BUFFALO SOLDIER TRAIL EXTENSION

State Route 92 to Moson Road

City of Sierra Vista, Cochise County, Arizona

SVMPO Project No. MPO-01

Draft Alternatives Analysis

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Submitted to:

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I. EXECUTIVE SUMMARY

The Sierra Vista Metropolitan Planning Organization (SVMPO), in conjunction with the City of Sierra Vista and Cochise County, have commissioned Dibble Engineering to prepare a Design Concept Report (DCR) to evaluate and provide recommendations for the extension of Buffalo Soldier Trail from State Route 92 (SR 92) to Moson Road. Buffalo Soldier Trail is a principal arterial which originates at the intersection of State Route 90/East Gate of Fort Huachuca (Hatfield Street) and terminates at State Route 92.

Midway between Ramsey Road in the south and State Route 90 in the north, there exists a need to provide an east-west arterial roadway to provide additional the additional connectivity the network needs. As early as 2003, the *Sierra Vista Small Area Transportation Study and as recently as 2014, the Vista 2030 Sierra Vista General Plan* presented solutions by calling for the extension of Buffalo Soldier Trail from State Route 92 to Moson Road. The goal of extending Buffalo Soldier Trail would be to provide a facility that can connect the rural areas to Sierra Vista and help to relieve and redistribute traffic within the transportation network.

Project Purpose and Need

- Reduce regional congestion
- Plan for future local growth and development
- Develop bypass route for State Routes 90 and 92 and reduce need to widen those roads
- Ensure future transportation corridor is compatible with existing and future land uses and environmental conditions
- Improve transportation system operations by distributing traffic onto parallel east-west roadway

Study Goals and Objectives

- Inform and seek public input into the project alternatives
- Maximize benefit to traveling public by reducing travel time and delays
- Determine the preferred roadway alignment from a regional framework perspective
- Enhance safety
- Minimize adverse impacts to the environment
- Identify new right-of-way requirements
- Enhance traffic operations
- Develop consensus-driven improvement alternatives
- Minimize adverse impacts to residents and businesses
- To create multi-modal corridor
- Develop a realistic phased implementation plan
- Develop an access management plan to maintain the operation efficiency of the roadway corridor

Alternative Analysis Recommendations

An alternatives analysis evaluation was conducted that used the following criteria to compare the 6 feasible build alternatives and the no-build alternative.

The public supported the project by a wide margin. In the evaluation criteria scoring summary table below, three alternatives –Alternative C, Alternative D, and Alternative E – stood out from the others as favorable corridors for the new alignment of Buffalo Soldier Trail. These three alternatives have the least impact to the existing homes in the area. Of the 3 alternatives, Alternative D has the least impacts to the natural, built and socio-economic environment and is therefore proposed as the preferred alternative. In summary, Alternative D has the following advantages:

- Most public support
- Minimal improvements required on Moson road
- Minimal disruption and reconstruction to mitigate access impacts to land parcels
- Fits the intent of the Tribute Specific Plan
- Creates one of the shortest paths for most drivers to take from the parcels south of BST and east of Moson Road
- Has minimal utility and well impacts compared to the other build alternatives
- Has the least noise impact to existing homes
- Alignment has the flexibility to avoid or minimize impacts to the floodplains, properties, environment, and ranching operations.
- Improves safety by creating a second all-weather crossing of Garden Canyon Wash which can be used when Moson Road is inundated with flood waters

Criteria	Public Support	Moson Rd Impacts	Access Impacts	Future Development Compatability	Traffic Network Continuity	Floodplain Impacts	Building/Property Impacts	Environmental Impacts	Utility/Well Impacts	Costs	Noise	Ranching	Total
Importance	10	10	10	10	10	10	10	10	10	10	10	10	120
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Total
Alternative													
No Build	**0**	**5**	**6**	**1**	**0**	**10**	**10**	**10**	**10**	**10**	**5**	**10**	**77**
A- Garza Road	**3**	**2**	**8**	**7**	**6**	**9**	**4**	**7**	**6**	**7**	**5**	**8**	**72**
B- Garden Creek	**6**	**1**	**5**	**9**	**7**	**8**	**5**	**7**	**7**	**7**	**6**	**8**	**76**
C- Lower Ranch	**2**	**7**	**8**	**9**	**8**	**9**	**8**	**6**	**6**	**6**	**7**	**8**	**84**
D- Durango	**8**	**7**	**10**	**9**	**9**	**6**	**7**	**6**	**7**	**6**	**8**	**6**	**89**
E- Connor	**1**	**7**	**10**	**9**	**10**	**7**	**8**	**6**	**4**	**5**	**5**	**7**	**79**
F- Valley	**0**	**7**	**4**	**9**	**10**	**0**	**0**	**4**	**3**	**5**	**3**	**8**	**53**

1 INTRODUCTION

1.1 INTRODUCTION

The Sierra Vista Metropolitan Planning Organization (SVMPO), in conjunction with the City of Sierra Vista and Cochise County, have commissioned Dibble Engineering to prepare a Design Concept Report (DCR) to evaluate and provide recommendations for the extension of Buffalo Soldier Trail from State Route 92 (SR 92) to Moson Road. Buffalo Soldier Trail is a principal arterial which originates at the intersection of State Route 90/East Gate of Fort Huachuca (Hatfield Street) and terminates at State Route 92. This alignment and partial access control serves as a perimeter parkway allowing the public to travel quickly from the northwest to the southern portions of the City while providing access to the interior of Sierra Vista and Fort Huachuca. **Figure 2.1** provides the location of the Study Area within southeastern Arizona and **Figure 2.2** provides a project vicinity map.

