



MEETING NOTES

PROJECT:	23982-23929 I-70 West Vail Pass Safety and Operations Improvements
PURPOSE:	ALIVE ITF #4 Meeting
DATE HELD:	May 3, 2021
LOCATION:	Online Google Meet Meeting
ATTENDING:	John Kronholm, Project Manager, CDOT Region 3 Karen Berdoulay, Resident Engineer, CDOT Region 3 Rob Beck, Program Engineer, CDOT Region 3 Matt Figgs, CDOT Region 3 Cinnamon Levi-Flinn, CDOT Jeff Peterson, CDOT Jenn Klaetsch, CDOT Carole Huey, US Forest Service Kristin Salamek, CDOT USFWS Liaison Michelle Cowardin, DNR Jeff Bellen, FHWA Robert Jacobs, Summit County Kristin Bertuglia, Town of Vail Mark Gutknecht, Kiewit Julia Kintsch, ECO-resolutions Paige Singer, Rocky Mountain Wild Jillian Mauer, Pinyon Environmental Randal Lapsley, R S & H Mary Jo Vobejda, Jacobs Jim Clarke, Jacobs Pat Bastings, Jacobs Loretta LaRiviere, Jacobs
COPIES:	Attendees

SUMMARY OF DISCUSSION:

1. Introductions & Meeting Purpose

- a. Karen introduced the attendees at today's meeting.
- b. Mary Jo said the purpose and goals for today's meeting is to review progress of the wildlife crossing designs, coordination with other designs, an update on the fence test project and gather your feedback on any of these topics.

1. Work Completed

- a. Mary Jo said there are updates being made to Wildlife Crossing Memo from the feedback we received at our last meeting.
- b. Design coordination continues for how the wildlife crossing locations affect the recreation trail, aesthetics, water quality, sediment ponds, drainage, and grading.
- c. The ALIVE Development Process is being followed. We took your input on the preliminary design locations and considerations presented at Meeting #3 and have revised the locations and crossing sizes. Today we are going to present the revised preliminary design locations and sizes. After today's meeting we will take your

feedback to refine the wildlife crossing designs and integrate the SWEEP features and the recreation trail alignment and present those to you at our next meeting.

2. Methodology for Sizing and Designing Wildlife Crossings

- a. Julia noted the two large crossings at MP 187.3 and MP 188.3 haven't changed since our last meeting.
- b. There have been a few shifts for the small & medium crossing locations because as we got into some of the design discussions, we did encounter some challenges with terrain and roadway design at the originally proposed locations. The four best locations for these locations have been identified at MP 185.8, MP 188.7, MP 188.9, and MP 189.6.
- c. Julia wanted to remind everyone of the methodology used for sizing and design of the wildlife crossings. The first step was to determine the mitigation objective.
- d. The goals are use by all target species with a minimum 60% success rate and goal of 80% success rate for all target species which are Canada lynx, mule deer, elk, and small fauna. We looked at the movement types which includes the deer & elk summer range, lynx resident and dispersal habitat.
- e. We acknowledged there are several habituation among the wildlife populations in the area including human activity and traffic and noise from I-70.
- f. The roadway footprint goal for the large wildlife crossings should not exceed 150'.
- g. There are terrain limitations including fill depth and steep slopes which have been a challenge in some locations.
- h. Other Considerations included integrating the wildlife crossing designs with the roadway, recreation trail, sediment ponds and aesthetics.

3. Wildlife Crossings Research Review Key Takeaways

- a. Julia said the research that was used for refining the West Vail Pass wildlife crossing locations focused on two primary wildlife crossings which are the Trans-Canada Highway in Banff, Canada and I-90, Snoqualmie Pass in Washington. These are in mountainous landscapes with heavy snow loads and have similar species to Vail Pass. We gathered as much information as we could from these two locations, but we also wanted to gather information on all the species, so we also looked at research studies in Arizona, Colorado, Montana, Utah, and Wyoming.
- b. Julia said Canada lynx are less common in other areas and there aren't that many crossing structures located in lynx habitat. The data we do have indicate that lynx successfully use a variety of crossing structure types and sizes, including bridges, large & small culverts.
 - i. We found there was at least one successful lynx crossing location over I-70 on West Vail Pass around MP 189.6. In addition to that successful



- crossing there were also multiple lynx documented near the highway in this area.
- ii. Structurally complex forest cover is very important for a successful crossing for lynx and their prey. Based on that we included in our design guidance the need to augment the natural cover around the culvert entrances with additional plantings and downed logs.
 - iii. The Vail Pass Winter Recreation Study documented temporal avoidance by lynx in areas where their habitat overlaps with high levels of recreation activity. We can use this in our design guidance. These activity areas may overlap, and they can still make use of them, but we would expect to see some temporal avoidance.
4. Julia reviewed the key takeaways for elk. There are several studies that show elk distribution are a major factor influencing their use of crossing structures. In addition to the design of the crossing structure they are more likely to use crossing structures in areas where they are most active.
- i. Crossings that target elk should be designed to be as short as possible and we do see herds prefer wide, open structures, but individual elk, pairs and smaller groups will use structures that are more constrained or longer in length.
 - ii. Elk do require more time to adapt to new structures. It may take four or more years for them to adapt to new crossing structures.
5. Julia note mule deer have similar preferences to elk. The most influential factor influencing deer use of crossing structures is openness, however, deer requirements for openness are less stringent than for elk. Structure length can be compensated to some extent by making the structure more open and width has a larger effect on successful deer passages than height.
6. Julia said the small and medium mammals are grouped together but it is important to note they are not all the same in terms of their requirements for the crossing structures. We classified the small and medium on West Vail Pass using the Wildlife Guild Methodology and we identified three guild categories. They are:
- i. Cover obligates which are marten, mice & voles, squirrel, weasel, and marmot. These are prey species that require cover to escape from predators. For these species we want to insure there is cover at available at structure approaches and in the larger structure have cover through the crossing.
 - ii. Medium structure generalists are badger, bobcat, and red fox. These are habitat generalists and have tolerance for a wide range of crossing structures and conditions. They don't require the larger structures, but they will use them in addition to the smaller structures.
 - iii. Large structure generalists include deer, coyote, and snowshoe hare. Despite their small body size, snowshoe hare prefer the larger structures. These



species require openness and good visibility but otherwise tolerant of a wide range of conditions.

