

Meeting Notes



I-70 Floyd Hill to Veterans Memorial Tunnels

Project: I-70 Floyd Hill to Veterans Memorial Tunnels (VMT) NEPA and 30% Design
Meeting: ALIVE Issue Task Force Meeting
Date: October 16, 2018; 9:00 am to 11:00 am
Location: CDOT Region 1, 425 Corporate Circle, Golden, CO

Summary of Action Items	Responsibility	Status
1. Set up a meeting with Joe Walter to review decisions made to date and to get CPW input on locations that are being advanced for further consideration	Julia (coordinate with Vanessa & Francesca)	
2. Meet with the show home landowner to discuss the idea of a wildlife crossing structure at Location #2	Vanessa (with support from Keith and Julia)	
3. Overlay parcel boundaries with the mitigation locations being carried forward. Review relative to Locations #2 & 3, as well as location #7 once the alignments for the new bridges are available	Keith	
4. Integrate Preble's habitat mapping into the T&E report	Keith	
5. Scheduler Preble's trapping for late Spring 2019	Keith & Francesca	
6. Explore sizing a box culvert for bears and other carnivores at Location #6 (Johnson Gulch)	Anthony, Tyler	
7. Coordinate with the Clear Creek County Greenway Authority and Open Space Department regarding Location #7	Julia & Keith	
8. Identify appropriate measures to prevent wildlife from getting onto the bridge decks at the bottom of Floyd Hill	ATKINS Team	
9. Ensure features to minimize barriers to bighorn sheep movements at the tunnel portals, particularly the east portal	ATKINS Team	
10. Determine fence alignment and fence end treatments to minimize wildlife incursions onto the highway	ATKINS Team	
11. Schedule ALIVE Meeting #4 to review wildlife mitigation and roadway designs	Vanessa	

Participants

Chelsea Beebe, Jefferson County	Alison Michael, US Fish and Wildlife Service
Lauren Boyle, CDOT, Region 1	Anthony Pisano, ATKINS
Stephanie Gibson, Federal Highway Administration	JoAnn Sorenson, Clear Creek County
Keith Hidalgo, ATKINS	Doreen Summerlin, USDA Forest Service
Julia Kintsch, ECO-resolutions	Francesca Tordonato, CDOT, Region 1
Tyler Larson, ATKINS	Mandy Whorton, Peak Consulting Group

Summary of Discussion

[Note Action Items are in [blue](#).]

1) Welcome and Introductions

Lauren Boyle gave an introduction and started off the meeting. She identified her role as CDOT project manager under Neil Ogden and explained that Vanessa Henderson and Neil were attending a tunneling short-course at the Colorado School of Mines and sent apologies for missing the meeting.

2) Meeting Objectives

Julia Kintsch started the presentation.

The objective of this meeting was to review the challenges and opportunities at each potential mitigation location in the Beaver Brook and Clear Creek Linkage Interference Zones (LIZs) and to receive input from the ALIVE Committee regarding which mitigation locations are recommended to carry forward for further evaluation and which are recommended to defer or eliminate.

- The CMGC process allows for additional flexibility as new information or new design elements may allow new opportunities to emerge to enhance or refine the wildlife mitigation recommendations, particularly related to constructability.

3) Action Items Review

Action Items that carry over from previous meetings include:

- Provide preliminary crossing design and or schematics to Clear Creek County to facilitate opportunities for partnerships with local development (Neil Ogden). This action item will be addressed once the mitigation locations are finalized and preliminary designs completed.
- Look into opportunities for conservation easements (Vanessa Henderson). This action item will be addressed once the mitigation locations are finalized.
- Coordinate with Colorado Parks and Wildlife (Joe Walter) on additional wildlife carcass information to add into reporting (Julia Kintsch and Keith Hidalgo). This action item is being pursued.

Stephanie Gibson had a question about use of sand in the corridor (regarding a previous action item to determine locations that may be still using sand for treatment). Mandy responded that this issue was related to effects on fish habitat and also raised by the SWEEP Committee regarding water quality. CDOT maintenance has confirmed that magnesium chloride is used primarily east of the Veterans Memorial Tunnels but that sand is still used for traction along Floyd Hill, particularly in the uphill sections (adjacent to Clear Creek).

4) Review of ALIVE Concerns and Project Updates

Julia gave a review of the Beaver Brook LIZ and the Clear Creek LIZ, target species and wildlife-vehicle collisions (WVC) in each LIZ. She identified that Beaver Brook LIZ extends east outside of the Floyd Hill Project study area.

The I-70 Mountain Corridor Biological Opinion (I-70 ROD and FPEIS, Attachment A, pp. 9-11) states: "A minimum of 13 wildlife crossings will be installed with a maximum number of 25 possible, after which the program will be assessed for effectiveness... These crossings will be installed in the 13 LIZs identified by the ALIVE Committee or subsequent documents." Since the PEIS, subsequent research has identified 17 LIZs.

Mandy requested more background about goals for the Beaver Brook and Clear Creek LIZs and how many wildlife crossings are required. Julia responded that there are different populations of wildlife at each LIZ; that across the I-70 Mountain Corridor LIZs are of varying lengths; and that depending on the LIZ, more than one wildlife crossing per LIZ may be warranted. The Beaver Brook LIZ, for example, is 4.7 miles long and even within that LIZ, different wildlife populations are supported (primarily elk in the western portion; primarily mule deer in the eastern portion of the LIZ).

Alison Michael: Is this the final design step for this segment of the I-70 mountain corridor, or is this an interim measure like some of the recent projects? Mandy identified that this project addresses the preferred alternative specific highway improvements from the PEIS. This will be the final improvements for the Floyd Hill area for the near term unless additional projects and budgeting comes forward, which is unlikely in this area since there are many other unmet needs in the rest of the corridor, as identified in the PEIS. Discussion identified that there would be a separate element for transit to meet long-term needs. Additional highway capacity will be unlikely to be included further. It is unlikely to have future capacity improvements or wildlife mitigation from future projects. Alison commented that it is unfortunate that there will not be any improvements at Beaver Brook for Preble's (assuming they are present). Francesca Tordonato noted that if this project results in impacts to Beaver Brook, mitigation would be included. She also noted that CDOT may conduct trapping next summer (2019) and DNA testing to determine if Preble's are present.