The area southeast of Sierra Vista has seen continued growth over the last decade and is projected to experience additional growth in the near future. Within this area, the existing transportation network has been taxed by additional traffic volumes and limited connectivity which would work to relieve the primary regional roadways of State Route 90 and 92. Moson Road and Ramsey Road provide relief and connection for the traveling public between the urban area of Sierra Vista and the rural areas around Hereford and Palominas. Midway between Ramsey Road in the south and State Route 90 in the north, there exists a need to provide an east-west arterial roadway to provide additional the additional connectivity the network needs. As early as 2003, the *Sierra Vista Small Area Transportation Study and as recently as 2014, the Vista 2030 Sierra Vista General Plan* presented solutions by calling for the extension of Buffalo Soldier Trail from State Route 92 to Moson Road. The goal of extending Buffalo Soldier Trail would be to provide a facility that can connect the rural areas to Sierra Vista and help to relieve and redistribute traffic within the transportation network.

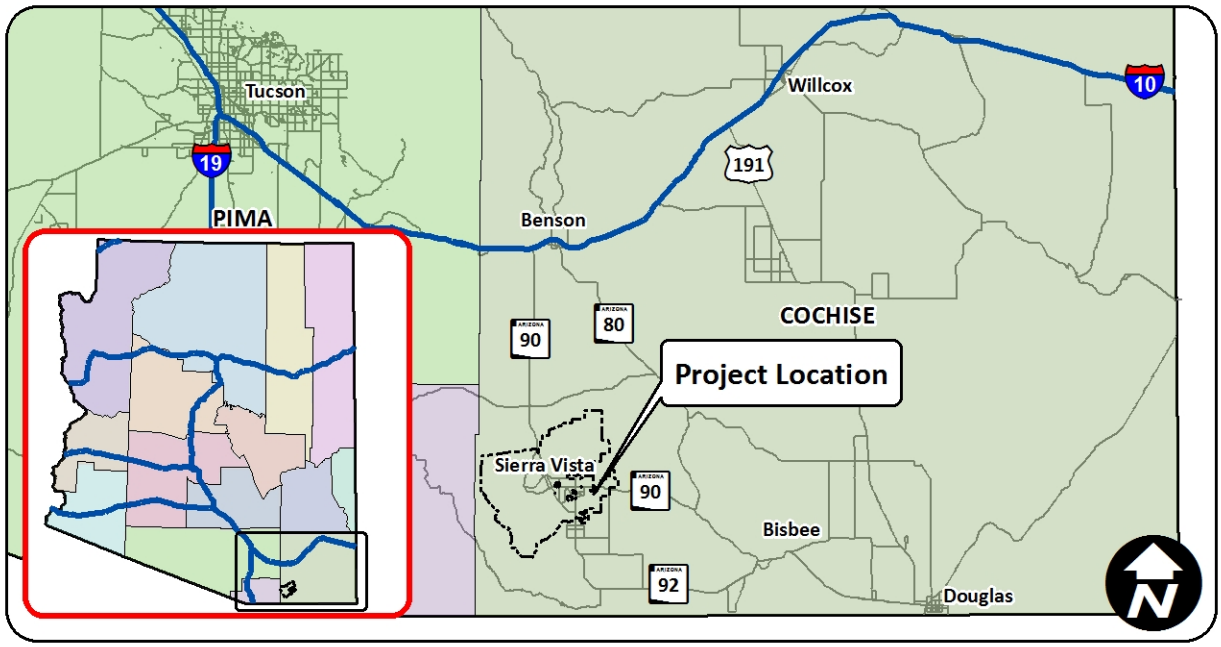

Figure 2.1 – Project Location Map

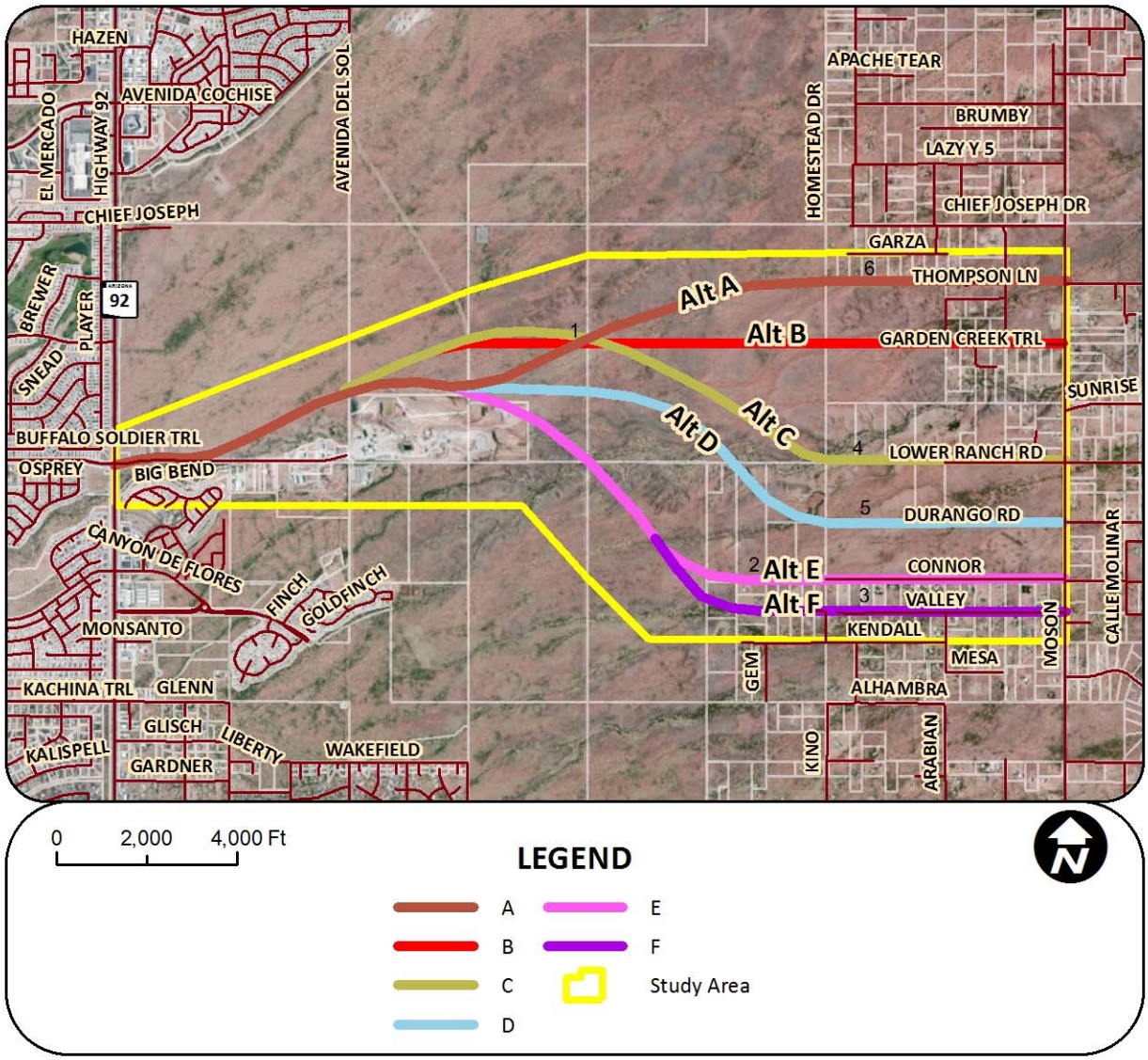

Figure 1.3 – Study Area

1.1.3 Project Purpose and Need

Project Purpose and Need

- Reduce regional congestion
- Plan for future local growth and development
- Develop bypass route for State Routes 90 and 92 and reduce need to widen those roads
- Ensure future transportation corridor is compatible with existing and future land uses and environmental conditions
- Improve transportation system operations by distributing traffic onto parallel east-west roadway

1.1.4 Study Goals and Objectives

- Inform and seek public input into the project alternatives
- Maximize benefit to traveling public by reducing travel time and delays
- Determine the preferred roadway alignment from a regional framework perspective
- Enhance safety
- Minimize adverse impacts to the environment
- Identify new right-of-way requirements
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5 ALTERNATIVES ANALYSIS

5.1 INTRODUCTION

Candidate alignments were developed according to the design criteria (include reference to the design criteria) and project goals and evaluated accordingly. Based on feedback given by attendees of the public meeting held on January 20, 2015, slight adjustments were made to a number of the candidate alignments. The alterations to the alignments are highlighted in **Figure 5.1.** Alternative A had an alignment change based on the comments from representatives from Castle & Cooke Arizona, Inc., the landowner and developer of the Tribute Master Planned Community. The previous alternative could better meet the intent of the Tribute Specific Plan if the alignment followed a line in the Specific Plan that demarks the separation between the Low Density Residential and Public Facilities land use areas. Several public comments also eluded to Alternative A needing a more direct alignment to reach Moson Road. Alternative B bisected the Public Facilities land use area and Castle & Cooke suggested an alignment change to conform better to the Tribute Specific Plan.

