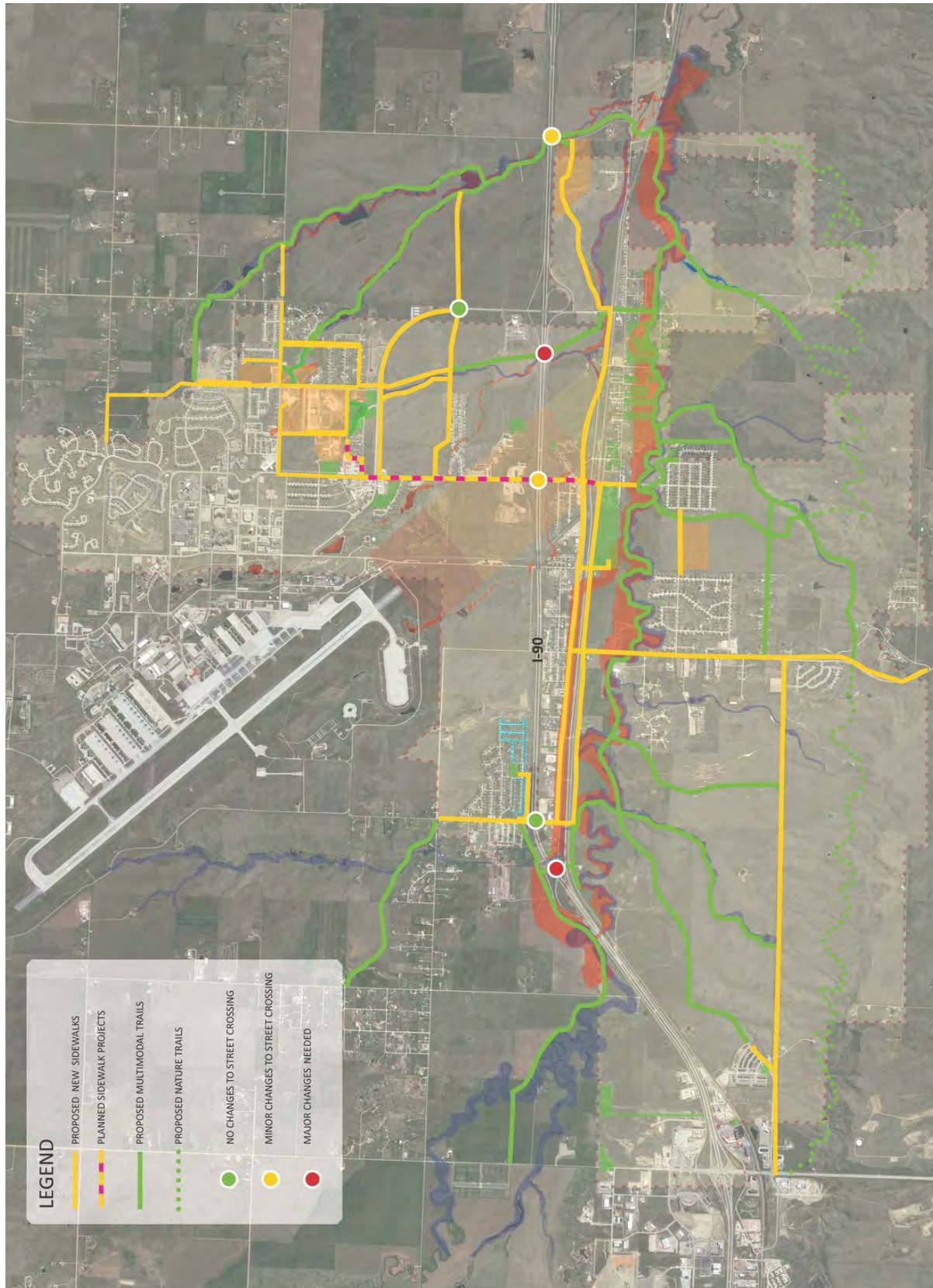*Figure 67: Box Elder's current parks and trails master plan*