5) Mitigation Matrix: Review of Potential Mitigation Actions

The group reviewed the mitigation matrix and the roll plot for the following discussion.

a. Beaver Brook LIZ

Five mitigation locations were presented:

#1 – MP 250, Ruby Ranch Road – underpass location in large fill slope. This location is in the Beaver Brook LIZ but outside of the Floyd Hill Project study area. It was developed based on concerns with disturbing the wetland complex in the Beaver Brook area (Locations #2 through #5), where potential fen wetlands were identified (testing confirmed that the wetlands do not qualify as fens but are of high quality). Location #1 is not recommended because it is

outside of the project area but was investigated and will be carried forward as an alternative mitigation location if neither Location # 2 nor # 3 are feasible.

#2 – MP 247.3, Meadow/Show Home – overpass location. Recommend that this location be carried forward for further design refinements.

#3 – MP 247.2, Meadow/Storage Units – overpass location. Recommend that this location be carried forward for further design refinements.

#4 – MP 247.0, Meadow/High School – overpass location. The group agreed that this location be eliminated from further consideration. The primary impediments to this location are the wetland impacts and that this location is most likely to be impacted by potential development on both the south and north sides of I-70.

#5 – MP 246.3, Floyd Hill West – overpass location. The group agreed that this location be eliminated from further consideration. The primary impediments to this location is that it is not a primary wildlife habitat area or I-70 crossing location and it would require funneling elk from the east side of the Floyd Hill exit and over Hyland Hills Interchange road to the overpass location.

Mandy: All of the locations at the top of Floyd Hill (Locations #2-5) serve the same wildlife populations.

Julia provided an overview of the two possible overpass designs for Locations # 2 & 3:

- Arches: Composed of three arch structures over the opposing lanes of I-70 and US 40. Arch structures are designed to be buried with soil and can accommodate variable slopes on the approaches and across the length of the structure. Arches could potentially look like tunnels to drivers, which may cause bottlenecks for traffic moving through the arches if drivers slow down on approach.
- Bridges: Composed of a single slab with multiple spans. Soil depth on a bridge structure increases cost. Bridges have a more open appearance for drivers, and as a result, drivers approaching the structures are less likely to slow down.

Stephanie: What are the issues regarding weight and structure design? Mandy and Julia responded that soil (up to 5 feet deep to prevent vegetation roots from freeze and thaw cycles), snowpack and snowmelt all add weight to a structure, and that the static weight of soil requires a higher level of engineering than the temporary weight of a semi-truck crossing a bridge. Julia noted that foam blocks have been used in some structures to allow landscaping on structures with lower soil loads.

In follow-up research, Julia confirmed that the soil depth used on a wildlife overpass in Ontario is 60cm (2') and has grasses and shrubs. In addition, the 19th St Lid in Golden has 18-24" soil depth where grasses were planted. However, the landscape architect noted that the Golden lid design is based on limited experience as the 'park deck' is newer to Colorado. The 19th St Lid also used an air cavity in the deck support to help insulate the soil. It should

be noted that damage to the vegetation occurs when there are multiple freeze/thaw cycles in a given season.

Stephanie Gibson noted that the 19th Street Lid used foam blocks. Julia confirmed with the landscape architect that foam blocks were used on landscaping berms with plantings. Similarly, an overpass in Yoho National Park in Canada used buried foam blocks along the sides of the overpass to provide noise and light attenuation for animals on the structure.

Stephanie asked if we could do tall, open arches like the VMT to prevent the tunnel effect for drivers. Tyler responded about limitations of the height and size of the tunnels at this location. Lauren identified that if traffic analysis suggests the arch design could cause a bottleneck, then CDOT would look strongly at a bridge to avoid pinch-point. Mandy also pointed out that a wildlife overpass is not nearly as long as the VMT and the tunnel effect would not be as significant.

Julia reviewed considerations for an overpass structure. A 200' wide overpass is recommended to ensure wildlife use (particularly elk) of a 300' long structure. However, she noted that a narrower overpass could be considered, although there would be tradeoffs:

- Resident and wintering animals may be able to adapt to a narrower structure better than if the structure was being designed for migratory populations.
- These populations are already habituated to human activity and may be more tolerant of a narrower structure than a wilder population.
- A narrower structure would provide some level of connectivity over I-70, but it would be expected to receive lower levels of use and, in particular, may limit use by both sexes and across age groups (e.g., individual males or small bachelor groups may be more likely to use the structure than a cow with a calf).

Mandy: What is more important for the width, the approach, the middle, or where? Julia identified that not only the approach but also at the top of the approach before an animal has committed to crossing are the most common places where animals repel. Julia identified that hour-glass shaped bridges have worked in other locations and saved costs.

Julia mentioned narrower overpasses can work where the span length is much shorter, or depending on the target species; however, elk require wider structures (underpasses or overpasses) than many other species. Lauren identified that engineers want the minimum identified but that recommendations will help discussions with contractors later on. Anthony also provided input that being open to changes during later discussions is beneficial.

Francesca noted that it would be helpful to compare the costs of wider structure vs a narrower one – if the cost difference isn't that much greater, then the added benefit is worth a higher cost. Mandy also identified that the effort to look at narrowing the structure was also a focus to minimize the wetland impacts when there was a concern of fen wetlands. It has since been confirmed that the wetlands are not fens, although they are still high-quality wetlands.

Lauren Boyle shared an email from Adam Springer (Clear Creek County) regarding the proposed development in the meadows on the south side of I-70. The developer has received push back from the neighborhood regarding plans for high-density apartments and commercial development at the meadows property (Location #3). The status of the proposal remains uncertain. Further research provided by JoAnn Sorensen (Clear Creek County) indicated that both Locations #2 and #3 are on the show home property but the status of development of the meadows property is still concerning given the high wildlife use on this parcel.

Alison: Could the parking lot at the show home be moved to the other side of the structure, away from the approach to an overpass? JoAnn noted that the visibility of the show home to I-70 is the primary marketing for the show home. Similarly, the owner may be reluctant to reduce lighting at the show home. Regardless, these items should be broached in a discussion with the landowner. **The group agreed that a conversation with the land owner is an important next step for this location before moving forward with design.** After the meeting, JoAnn provided the owner's contact information to CDOT, and **Vanessa Henderson (CDOT) will contact the owner to set up a discussion.**

Julia asked for each of the stakeholders present to share their thoughts and additional considerations regarding Locations # 2 & 3:

- JoAnn Sorensen (Clear Creek County) – After clarifying that the south approach of an overpass at Location # 2 would be at a lower elevation than the show home, she noted that the landowner may be open to a decreased width overpass, or a design that angles the bulk of the approach slope towards the meadow and away from the show home. Location # 3 will depend more on the plans for development of the meadows property. **Recommended action item to overlay parcel boundaries with mitigation locations.**
- Francesca Tordonato (CDOT) – Recommended engaging with the meadows developer to get assurances that Location #3 is good long-term mitigation investment. #2 and #3 are the best options, but further investigations are required to determine which of the two is best. She also noted that wetland impacts have an option to do on-site mitigation or existing banks in other places.
- Stephanie Gibson (FHWA) – Noted that we are dealing with something that is existing (Show Home) that we know will be problematic (#2) and the unknown development (#3). #3 looks longer, more expensive. #2 is shorter but the brightly lit show home would limit use. She recommended obtaining easements to get longer-term assurances for wildlife use.
- Alison Michael (USFWS) – In addition to what others had already state, she wanted to know what the potential is for Preble's habitat upstream from Locations #2 and #3 – is there a habitat connection between Beaver Brook and the meadow wetlands? **Recommended action item to determine whether the wetlands may provide Preble's habitat.**

- Chelsea Beebe (Jefferson County) – What is the future land use of the surrounding area, beyond the immediate crossing locations? What are the long-term habitat protection needs in the broader landscape? She also noted that Location #3 offers a better sight distance for drivers. She asked whether human use of an overpass would be prohibited? Julia identified that yes, want to keep it to wildlife use, not humans.
- Julia confirmed with the group that filtering down to Locations # 2 and 3 and eliminating Locations # 4 & 5 is agreed upon by the group.

b. Clear Creek LIZ

Five mitigation locations were presented:

6, MP 244.9, Johnson Gulch – underpass location. This location was eliminated for a large crossing structure due to constructability issues and because US 40 is immediately to the east.

#7, MP 244.2, Two Bears Bridges – add wildlife bench under bridges. The bench would be adjacent to and set slightly above the greenway with a vegetated buffer between the wildlife bench and the greenway. Recommend that this location be carried forward for further design refinements.

#8, MP 242.8, Clear Creek Bridges (east of VMT) – add wildlife pathways. This location was eliminated because the future bridge alignment will not support complete north-south movements.

*Francesca noted that Location #6 could still have value as a smaller carnivore crossing and should be retained as a mitigation recommendation during drainage design. **Carry Location # 6 forward for further consideration as a carnivore crossing.***

The group noted that wildlife moving to/from the south side of the bridges will have to come off the slopes immediately adjacent to the western-most bridge. On the north/east side of the bridges, the bench should continue beneath the westbound off-ramp bridge. There is room to clear out a pathway beneath the existing span.

Stephanie asked about changing the stream shape and improving resiliency. Clear Creek is channelized with steep rip rap banks. Mandy provided input on other sections of the stream that have been discussed for improvements. This location is a concern for rafting use. Many other users of the creek as well. Fishing, rafting, pull-out between easy to moderate/difficult rafting.

Stephanie identified that based on the photos, there are opportunities to enhance the conditions and make it more aesthetically pleasing and more wildlife/habitat friendly.

*Francesca made a note of deer deaths from getting on these bridges and getting to a pinch-point and jumping off and dying. **It was noted that measures should be taken to prevent***

wildlife from getting onto the bridges.

Stephanie asked if we had a 3D model. Tyler answered we do not have it yet.

JoAnn requested that the **Project Team coordinate with the Clear Creek County Greenway Authority regarding the wildlife bench at Location #7, as well as Clear Creek County Open Space.**

Stephanie and others emphasized that we are also avoiding additional impacts by choosing the tunnel alternative versus expanding the road footprint and making additional rock cuts.

Doreen noted that the east tunnel portal design should be reviewed by the ALIVE Committee for recommendations to minimize impacts to bighorn sheep habitat and movements.

Consider a stair-step design or other features to facilitate bighorn sheep movement and reduce barriers at the tunnel portals.

Francesca asked about the ability to keep Location #1 in the progression if there are fatal flaws with Location #2 and Location #3. The ATKINS Project Team stated that the objective is to mitigation within the project limits; however, it will be kept as a backup if the others don't meet the requirements. Julia identified that additional sites were looked at because of the initial concerns regarding the presence of the fens. During that process both Locations # 1 & 2 were added to the mitigation matrix as potential wildlife crossing mitigation locations.

In addition to these notes, the project team summarized the issues and actions associated with the crossings being carried forward. That summary is attached to these notes for the ALIVE Committee information and input.

The next ALIVE meeting is projected for winter 2018/19. At this meeting ALIVE members will provide comment on initial wildlife mitigation and roadway designs.

Summary of Agreements

1. Agreed to eliminate Locations # 4, 5 and 8 from further consideration. Location #1 will be retained as an alternative pending a decision on Locations # 2 and 3. Location #6 will be retained for consideration for a medium-sized culvert.
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Attachments – Presentation slides and Locations #2 and #3 summary



I-70 Floyd Hill to Veterans Memorial Tunnels

ATKINS

ALIVE Meeting #3

October 16, 2018



I-70 Floyd Hill to Veterans Memorial Tunnels

Agenda

- Welcome / Introductions
- Action Items Review
- Project Updates
- Mitigation Matrix: Review of Potential Mitigation Actions
 - Beaver Brook LIZ
 - Clear Creek Junction LIZ
- Next Steps & Review of Action Items



Meeting Objectives

- Review Mitigation Matrix
 - Challenges and opportunities at each potential mitigation location in the Beaver Brook and Clear Creek Linkage Interference Zones
 - New locations added to mitigation matrix
- Refine List of Potential Mitigation Actions
 - Recommendations for mitigation locations to carry forward or eliminate



I-70 Floyd Hill to Veterans Memorial Tunnels

Wildlife Mitigation

- Beaver Brook LIZ
 - 4.7 miles long
 - Very high WVC – mostly elk WVC in western portion of LIZ; mostly deer WVC in eastern portion
- Clear Creek Junction LIZ
 - 1.9 miles long
 - Moderately-low WVC through canyon
- ALIVE Goals:
 - Improve connectivity for wildlife across I-70 and reduce WVC
 - At least one wildlife crossing per LIZ (Biological Opinion)



I-70 Floyd Hill to Veterans Memorial Tunnels

Action Items Checklist (April meeting)

Summary of Action Items	Responsibility	Status
1. Follow up to see if there are site specific locations that may still be using sand for treatment	Neil Ogden	✓
2. Look into designs for rockfall netting that minimize entanglement	Julia Kintsch and Stephanie Gibson	✓
4. Check with drone footage used for rock fall to see if it caught any issues with entanglement or animals	Neil Ogden	✓
5. Provide preliminary crossing design and or schematics to Clear Creek County to facilitate opportunities for partnerships with local development	Neil Ogden	
6. Look into opportunities for conservation easements	Vanessa Henderson	
7. Coordinate with Joe on additional wildlife carcass information to add into reporting	Julia Kintsch and Keith Hidalgo	