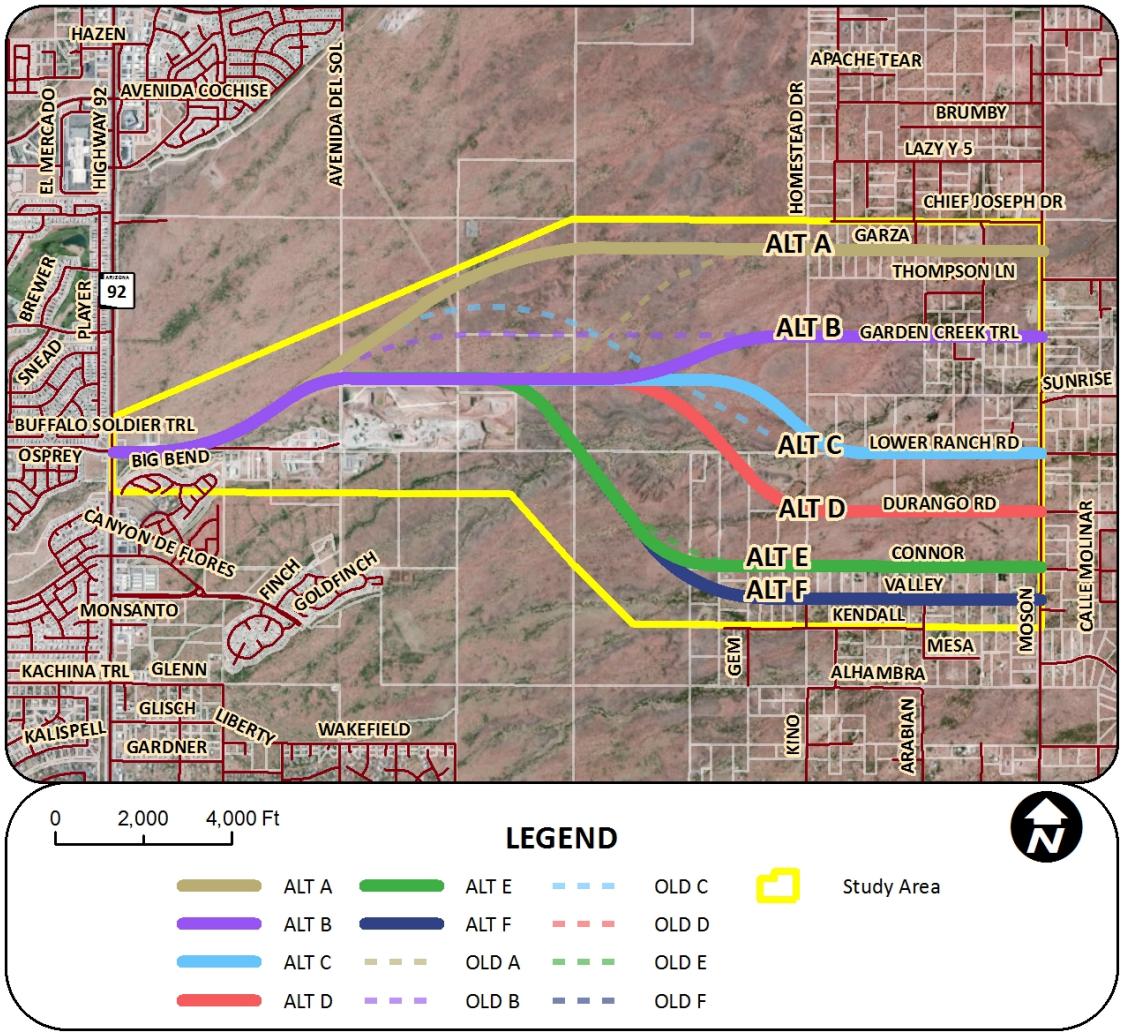

Figure 5.1 - Alignment Adjustments

5.2 ALIGNMENT ALTERNATIVES CONSIDERED.

Seven alternatives were analyzed, including six candidate alignments for construction and one no-build alternative. Each build alternative intersects the Tombstone Aqueduct, an historic and vital water transmission line that crosses the study area diagonally east of the sand and gravel pit toward Tombstone, Arizona. The final design of these alternatives should provide careful consideration to maintaining the existing Aqueduct. For planning purposes, a minimum 125-foot-wide corridor per the City of Sierra Vista Standards was used for each build alternative, with additional right-of-way considered as necessary. From the intersection of Buffalo Solider Trail (BST) and SR92 on the west end of the study area, each candidate alignment follows the same path north of Garden Canyon Wash up to the northwest corner of the Cemex mine site, where the alignments separate from each other approaching their intersections with Moson Road on the east end of the study area. **Figure 5.1** provides a graphical representation of the study area and alignment alternatives.

5.2.1 Alternative A

Alternative A follows the northernmost path of any alternative alignment from the northwest corner of the Cemex mine site. Alternative A continues northwesterly through its intersection with planned future alignment of Avenida Cochise about 2100 feet north of the Cemex mine site. East of the Avenida Cochise intersection, Alternative A includes a horizontal curve to align with Garza Trail about 10,000 feet west of Moson Road. Alternative A then follows the Garza Trail alignment to where it intersects Moson Road. There is a 4,500-foot offset between the Buffalo Soldier Trail alignment and the Garza Trail alignment.

It was observed in the field that the intersection of Moson Road and Garza Trail is likely to require reconstruction of Moson Road to improve sight distance conditions. There is one minor wash crossing about 3,500 feet west of Moson Road that may require culvert improvements to maintain historical drainage patterns in the area. Alternative A maintains the land use designated in the Tribute Specific Plan, possibly requiring minor adjustments to accommodate the altered alignment of Buffalo Soldier Trail. A number of existing residential driveways are impacted by Alternative A on the east end of the study area. All but one residential property on the north side of Garza Trail have access to Chief Joseph Drive, but the eleven existing residential properties on the south side of Garza Trail do not have an alternative ingress/egress point. The impacts to residential access would require a 3,800-foot frontage road on the south side of Garza Trail and frontage access for about 400 feet to serve the residence impacted on the north side. Proposed right-of-way for Alternative A is in close proximity to four existing residences. Offset to the roadway from these structures should be examined as a part of final design. Other property impacts include four bisected undeveloped parcels with no anticipated impacts to improvements related to ranching activities.

5.2.2 Alternative B

From the point of separation at the northwest corner of the Cemex mine site, Alternative B parallels the northern boundary of the mine site until about 1800 feet east of the western boundary of the mine, where a reverse curve is utilized to shift northward and align with Garden Creek Trail. Alternative B remains on the Garden Creek Trail alignment until its intersection with Moson Road. There is a 2,600-foot offset to the north between the Buffalo Soldier Trail alignment and the Garden Creek Trail alignment.

It was observed in the field that the intersection of Moson Road and Garden Creek Trail is likely to require reconstruction of Moson Road to improve sight distance conditions. There are minor wash crossings in Alternative B at 5,000, and 3,000 feet west of Moson Road, possibly requiring culvert improvements to maintain historical drainage patterns. Alternative B maintains the land use designated in the Tribute Specific Plan with no changes anticipated. The driveway access of ten existing homes would be impacted by the construction of Alternative B, requiring a 300-foot frontage road on the north side of Garden Creek Trail and a frontage road on the south side measuring 1,200 feet in length to service the existing parcels. Proposed right-of-way for Alternative B is in close proximity to three existing residences. Offset to the roadway from these structures should be examined as a part of final design. Other property impacts include five bisected undeveloped parcels with no anticipated impacts to improvements related to ranching activities.

5.2.3 Alternative C

Alternative C follows the same path as Alternative B until the point 1,800 feet east of the Cemex sand and gravel pit site where Alternative B curves northward. From there, Alternative C continues east an additional 2,500 feet, where a reverse curve shifts the alignment south and across Garden Canyon Wash to the Lower Ranch Road alignment, where Alternative C intersects Moson Road. There is no offset between the Buffalo Soldier Trail alignment and the Lower Ranch Road alignment, but the reverse curves required to avoid the mine result in about 3,200 feet of horizontal offset for Alternative C.

Field reconnaissance indicated sight distance requirements were met at the intersection of Lower Ranch Road and Moson Road, thus requiring only widening improvements for Moson Road. There is one major floodplain crossing at Garden Canyon Wash that will likely require the construction of a bridge. Alternative C maintains the land use designated in the Tribute Specific Plan with no changes anticipated. The driveway access of four existing homes will be impacted by Alternative C, all on the north side of Lower Ranch Road. One of these homes has direct access to Lower Ranch Road, and the other three homes have access to Lower Ranch Road via Parrot Lane. Parrot Lane is 1/8-mile west of Moson Road, and the design guidelines permit access points only at 1/4-mile intervals. Providing these four homes with ingress/egress points on the Bakarich Trail alignment would require improvements to Bakarich Trail in this area. Alternative C includes four bisected undeveloped parcels with no anticipated impacts to improvements related to ranching activities.