LEGEND

PROPOSED NEW SIDEWALKS

PLANNED SIDEWALK PROJECTS

PROPOSED MULTIMODAL TRAILS

PROPOSED NATURE TRAILS

NO CHANGES TO STREET CROSSING

MINOR CHANGES TO STREET CROSSING

MAJOR CHANGES NEEDED

As part of the trail network, at least one primary route should be a multimodal path wide enough to accommodate both cyclists and pedestrians. A minimum width should be 10', with busier sections and intersections with other paths up to 20' wide. These width standards provide adequate room for faster cyclists to safely pass while traffic runs in both directions. The multimodal path will form a spine connecting the neighborhoods together with future developments, schools, and businesses, providing all residents and visitors opportunities for physically active lifestyles. In other locations, bike lanes should be painted alongside travel lanes on the streets, removing cyclists from sidewalks.

The path should also include waystations with benches, shade, and drinking fountains to break up long distances. Ideally these comfort stations would be placed every half-mile or mile, providing a break every 15-20 minutes for walking pedestrians.
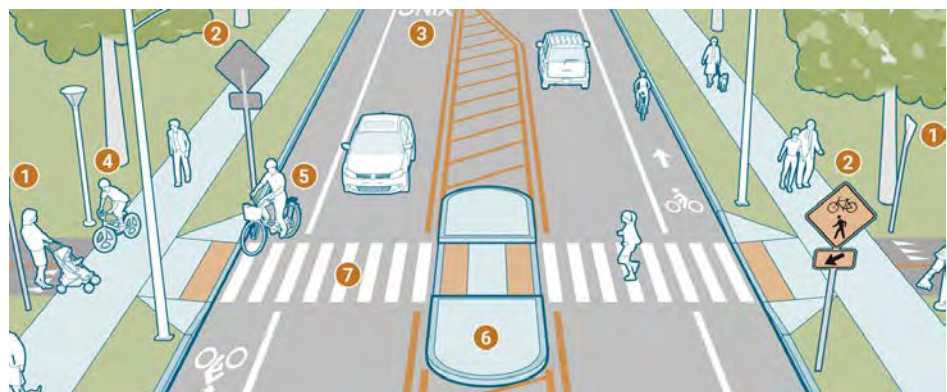

Figure 68: Trailhead for a multimodal path

Figure 69: Multimodal trail for cyclists and pedestrians

Figure 70: Bike lanes on urban streets

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RECOMMENDATION 27: INSTALL CROSSWALKS AT ALL INTERSECTIONS

Crosswalks offer many positive impacts on a community's safety and quality of living. They alert drivers to their surroundings and help direct pedestrians to cross the street at safe locations. Crosswalks can also contribute to a community's sense of place, as they can incorporate art to add interest to the street environment. In Box Elder most intersections lack crosswalks including entry intersections to residential neighborhoods. By identifying key locations to incorporate crosswalks, Box Elder will bring a better greater sense of life and increased safety to the community.

Figure 71: Box Elder's only intersection with a traffic light should include crosswalks and sidewalks

The intersections most in need of crosswalks include Liberty Boulevard at the traffic light, Highway 1416 at Radar Hill Road, Ellsworth Road at Liberty Boulevard, and Radar Hill Road at Creekside. Sending out a worker with a bucket of paint to install temporary crosswalks to test patterns, locations, and community reactions would be a good first step. More permanent crosswalks should be installed after the test period.

RECOMMENDATION 28: INSTALL AND COMPLETE SIDEWALKS IN SCHOOL ZONES

Schools are the heart of Box Elder and there are strong sidewalks in the nearby communities. Safety of the children is the number one priority in a community. Completing sidewalks and making sure they run through the school zones will provide safety for students and teachers. Students can ride their bikes and parents can walk their kids to school in a safe and efficient manner. This will bring more community engagement to the school areas because parents will be more likely to walk their kids to school or kids will ride their bikes and meet people.