I-70 Floyd Hill to Veterans Memorial Tunnels

Action Items Checklist (June Site Visit)

Summary of Action Items	Responsibility	Status
1. Contact Clear Creek County Road and Bridge re: WVC on Saddleback Road	Julia	✓
2. Provide guidance and specifications for wildlife crossing designs (e.g., dimensions, slopes, substrate, bench width)	Julia	✓
3. Develop cross section of potential wildlife crossings	Anthony	✓
4. Provide traffic analysis demonstrating how I-70 realignment is projected to affect truck traffic from the quarry on US 40	Neil	✓
5. Preble's habitat assessment and coordination with USFWS and CDOT regarding potential mitigation.	Keith	✓



I-70 Floyd Hill to Veterans Memorial Tunnels

Project Area





Initial Stakeholder Concerns

- Threatened and Endangered Species
 - Canada lynx
 - Preble's meadow jumping mouse
- Bighorn sheep winter range and mortality
- Connectivity for terrestrial wildlife
- Reduce wildlife-vehicle collisions
- Clear Creek is a high value fishery
 - Improve fish passage and reduce channelization



Project's Effects on Wildlife

- Habitat loss due to expanded highway footprint
 - Highway widening, new alignment, rock cuts
- Increase in barrier effect:
 - Increased number of traffic lanes
 - Increasing traffic volumes
 - Retaining walls, median and shoulder barriers
 - Lighting at interchanges and signs
- Potential increase in wildlife-vehicle collisions



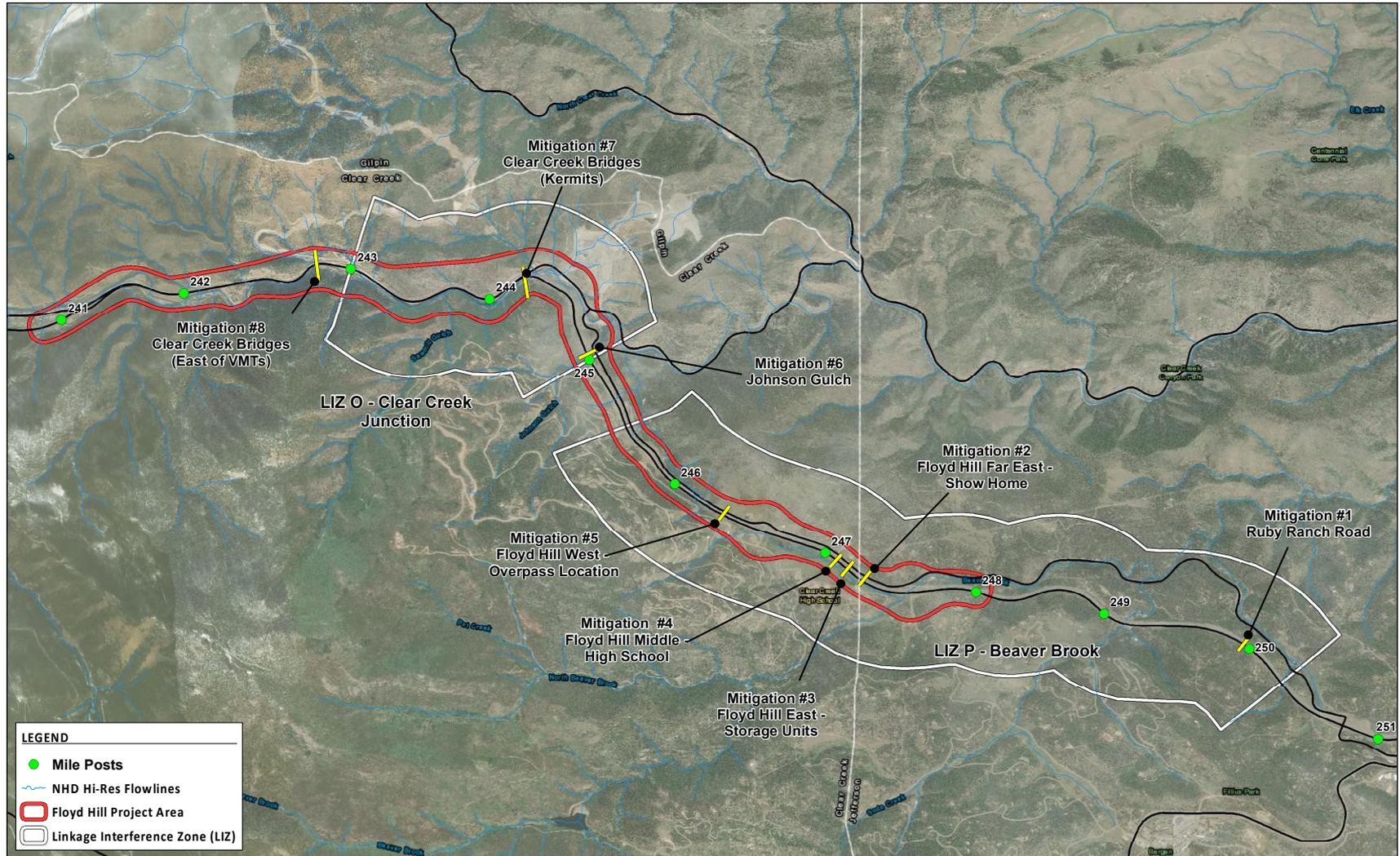
Updates Since June Site Visit

- CDOT/Consultant meeting to review conceptual designs, challenges and opportunities at each location
 - Created Mitigation Matrix
 - Opportunities for mitigation outside of project boundary in eastern portion of Beaver Brook LIZ?



I-70 Floyd Hill to Veterans Memorial Tunnels

Mitigation Locations Considered





Beaver Brook LIZ Mitigation Locations

- 1 – MP 250, Ruby Ranch Road – Underpass (outside of study area)
- 2 – MP 247.3, Meadow/Show Home – Overpass
- 3 – MP 247.2, Meadow/Storage Units – Overpass
- 4 – MP 247.0, Meadow/High School – Overpass
- 5 – MP 246.3, Floyd Hill West - Overpass



Beaver Brook LIZ – Locations Considered

1 – MP 250, Ruby Ranch Road – Underpass (outside of study area)

2 – MP 247.3, Meadow/Show Home – Overpass

3 – MP 247.2, Meadow/Storage Units – Overpass

4 – MP 247.0, Meadow/High School – Overpass

5 – MP 246.3, Floyd Hill West – Overpass



Beaver Brook LIZ: Locations Eliminated

- #4: MP 247.0, Meadow/High School Overpass
 - Eliminated due to greater wetland impacts and potential for this site to be more impacted by planned development on south side of I-70.