5.2.4 Alternative D

Alternative D follows the same path as Alternative B until the point 1800 feet east of the Cemex mine site where Alternative B curves northward. At that point where Alternative B curves northward, Alternative D utilizes a reverse curve to shift southward across Garden Canyon Wash and to the Durango Road alignment, where Alternative D intersects Moson Road. There is a total of about 4,500 feet of horizontal offsetting in Alternative D.

Field reconnaissance indicated sight distance requirements were met at the intersection of Durango Road and Moson Road, thus requiring only widening improvements for Moson Road. There are minor wash

crossings in Alternative D at 5,500, and 2,300 feet west of Moson Road, possibly requiring culvert improvements to maintain historical drainage patterns. There is one major floodplain impacted at the Garden Canyon Wash crossing that will likely require the construction of a bridge. Alternative D maintains the land use designated in the Tribute Specific Plan with no anticipated changes. There are no residential access impacts for Alternative D. Alternative D includes six bisected undeveloped parcels. There are two potential ranching conflicts in the vicinity of Alternative D near the point where it aligns with Durango Road. It is anticipated that these conflicts can be avoided by realignment if necessary.

5.2.5 Alternative E

Alternative E parallels the northern boundary of the Cemex mine site for about 3100 feet before curving to a southeasterly alignment. For about 3,200 feet, Alternative E proceeds southeastward across Garden Canyon Wash and curves eastward to align with Connor Road, where it intersects Moson Road. There is a total of about 5,800 feet of horizontal offsetting in Alternative E.

Field reconnaissance indicated sight distance requirements were met at the intersection of Connor Road and Moson Road, thus requiring only widening improvements for Moson Road. There is one minor wash crossing in Alternative E about 9,000 feet west of Moson Road, possibly requiring culvert improvements to maintain historical drainage patterns. There is one major floodplain impacted at the Garden Canyon Wash crossing that will likely require the construction of a bridge. Alternative E maintains the land use designated in the Tribute Specific Plan with no anticipated changes. There are no residential access impacts for Alternative D. Four undeveloped parcels are bisected by Alternative E with one potential ranching conflict that is avoidable by realignment if necessary.

5.2.6 Alternative F

Alternative F follows the path of Alternative E, paralleling the north side of the mine and curving to the southeast at the west end of the mine site. Where Alternative E curves eastward to align with Connor Road, Alternative F proceeds southwest an additional 350 feet where it curves eastward to align with Valley Drive. Alternative F then maintains the Valley Drive alignment to its intersection with Moson Road. There is a total of about 6,500 feet of horizontal offsetting in Alternative F.

Field reconnaissance indicated sight distance requirements were met at the intersection of Valley Drive and Moson Road, thus requiring only widening improvements for Moson Road. There is one minor wash crossing in Alternative F about 9,000 feet west of Moson Road, possibly requiring culvert improvements to maintain historical drainage patterns. There are two major floodplain impacts in Alternative F, one at the Garden Canyon Wash crossing, where a bridge would likely be required, and one along the Valley Drive alignment. Alternative F maintains the land use designated in the Tribute Specific Plan with no anticipated changes. Three existing residences would be displaced as a result of the construction of Alternative F, and one additional home would be close to the projected right-of-way limits, such that offset to the structure might be a concern. Access impacts for residences include all nineteen residences on the north side of Valley Drive that would require about 7,000 feet of frontage access to Alternative F, as well as eight residences on the south side that would require about 2,600 feet of frontage access or shifting the driveway access onto either a new Connor Road or Kendall Lane Four additional residential parcels would incur access restrictions to the Valley Drive alignment as a result of the improvements

associated with Alternative F, but these parcels have alternate means of ingress/egress at Kendall Lane. Alternative F bisects five undeveloped parcels with no anticipated impacts to improvements related to ranching activities.

5.2.7 No-Build Alternative

The No-Build Alternative was also analyzed and evaluated according the criteria defined by the study.

5.3 Alternatives Considered but Removed from Further Evaluation

Two Alternative alignments were considered but removed from the evaluation due to specific concerns noted below.

5.3.1 Chief Joseph Road

An alignment was considered similar to the six that were evaluated except that the alignment connected to Chief Joseph Road, the northernmost road in the study area. Two primary reasons were developed through the evaluation of the existing project features to remove this alternative. First, Chief Joseph Road has large power transmission towers on the south side of the existing right-of-way. The power lines would be excessively costly to relocate and the impacts to numerous homes would be significant if the roadway was constructed to the north or south of the power lines. Second, the alignment was considered to be too far north for the majority of drivers expected to use the BST extension based on the criteria in Section 5.4.5. Based on these considerations, this alternative was determined to be infeasible and dropped from further consideration.

5.3.2 South of the Cemex Plant

Most of the alternatives were aligned north of the sand and gravel operation. A southerly alignment was also considered which used the existing Buffalo Soldier Trail east of SR 92 threaded a path between the Cemex Sand and Gravel Pit and the school district bus parking area. The existing industrial land uses made such an alignment difficult. An old mine site to the south created a deep hole that needed to be avoided. In addition, Stream K wound through the same area and is located in the key open land area between the Cemex mine site and the Sierra Vista Unified School District bus site. The impacts to Stream K and the industrial sites, along with the potential for hazardous materials, provided justification to remove this alignment from further consideration.

5.4 Evaluation Criteria

A Decision Matrix was developed to aid in determining which alternative best fit the needs of SVMPO and the community. The decision matrix is typically used to select the optimum alternative based on criteria developed from agency and public input. Each alternative is ranked based on objective criteria to the extent possible. Numerical rankings from 0 to 10 were given based on how the alternative supported the criteria. The following is a narrative of each criteria and the evaluation parameters used.

5.4.1 Public Support

A Public Meeting was held on Tuesday, January 20, 2015, at the Golf Course Country Club. The public was introduced to the project and the alternatives were depicted on three maps. The public asked questions and had the opportunity to signify if one or any alignment was preferable to them. Sixty two written comments were received. The results of the alignment selection is presented on **Table 5.1**. The additional comments are presented in **Table 5.2** with the number of times that comment was made.