Sidewalks can also encourage active transportation such as walking and cycling, which can promote physical activity and help to reduce traffic congestion around schools. Sidewalks can also make it easier for students with disabilities to access their schools. A well-designed sidewalk can ensure that students can navigate their way to and from school safely and independently. Installing and completing school zone sidewalks can help to build a stronger sense of community. Parents, teachers, and students can feel more connected to their neighborhoods when they have safe and accessible paths to their schools.

Figure 72: Well-marked crosswalk near a school

Figure 73: Colored sidewalks with signed pedestrian crossing zone

RECOMMENDATION 29: PLACE ADDITIONAL BUS STOPS

In Box Elder there were bus stop shelters placed throughout the community in residential districts including single and multi-family housing developments. However, there was a lack of consistency throughout the community. Most of the commercial and less-affluent residential districts were underserved. Sheltered bus stops provide comfort to students awaiting the morning pickup and become activity nodes during afternoon and evening hours.

These will also form the basis for eventual public transportation offerings connecting Box Elder with Rapid City and other regional communities.

Figure 74: A typical bus shelter with public art and seating

RECOMMENDATION 30: INSTALL BENCHES ON SIDEWALKS

Benches incentivize walkability and offer stopping points for the populus to rest and enjoy the aesthetics of a community's landscape. In Box Elder there is a great opportunity to implement benches along a trail system and in neighborhoods. More benches would benefit Box Elder as it would promote walkability and add to the aesthetics of the community.

Figure 75: Placing seating in parks is useful to promote use

The main idea is to add benches in strategic locations throughout all residential and commercial neighborhoods to make Box Elder a more comfortable, active environment to live and play. The idea is important because it sets a prec-

Figure 76: Benches in neighborhoods promote interpersonal interaction

edent for what Box Elder is striving to become with its growing population.

RECOMMENDATION 31: INCREASE PEDESTRIAN AND VEHICULAR LIGHTING

Box Elder has street lighting at various locations, particularly along Liberty Boulevard and Ellsworth Road. Road-oriented lighting helps make the community safe and drivable. However, there is a great opportunity for more lighting throughout the city including in mobile home districts and near parks. Lighting in parks has demonstrated to decrease crime and improve park use in the morning and evening hours.
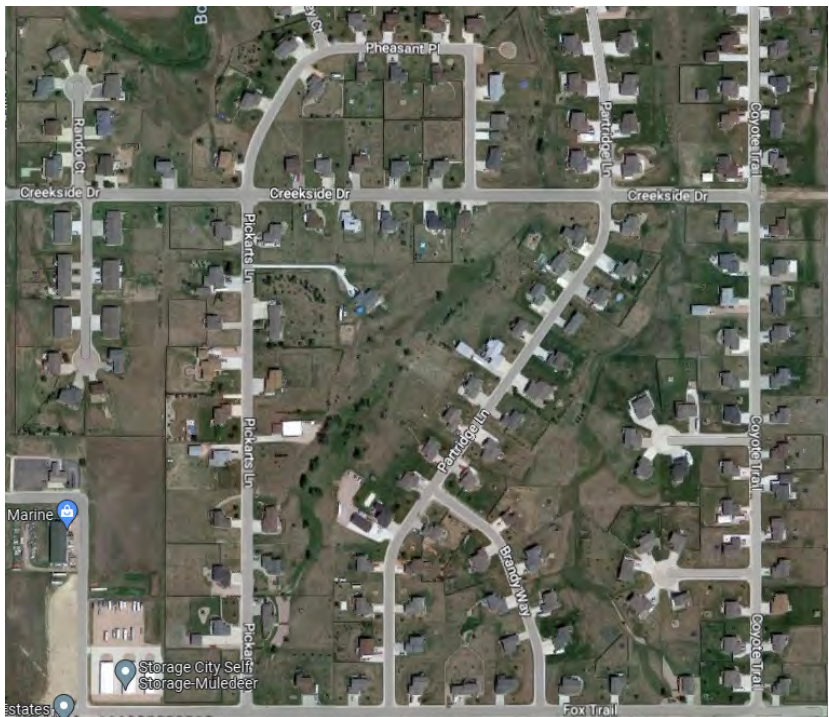
Lighting should be placed along sidewalks and roads to enhance nighttime use. It should also be implemented and maintained in all city parks to deter nefarious activity and help residents feel safer during evening hours.