- #5: MP 246.3, Floyd Hill West Overpass
 - Eliminated due to lower wildlife value & WVC; Would require fencing and deer guards across Floyd Hill Exit to direct animals to crossing location.

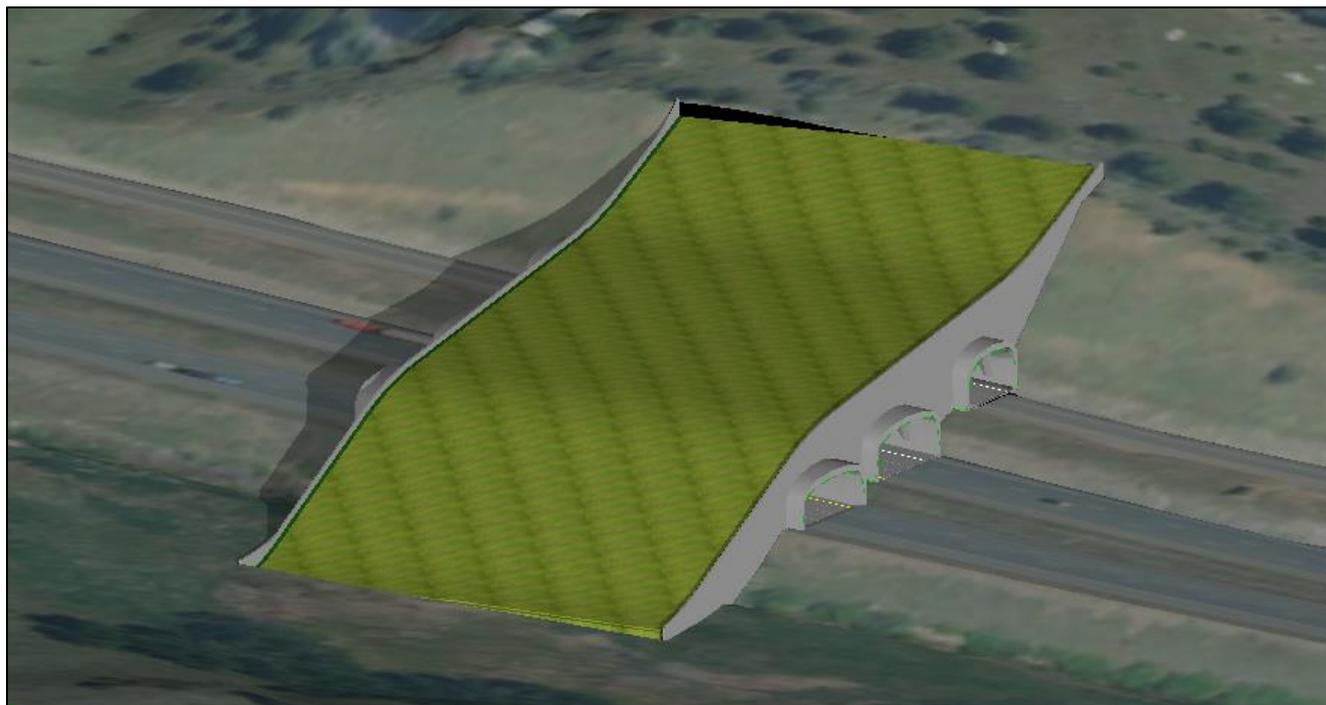


I-70 Floyd Hill to Veterans Memorial Tunnels

Wildlife Overpass Options

Arches

- Three arches over opposing I-70 lanes and US 40
- Designed to be buried; Allows variable slopes





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Wildlife Overpass Options

Bridges

- Single bridge with multiple spans
- Bridge/fill weight will increase cost
- More open appearance





Beaver Brook LIZ Considerations

- Overpass Width
 - Given the length of an overpass spanning I-70 and US 40, recommended overpass width is 200'
 - However, residential and wintering animals may be more likely to adapt to a narrower structure, also because these populations are already habituated to human activity
 - A narrower structure would not be expected to receive high levels of use, but would provide some connectivity across interstate barrier



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MP 247.2 Meadow Overpass (#2)





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MP 247.2 Meadow Overpass (#3)





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Design Concepts

- View concepts, wetlands, parcel boundaries



Beaver Brook LIZ Discussion

- Are there any fatal flaws associated with Location #2 or #3?
- What alternative design refinements might improve locations carried forward? e.g., narrower structures?
- Is there additional information that would help in determining the best location(s) or design of wildlife-highway mitigation?
- Do any of the locations need habitat protection to be successful?



Clear Creek LIZ – Locations Considered

6 – MP 244.9, Johnson Gulch

- Possible location for wildlife underpass

7 – MP 244.2, Two Bears

- Add wildlife bench under new bridges

8 – MP 242.8, Clear Creek bridges east of VMT

- Location is outside of LIZ, but planned bridge realignment considered as opportunity for wildlife passage under I-70



Clear Creek LIZ Mitigation Locations

6 – MP 244.9, Johnson Gulch

- Possible location for wildlife underpass

7 – MP 244.2, Two Bears

- Add wildlife bench under new spans

8 – MP 242.8, Clear Creek bridges east of VMT

- Location is outside of LIZ, but planned bridge realignment considered as opportunity for wildlife passage under I-70



Clear Creek LIZ: Locations Eliminated

- #6: MP 244.9 Johnson Gulch
 - Eliminated due to constructability issues, and US 40 immediately to east with high traffic speeds leaves wildlife with nowhere to go on north/east side; May increase WVC risk on US 40.
- #8: MP 242.8, Clear Creek bridges east of VMT
 - Eliminated because future bridge alignment leaves nowhere for wildlife to go on the south side between bridges and frontage road walls.



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MP 244.2 Two Bears (#7)





Clear Creek Junction LIZ Discussion

- Are there any fatal flaws associated with Location #2 or #3?
- What alternative design refinements might improve locations carried forward? e.g., narrower structures?
- Is there additional information that would help in determining the best location(s) or design of wildlife-highway mitigation?
- Do any of the locations need habitat protection to be successful?