Based on the number of positive (for the alternative) minus the number of negative (against the alternative), a value from 0-10 was given. Alternatives with more negative than positive preferences was given a "0". An alternative with the most positive preferences with zero negative preferences would have been assigned a "10". All alternatives were prorated between 0-10 based on the representative net preference versus the greatest positive preference. **Table 5.1** presents the relative comment value used in the decision matrix.

Table 5.1 - Relative Comment Value

Criteria	Positive	Negative	Net	Rating (1-10)
Alternative				
No Build	**8**	**56**	**-48**	**0**
A- Garza Road	**10**	**5**	**5**	**3**
B- Garden Creek	**18**	**8**	**10**	**6**
C- Lower Ranch	**8**	**6**	**2**	**2**
D- Durango	**19**	**4**	**15**	**8**
E- Connor	**6**	**6**	**0**	**1**
F- Valley	**3**	**16**	**-13**	**0**

Table 5.2 - Additional Comments

Comment	Frequency
Southern area is heavily populated and it will affect too many residents/homes	24
Improve Moson Road instead	12
Noise pollution/people want to have solitude	9
Don't connect BST to Moson (opposed to project)	7
Too expensive/money should be spent elsewhere	5
Bad sight distance	5
Include bike lanes/multiuse path	5
Don't cross the wash	4
Connect BST to Moson (support project)	4
Go straight through	3
Traffic signal will be needed	3
Least impact to environment	2
Go straight through (no curves)	2
Impacts horses, cattle, and wild life	1
Extention will cause more problems	1
Tombstome Aquaduct impacted	1
Build 4-lanes without an interim 2-lane	1

5.4.2 Moson Road Impacts

Moson Road is a two-lane roadway running north-south. It has several locations where sight distance is questionable. A field review of each of the alternative intersection with Moson Road was made. If an intersection location had low sight distance, the alternative would require reconstruction work on Moson Road to correct the sight distance to meet current standards. This condition (*) received a "2" rating because the reconstruction work would significantly impact the travelling public during construction. If the sight distance was low and the intersection had a known accident history, then it was expected that the issue would be more extensive and the impacts to the travelling public would be greater. This condition (**) received a rating of "1". The No-Build alternative would not correct any existing sight distance issues so it was given a rating of "5". Any alternative that could be widened or reconstructed without any profile corrections was given a rating of "7" since some impacts during construction would be present.

Table 5.3 presents the relative ratings of each alternative.

Table 5.3 - Moson Road Impacts

Criteria	Reconstruction for Sight Distance	Widening Only	No Improvements	Rating (1-10)
Rating	1-2	7	5	
Alternative				
No Build			**X**	**5**
A- Garza Road	*			**2**
B- Garden Creek	**			**1**
C- Lower Ranch		**X**		**7**
D- Durango		**X**		**7**
E- Connor		**X**		**7**
F- Valley		**X**		**7**

5.4.3 Access Impacts

The BST roadway will have a level of access management that would limit the number and location of connecting roadways and driveways. If an alternative is aligned on an existing roadway which has existing crossroads that are not at the required 1/4-mile interval, then additional connecting roadways may be required to redirect traffic to the required locations. If an alternative is aligned on an existing roadway that has driveways that are not located at the allowable locations, then the driveway must be reconfigured on the subject parcel or a parallel frontage road must be developed to redirect driveways to the required locations.

The number of existing driveways and crossroads in conflict with current standards were measured for each of the alternatives. The rating was calculated by finding the ratio of conflicting driveways and crossroads for an individual alternative to the total number of conflicting driveways and crossroads for all alternatives and multiplying that ratio by 10. The "No Build" alternative would not have any access impacts, but it would also not address any access challenges and was assigned a value of 6.The results are presented in **Table 5.4**.

Table 5.4 - Access Impacts

Criteria	No. of Driveways	No. of Crossroads not at 1/4 mile	Moson Road Dwys	Rating (1-10)
Alternative				
No Build				**6**
A- Garza Road	**12**	**0**	**0**	**8**
B- Garden Creek	**10**	**3**	**4**	**5**
C- Lower Ranch	**4**	**1**	**1**	**8**
D- Durango	**0**	**0**	**0**	**10**
E- Connor	**0**	**0**	**0**	**10**
F- Valley	**31**	**1**	**0**	**4**

5.4.4 Future Development Compatibility

The Tribute Specific Plan has been approved by the Sierra Vista City Council. Alternatives that require minor changes that do not affect the intent of the approved Specific Plan would not require Council approval. Any alternative that does change the intent of the Specific Plan would require Council approval. Changes to the intent for this report are defined as a redefinition in size of the land-use areas shown in the specific plan. For example, an alternative that is aligned between two or more land-use areas without altering those land use areas is expected to be suitable. An alignment alternative that bisects a land-use area would result in a significant loss of area to the bisected land-use area and therefore would require Council approval.

Alternatives with no changes to the Tribute Specific Plan were given a rating of 9 rather than 10 due to the need to prove no impact. Alternatives that have minor impacts to the Tribute Specific Plan due to the need to go to a higher level of justification and assurance of no impact were given a rating of 7. The No-Build alternative failed to meet the intent of the plan because it makes the proposed Buffalo Soldier Trail a dead-end roadway with no easterly connection. The results are presented in **Table 5.5**.