Figure 77: Many residential neighborhoods lack adequate street lighting

Figure 78: Streetlighting enhances aesthetics and safety

Figure 79: The Creekside neighborhood is a good place to trial streetlighting

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RECOMMENDATION 32: DEVELOP COMPREHENSIVE PLANS FOR NEW NEIGHBORHOODS

Box Elder is consulting outside resources seeking to build an active, cohesive city to plan for the future of the rapidly growing community. Box Elder currently has a development of 3000 dwelling units planned to connect the southern portions of the town. There needs to be more city involvement in the development of new areas. This will ensure that new development plans encourage high livability and walkability standards. Box Elder has historically been developed in pieces which has created a dislocated city plan. The consequence of this can be seen in limited walkability and decreased community identity and connectedness.

Developing a city comprehensive plan for new developments will increase the connectivity between neighborhoods. It would improve the relations between residential and commercial zones. This would create opportunities for a multimodal pathway that connects the city via non-vehicular traffic . Social connection of the community will be improved by physically connecting the city. This would increase residents' interest and involvement in their city. A cohesive city comprehensive plan would lead to lower crime, and safer, interesting, accessible public spaces. It would also create aesthetically pleasing, safe, and affordable housing. Extending the current parks master plan from Tall Grass Landscape Architecture to include pedestrian and commercial greenways on unwelcoming walkways would assist in connecting the greenspaces with the community.

Figure 80: Residential neighborhoods are important to the community

RECOMMENDATION 33: INCREASE PUBLIC INTEREST IN COMMUNITY SPACES

Box Elder is currently working with and has received a parks master plan from Tallgrass Landscape Architecture firm. This master plan includes trails, tree plantings, water management, recreation locations, and shelter, among other things. The Box Elder community has minimal public spaces available. Increasing the public interest

Figure 81: Non-traditional playground for younger children

in and stewardship of these spaces will elevate community involvement and overall health of the community. Ways to ensure that public parks serve the demographics of the city would be proper playground equipment, open greenspaces, indoor and outdoor sport courts, and shelters. These elements would encourage public engagement with greenspace. Resources that improve aesthetics include shade trees, community art installments and murals, maintained gardens, and accessible playgrounds.

Figure 82: Expansive play opportunities for children of all ages

References

"Bioswales." National Association of City Transportation Officials, 5 Oct. 2016, https://nacto.org/publication/urban-street-design-guide/street-design-elements/stormwater-management/bioswales/.

Box Elder Strategic Transportation Plan FINAL11262014. https://www.boxelder.us/documents/view/box-elder-strategic-transportation-plan-final-12-01-2014/.

Brent C. Chamberlain a, et al. "A Route-Based Visibility Analysis for Landscape Management." Landscape and Urban Planning, Elsevier, 8 Jan. 2013, https://www.sciencedirect.com/science/article/pii/S016920461200326X.

"CPTED International." ICA Home Page, https://www.cpted.net/.

"Green Stormwater Infastructure." EPA, Environmental Protection Agency, https://www.epa.gov/water-research/stormwater-management-and-green-infrastructure-research.

"Issaquah-Pine Lake Road Improvements Project." Connect Sammamish, https://connect.sammamish.us/IPLR?tool=survey_tool.

"Project-Details." Oregon Department of Transportation : Project-Details : Projects : State of Oregon, https://www.oregon.gov/odot/projects/pages/project-details.aspx?project=19763.

"Research on Urban Street Trees." EPA, Environmental Protection Agency, https://www.epa.gov/water-research/urban-street-trees-and-green-infrastructure.

Soeharjono , Dewita. "What Is Walkability?" Planetizen, https://www.planetizen.com/definition/walkability.

South Dakota Department of Transportation - Home. https://dot.sd.gov/media/I90Exit63IMJR_Final_08252021_compiled.pdf.

"Traffic Calming 101." RSS, https://www.pps.org/article/livememtraffic.