I-70 Floyd Hill to Veterans Memorial Tunnels

Next Steps and Action Items





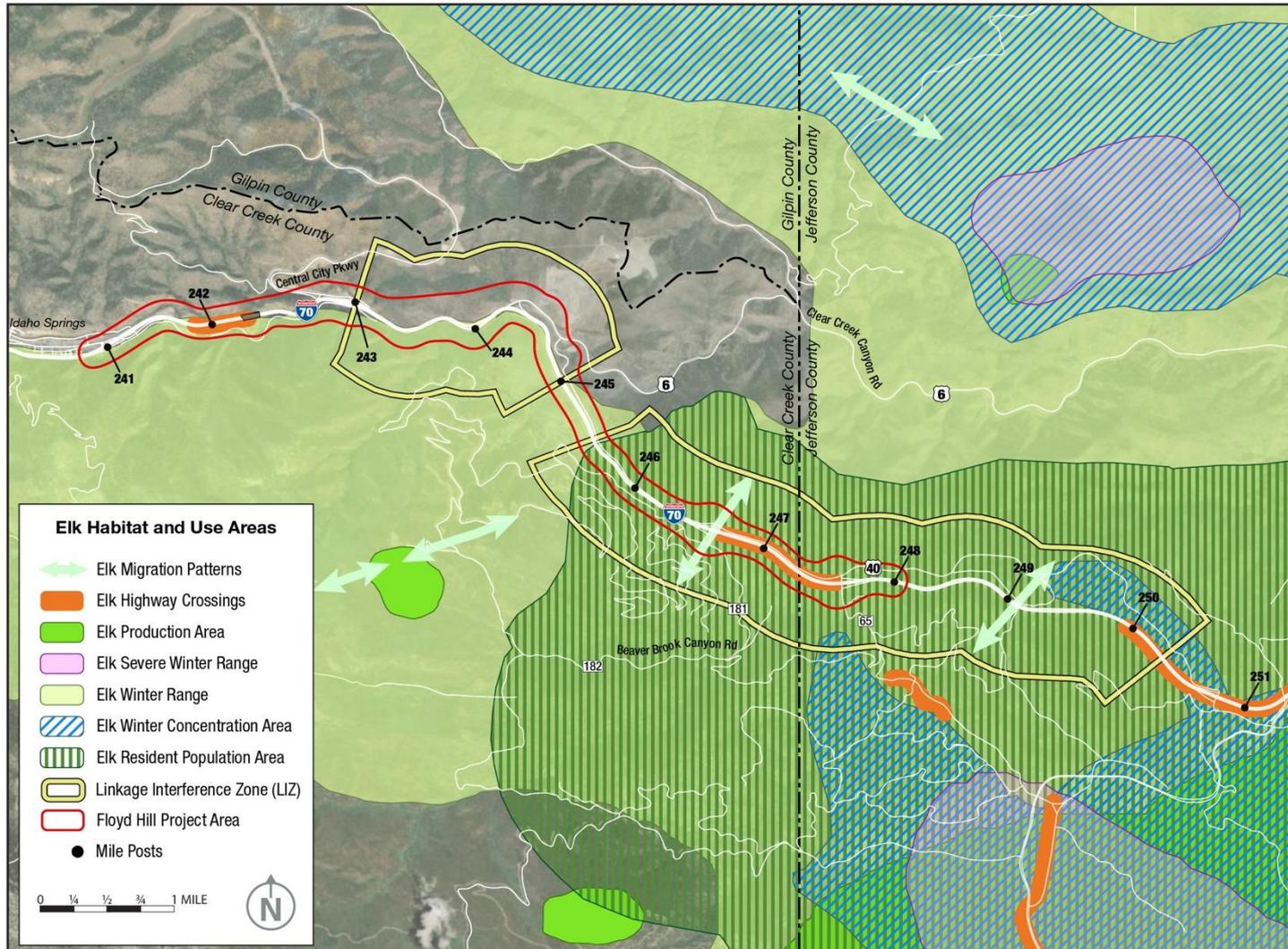
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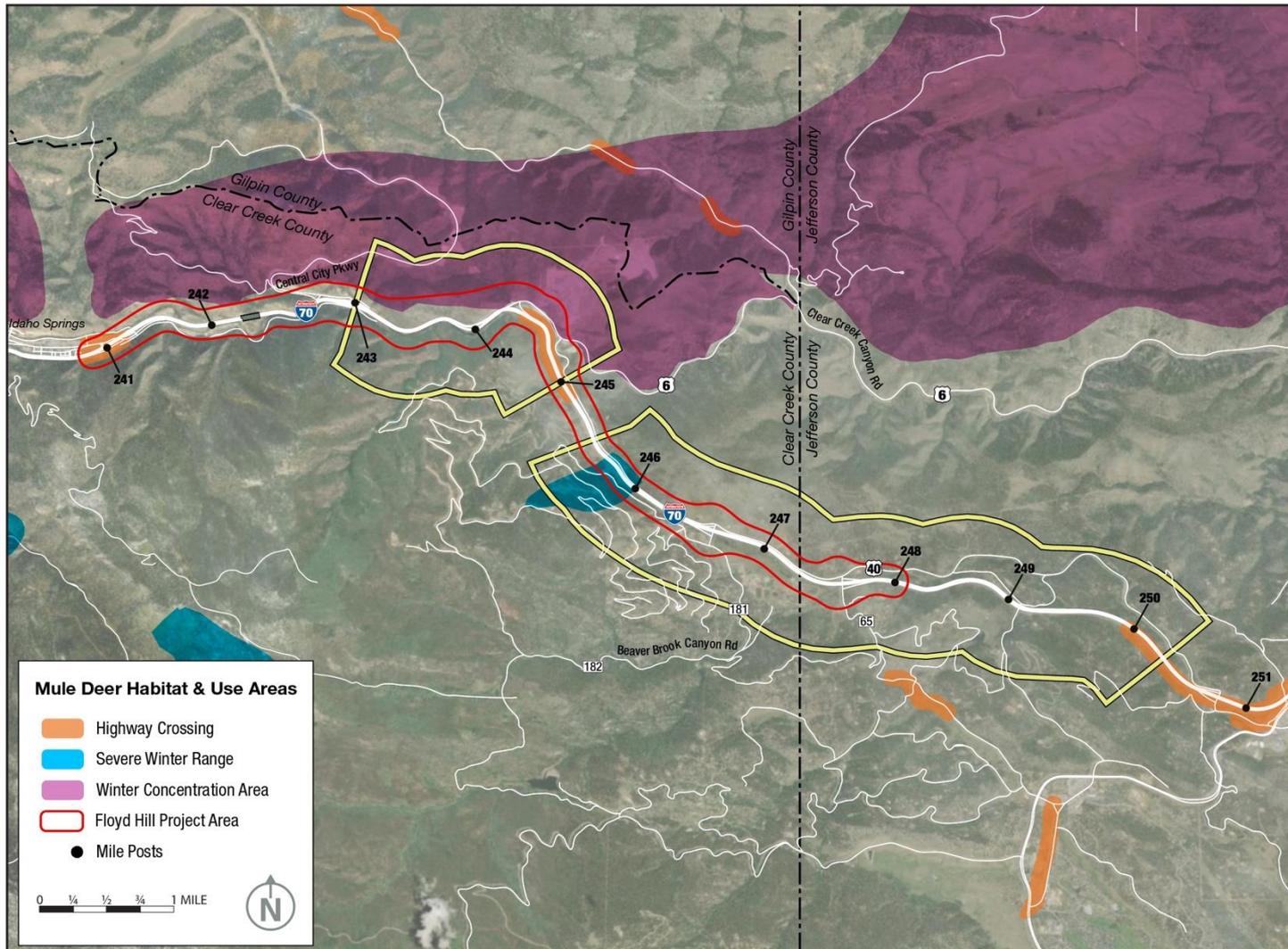
Elk Habitat and Movement Patterns