Table 5.5 - Future Development Compatibility

Criteria	No Changes to Specific Plan	Meets Intent but requires small change	Fails meet intent	Rating (1-10)
	9	7	1	
Alternative				
No Build			**X**	**1**
A- Garza Road		**X**		**7**
B- Garden Creek	**X**			**9**
C- Lower Ranch	**X**			**9**
D- Durango	**X**			**9**
E- Connor	**X**			**9**
F- Valley	**X**			**9**

5.4.5 Traffic Network Compatibility

One of the purposes of the Buffalo Soldier Trail Extension project is to reduce the amount of future traffic utilizing State Routes 90 and 92. ADOT modeled the alternatives to determine the amount of traffic that is diverted from SR 90 and SR 92 onto BST as a result of the completion of each alternative. Ratings for this criteria increase with increasing volume of diverted traffic. Ratings were based on the ratio of traffic on each alternative compared to the highest volume alternative averaged with the ratio of diversion of traffic from SR 92 for each alternative compared to the highest diversion alternative. Since the model predicted the same amount of diversion from SR 90, these were not included in the scoring. The findings are presented in **Table 5.6**.

Table 5.6 - Traffic Network Compatibility

Criteria	Traffic on BST	Diversion from SR 90 (%)	Diversion from SR 92 (%)	Rating (1-10)
	ADT	%	%	
Alternative				
No Build	**0**			**0**
A- Garza Road	**2994**	**-10.6**	**-3.0**	**6**
B- Garden Creek	**3184**	**-10.6**	**-3.6**	**7**
C- Lower Ranch	**3543**	**-10.6**	**-4.7**	**8**
D- Durango	**3723**	**-10.6**	**-5.4**	**9**
E- Connor	**3903**	**-10.6**	**-6.0**	**10**
F- Valley	**3993**	**-10.6**	**-6.5**	**10**

5.4.6 Floodplain and Drainage Impacts

The designated floodplains were provided by the SVMPO. For each alternative, a 132-foot wide right-of-way was superimposed over the floodplain limits on the GIS system. The area of impacts was provided by the GIS system. In addition, minor drainages that are not defined floodplains were identified and tabulated. To determine the rating, each alternative started with a rating of 10. The floodplain impact of each alternative was calculated by dividing floodplain area impacted by the largest floodplain area impacted, 462,000 s.f. That number was multiplied by ten to get the number on a scale from 1 to 10 and then subtracted from base score of 10. This bases the score on the larger the impact, the less points assigned. From the new score, thee number of minor drainages were subtracted. The final calculated value was rounded to the nearest whole number. The results are presented in **Table 5.7**.

Table 5.7 - Floodplain and Drainage Impacts

Criteria	Floodplain Impacts	Minor Drainages needing culverts	Rating (1-10)
	Area	No.	
	(s.f.)		
Alternative			
No Build	0	0	**10**
A- Garza Road	0	1	**9**
B- Garden Creek	0	2	**8**
C- Lower Ranch	66,472	0	**9**
D- Durango	101,179	2	**6**
E- Connor	106,852	1	**7**
F- Valley	462,000	1	**0**

5.4.7 Building and Property Impacts

For each alternative, the number of existing buildings displaced were counted. In addition, the number of currently existing homes that would be near the right-of-way line were also counted. This critical offset distance was set at 20 feet and was measured in Cadd software. Bisected parcels were considered to be an impact and were counted for each alternative. Each alternative started with a value of 10. Each home potentially displaced was multiplied by 3 and then subtracted. Each home that would be within 20 feet of the right-of-way line to the right-of-way line was subtracted as well. Finally, each parcel bisected was given a value of 0.5 and was subtracted. A minimum rating of zero was imposed so that no alternative could achieve a negative rating. The results are presented on **Table 5.8**.

Table 5.8 - Building and Property Impacts

Criteria	Homes Displaced	Homes close to R/W	Parcel Bisected	Rating (1-10)
	No.	No.	No.	
Value	3	1	0.5	
Alternative				
No Build	**0**	**0**	**0**	**10**
A- Garza Road	**0**	**4**	**4**	**4**
B- Garden Creek	**0**	**3**	**5**	**5**
C- Lower Ranch	**0**	**0**	**4**	**8**
D- Durango	**0**	**0**	**6**	**7**
E- Connor	**0**	**0**	**4**	**8**
F- Valley	**3**	**1**	**5**	**0**

5.4.8 Utility and Well Impacts

For each alternative, the number of power distribution poles impacted and wells displaced were counted. To develop a rating, each alternative started with a rating of 10. Each well displaced was subtracted. The power distribution impacts were calculated by finding the ratio of each alternative's number of impacted distribution poles divided by the highest number of distribution poles affected by any individual alternative. This value was multiplied by three and subtracted from the rating. The potential impact to the power transmission poles was given a value of 0-2 and subtracted. Most power transmission poles can be avoided except for a cluster of poles near Alternatives E and F. If the alternative impacted the Tombstone Aqueduct, then it was given a value of one and subtracted. For impacts to the communication lines, a relative value of 0-2 was given and subtracted. The resultant number was rounded to the nearest whole number. The results are presented in **Table 5.9**.

Table 5.9 - Utility and Well Impacts

Criteria	Wells	Power Distribution	Power Transmission	Tombstone Aqueduct	Communications	Rating (1-10)
	No.	No. Poles				
	0-2	0-3	0-2	1	0-2	
Alternative						
No Build	**0**	**0**	**N**	**N**	**N**	**10**
A- Garza Road	**0**	**8**	**N**	**Y**	**Y**	**6**
B- Garden Creek	**0**	**1**	**N**	**Y**	**Y**	**7**
C- Lower Ranch	**0**	**7**	**N**	**Y**	**Y**	**6**
D- Durango	**0**	**0**	**N**	**Y**	**Y**	**7**
E- Connor	**0**	**26**	**Y**	**Y**	**N**	**4**
F- Valley	**2**	**3**	**Y**	**Y**	**Y**	**3**

5.4.9 Costs

Relative costs were prepared for each alternative. Since costs are based on the impacts developed in the other criteria, the rating was limited between five and ten. The higher costs would be five, the lower cost a 10. Each build alternative was compared to a $17.5M base value. The results are presented in **Table 5.10**.