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Mule Deer Habitat and Movements

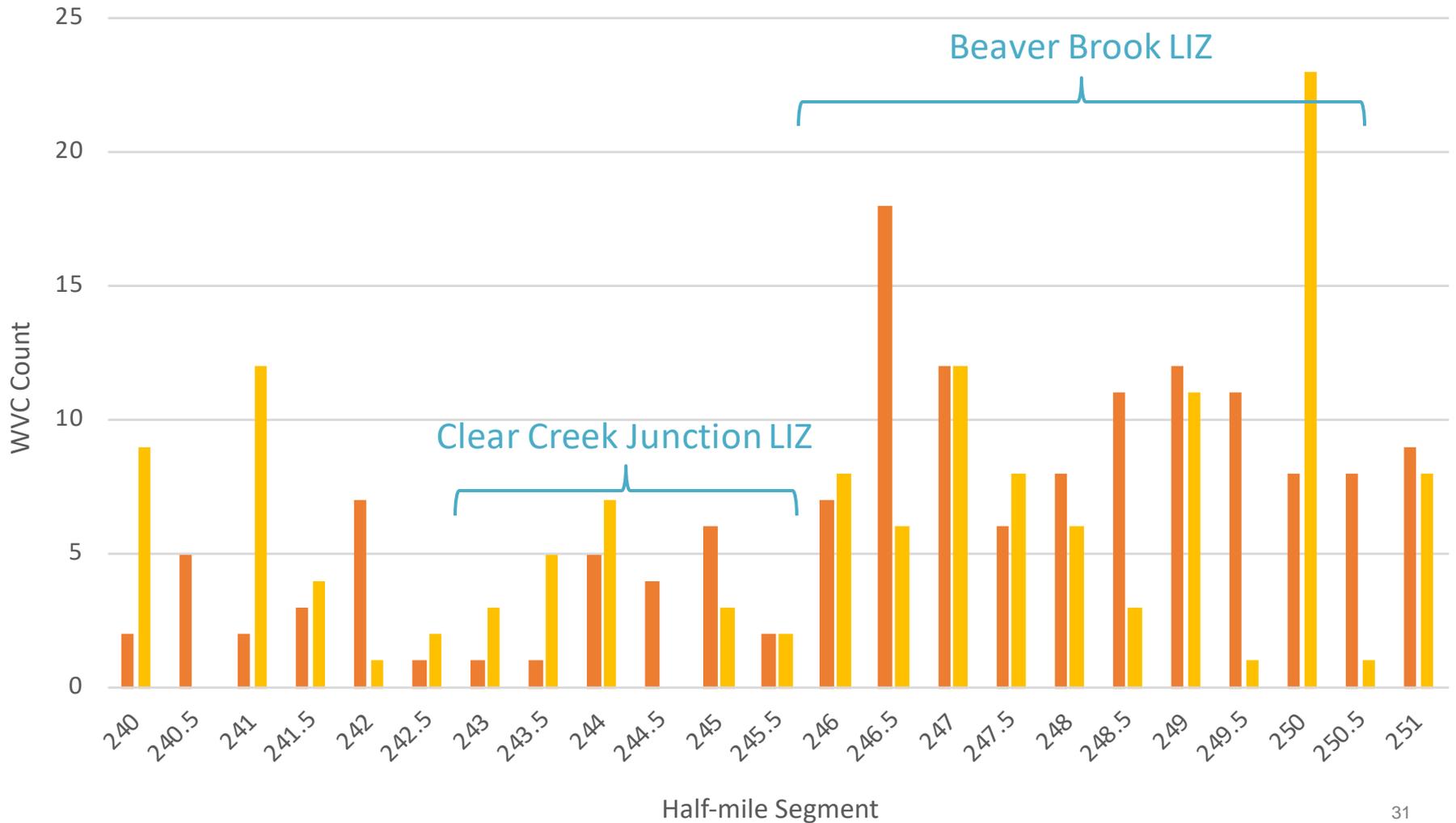




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Reported WVC Crashes and Carcass Pickups (2006-2017) - Mule Deer

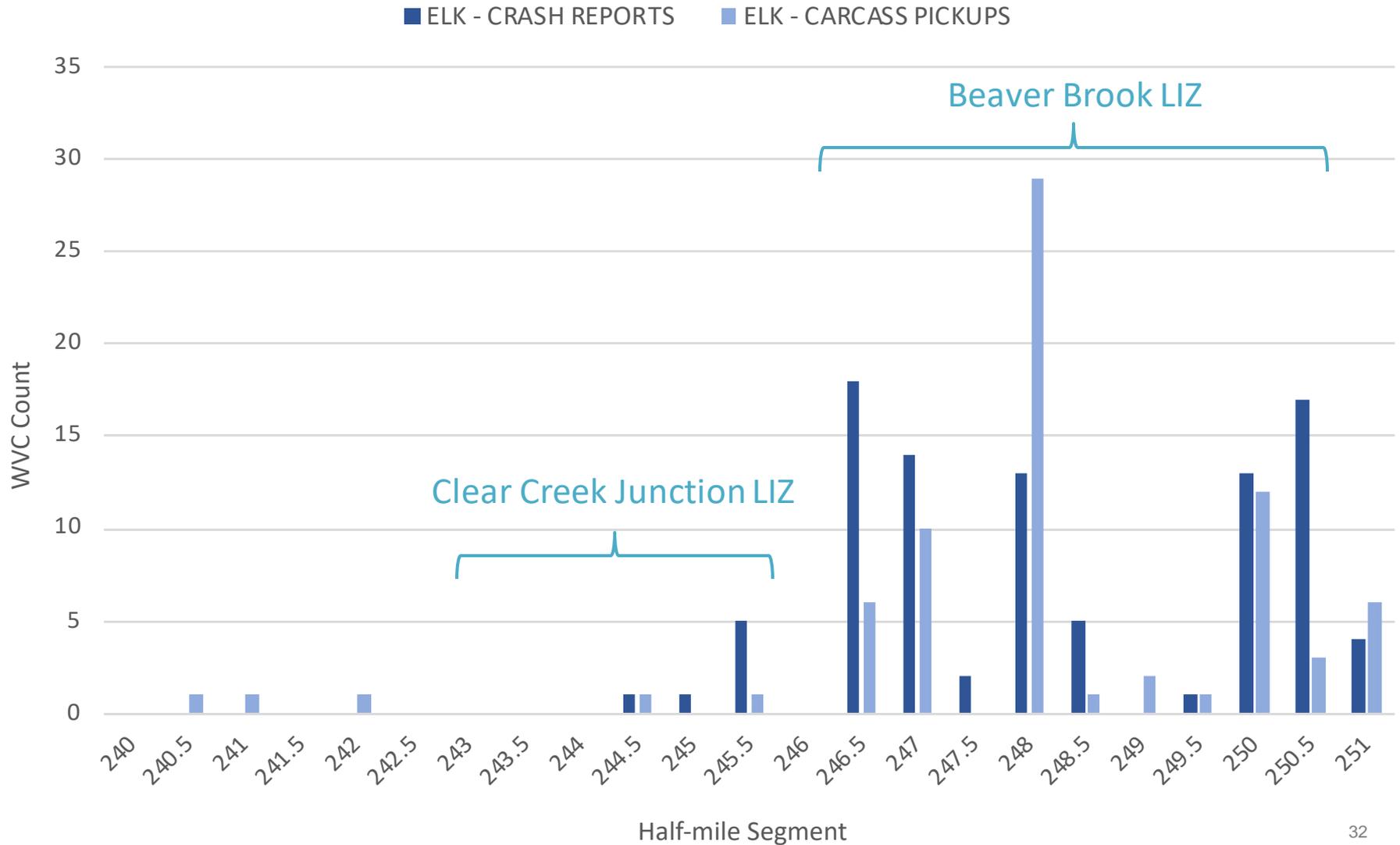
■ DEER - CRASH REPORTS ■ DEER - CARCASS PICKUPS





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Reported WVC Crashes and Carcass Pickups (2006-2017) - Elk





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Wildlife Underpass Options

- Create pathways for wildlife under existing or new bridges
 - Easier opportunity for improving wildlife passage
- Construct new wildlife underpass through embankments under the highway
 - Challenging to maintain traffic during construction





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MP 250 Ruby Ranch Road Underpass (#1)





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MP 250 Ruby Ranch Road Underpass (#1)



Clear Creek LIZ Crossing

Crossing Location # 7: One location for **underpass**, incorporating a dedicated wildlife bench into multiuse greenway/wildlife/creek crossing under the US 6/I-70 bridges

Primary use = mule deer

Secondary use = carnivores, bighorn sheep



Existing I-70 bridges spanning the bike path, Clear Creek & the I-70 westbound on-ramp.

INITIAL QUESTIONS TO ANSWER

Design

- What are the vertical and horizontal profiles? Vertical clearance and shared width with greenway?
- Where / how does the bench continue on the north side to direct animals away from I-70, US 6 and US 40 and prevent animals from going back onto the highway?
- What additional elements may be needed to ensure wildlife use, e.g., vegetation enhancements, guide fencing?

Land Use

- What are the existing and future land uses and property ownership for habitat on north and south side of I-70 (and US 6 and US 40)?
- What are the conflicts, if any, with Two Bears, trailhead, or rafting uses?
- How would the crossing work with the greenway? How can human and wildlife uses be buffered?

Biology

- How can the wildlife crossing be most open and inviting to deer and carnivores?
- How do we prevent animals from getting onto the highway – e.g., fencing, trails, approach treatments?
- Where would the wildlife bench be located, and are stream improvements (reduced channelization) possible/necessary?
- Are there additional measures that need to be incorporated to minimize impacts to bighorn sheep (or deer) that get trapped on bridges (above the crossing)?

Other considerations in this LIZ

- Bighorn sheep conflicts at the tunnel entrance/exits
- Where possible, design or create culverts that accommodate bear or smaller animal passage, in particular, a box culvert at Location #6 Johnson Gulch.

Beaver Brook LIZ Crossing

Crossing Locations #2 and #3: Two locations under review for **overpass**, both in the Beaver Brook meadow near CR 65

Primary use = elk

Secondary use = mule deer, carnivores

Location #2 extends from the low point on the center right of the photo on the north side of the frontage road across I-70; Location #3 would run from the cut slope to the meadow.



INITIAL QUESTIONS TO ANSWER

Land Use and Right of Way

- What are the existing and future land uses and property ownership for habitat on north and south side of I-70 (and US 40)?
- What are the conflicts with the Show Home? Initial conflicts identified = parking lot, lighting, human activity.
- Are there other development plans on the north side properties?
- What are the activities / conflicts that occur at the storage unit site, and what are plans for the property in future?
- What is the status of development of the Beaver Brook meadow?
- Are conservation easements possible to protect the lands around the crossing from development?
- What is the temperature of the land owners? Is land owner opposition a fatal flaw to one or both locations?

Design

- What are the loading requirements for the overpass with soil, and are there alternatives, such as foam blocks or hollow sections?
- What is the skew of the bridges, and how does that affect site distance on I-70?
- How significant is the potential “tunnel effect” creating a new bottleneck from drivers slowing through the tunnel, and what are options to reduce this potential problem?
- What are strategies to minimize impacts to wetlands on the south side – options to minimize width and fill? Incorporate culverts or other features to maintain hydrologic connectivity for wetland complex.

Biology

- How can the approaches be most inviting for elk use?
- What will be the fence alignment and what measures will be employed to prevent end-arounds? Where will escape ramps be located? Where are deer guards are needed and what design will best meet mitigation and landowner needs?
- What are the movement patterns of the existing herds, and how might the crossing change patterns?
- What are the human and land use conflicts that may limit use of the crossings?
- Does the layout of CR 65 ramp affect the crossing?