Table 5.10 – Costs

Criteria	Costs	Length (lane miles)	Bridge Cost Included	Rating
	$M			
				5-10
Alternative				
No Build	$ -			10
A- Garza Road	$ 13.4	16.880		7
B- Garden Creek	$ 13.3	16.390		7
C- Lower Ranch	$ 15.1	16.575	X	6
D- Durango	$ 16.2	16.992	X	6
E- Connor	$ 17.1	17.564	X	5
F- Valley	$ 17.3	17.776	X	5

5.4.10 Noise

Noise impacts were rated based on the relative number of homes within 1,000 feet on each side of the alternative centerline. Since each alternative impacted the same number of homes within the western two miles, these homes were not used in the rating comparison but the maximum value was lowered to 8 to account for the noise impacts in the western two miles. The No-Build alternative would have more noise impacts to a larger number of homes along State Route 90 and 92 and therefore was given a rating of 5. The build alternatives were compared by the number of homes in the eastern two miles that are within 1,000 feet each side of the alternative. The results are presented in **Table 5.11**.

Table 5.11 - Noise Impacts

Criteria	No. Homes Section 19	No. Homes in Sections 15, 21, 22		Rating
	within	within		
	1000'	1000'		5-10
Alternative				
No Build	**0**			**5**
A- Garza Road	**150**	**30**		**5**
B- Garden Creek	**150**	**20**		**6**
C- Lower Ranch	**150**	**10**		**7**
D- Durango	**150**	**0**		**8**
E- Connor	**150**	**30**		**5**
F- Valley	**150**	**55**		**3**

5.4.11 Ranching Impacts

The Ranch lands are also impacted by each build alternative. The bisecting of these lands is incorporated in Section 5.4.7. The Arizona State Land Department considers built improvements such as wells, tanks, corrals, and stock tanks as infrastructure that requires replacement or relocation if they are impacted by the roadway improvements. Therefore, the ranching related infrastructure was identified for each alternative. The results are presented in **Table 5.12**.

Table 5.12 - Ranching Impacts

Criteria	Direct Impact	Potential Impact	Pasture Impact	Rating (1-10)
Value	4	1	2	
Alternative				
No Build	0	0	N	**10**
A- Garza Road	0	0	Y	**8**
B- Garden Creek	0	0	Y	**8**
C- Lower Ranch	0	0	Y	**8**
D- Durango	0	2	Y	**6**
E- Connor	0	1	Y	**7**
F- Valley	0	0	Y	**8**

5.4.12 Environmental Issues

The environmental issues were addressed in Chapter 2 – Existing Features Analysis. Based on the key environmental issues present on this project, three environmental issues were considered as part of this criteria; 1) Section 404 of the Clean Water Act, 2) Cultural Resources, and 3) Biological Resources. Each of the issues can be mitigated, but the cost of the mitigation is what is being evaluated. For each alternative, the number of jurisdictional waters of the U.S. as defined by the U.S. Corps of Engineers is estimated, the number of known cultural sites is developed, and the number of special habitat areas that may be affected are counted. Each alternative begins with a rating of 10 and each occurrence of one of these three issues is subtracted. The results are presented in **Table 5.13**.

Table 5.13 – Environmental Issues

Criteria	Section 404 Clean Water Act	Cultural - Sites	Biological - Habitat	Rating (1-10)
	Area	No.	No.	
Alternative				
No Build	0	0	**0**	**10**
A- Garza Road	1	1	**1**	**7**
B- Garden Creek	1	1	**1**	**7**
C- Lower Ranch	2	1	**1**	**6**
D- Durango	2	1	**1**	**6**
E- Connor	2	1	**1**	**6**
F- Valley	4	0	**2**	**4**

5.5 COMPARISON OF ALTERNATIVES

The alternatives were compared using a decision matrix. The summary of the evaluation criteria and scoring is presented in **Table 5.14**.

Table 5.13 - Decision Matrix

Criteria	Public Support	Moson Rd Impacts	Access Impacts	Future Development Compatability	Traffic Network Continuity	Floodplain Impacts	Building/Property Impacts	Environmental Impacts	Utility/Well Impacts	Costs	Noise	Ranching	Total
Importance	10	10	10	10	10	10	10	10	10	10	10	10	120
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Total
Alternative													
No Build	**0**	**5**	**6**	**1**	**0**	**10**	**10**	**10**	**10**	**10**	**5**	**10**	**77**
A- Garza Road	**3**	**2**	**8**	**7**	**6**	**9**	**4**	**7**	**6**	**7**	**5**	**8**	**72**
B- Garden Creek	**6**	**1**	**5**	**9**	**7**	**8**	**5**	**7**	**7**	**7**	**6**	**8**	**76**
C- Lower Ranch	**2**	**7**	**8**	**9**	**8**	**9**	**8**	**6**	**6**	**6**	**7**	**8**	**84**
D- Durango	**8**	**7**	**10**	**9**	**9**	**6**	**7**	**6**	**7**	**6**	**8**	**6**	**89**
E- Connor	**1**	**7**	**10**	**9**	**10**	**7**	**8**	**6**	**4**	**5**	**5**	**7**	**79**
F- Valley	**0**	**7**	**4**	**9**	**10**	**0**	**0**	**4**	**3**	**5**	**3**	**8**	**53**

5.6 CONCLUSIONS

The public supported the project by a wide margin. There are three alternatives –Alternative C, Alternative D, and Alternative E – that stood out from the others as favorable corridors for the new alignment of Buffalo Soldier Trail. These three alternatives have the least impact to the existing homes in the area. Of the 3 alternatives, Alternative D has the least impacts to the natural, built and socio-economic environment and is therefore proposed as the preferred alternative. In summary, Alternative D has the following advantages:

- Most public support
- Minimal improvements required on Moson road
- Minimal disruption and reconstruction to mitigate access impacts to land parcels
- Fits the intent of the Tribute Specific Plan
- Creates one of the shortest paths for most drivers to take
- Has minimal utility and well impacts compared to the other build alternatives
- Has the least noise impact to existing homes
- Alignment has the flexibility to avoid or minimize impacts to the floodplains, properties, environment, and ranching operations.

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