7. Balancing Design for Large Mammal Crossings

- a. Julia said they provided the following guidance to the design team for the large mammal crossings:
 - i. Maintain crossing structure length no greater than 150' and maintain 14' height and 50' width. We also emphasized the use of context sensitive contour grading to blend into the natural terrain.
 - ii. Drainage is a big concern. Overall, we are able to divert drainage from the road and hillside away from the crossing structures but inevitably there is going to be some local precipitation that that enter into the crossing. We wanted to make sure to design the crossings so they drain well to prevent icing inside the structure that could hinder wildlife use.
 - iii. Minimize impacts to adjacent tree cover and retain as much natural woody cover as possible.
 - iv. To accommodate small fauna use of the larger crossing structures we need to place coarse woody material and rock cover in the approaches and within each crossing structure. This is an EA requirement.
 - v. Another EA requirement is to integrate snow deflection to keep the crossing structures are clear of snow and debris to maintain year-round functionality for wildlife passage.
 - vi. Minimize impacts of recreation activities and the recreation trail that parallels the highway we also want to locate the crossings in areas that will discourage human activities.
 - vii. Minimize construction impacts to wetlands, but wetlands near crossings can attract wildlife so we want to make sure we maintain or restore impacts to wetlands adjacent to crossing structures.
 - viii. The two structure types we are considering for the large crossings are a traditional arch culvert and a buried bridge. Having the soil depth on top of the bridge helps to prevent the bridge from icing and thawing differently from the rest of the roadway.
- b. Julia said the first large crossing location is at MP 187.3. The bike path veers away from the interstate and there is a bit of a low spot on the north side of I-70 to work with.
 - i. She noted that during this point in the design process the designers still use very simple lines to depict the grading so we can easily make adjustments. The final grading plan will incorporate more of the detail and the naturalizing and contouring. The structure as it is currently designed is 14'H x 50'W x 140' L with an open bottom.
 - ii. We incorporated a small cross slope through culvert to keep local drainage to one side of the crossing.

- iii. Sediment ponds will be immediately uphill to divert roadway drainage and sediment flow away from the crossing structures.
 - iv. The approach slope has flat bench areas on either side which will be graded into the surrounding terrain.
- c. MP 188.3 is the second large mammal crossing. We did shift it a little to the south to allow for better grading into the local topography. This site has pretty good proximity to vegetation cover on both sides of the interstate. You can see where this is one of the spots where the recreational trail curves away from the highway and is situated before the crossing structure.
- i. This crossing structure has the same dimensions and design considerations as the previous one. A lot of the thinking to the previous location is relevant this location.
 - 1. Michelle said she supports the span bridge rather than the culvert due to the length of these structures.
 - 2. Michelle asked what is the longest underpass used by deer and elk that you found in your research?

Julia said that for both species, shorter structures are preferred, but smaller groups or individuals have been documented using structures 140' or longer.

For elk, length can be a limiting factor for larger groups, habituation and how they use the structure. It can take a little bit longer for the species to adapt to a longer structure but there is definitely well documented evidence in regard to the crossing structure dimensions and success rates.
 - 3. Michelle asked if the memo will include details on structure type -culvert versus span bridge?

Julia said yes, all those details are included. The research that shows both of these species using these structures will be included in the memo.
 - 4. Michelle commented that if you haven't talked to John Squires or Kerry Forseman or anybody that has worked with crossing structures and lynx, it might be worth it to speak with them to get an expert opinion on your research.

Julia said they have not reached out to them individually, but we have drawn upon the papers and reports they have written. We also used other multiple reports about the West Vail Pass Recreation Study and other research like the Baigas Study that looks at the probability of crossings across the state to complement the data we have on actual lynx crossing structure use.

8. Balancing Design for Small and Medium Mammal Crossings

- a. Julia reviewed the guidance we used to inform the design for small and medium crossing structures:
 - i. There will be a flat bench area immediately in front of culvert entrances. It's hard to balance having gentle approach slopes leading to these culvert locations but we also

want to avoid digging out a big hole outside of the culvert entrance that would have significant grading impacts and impacts to the adjacent vegetation.

- ii. On the downhill slopes we have to contend with steeper slopes in a few locations and we can also grade in couple of small wildlife trails to lead to the culvert to help draw animals to that location. We are striving to keep the slopes fairly gentle and not to exceed 5%.
 - iii. We are looking at a couple of different structure styles and sizes. Specifically, we are looking at pipe culverts that are 5'-6' in diameter and elliptical culverts that are approximately 5'-6' high and 7'-8' wide. Metal is feasible here and more cost-effective than reinforced concrete and because we are diverting the drainage away from the crossing structure location and will have soil substrate through culvert so we are not worried about the long term damage to the culverts if we were talking about a drainage culvert.
 - iv. We are aiming to keep the length of these crossings under 200' where possible, however there are a few locations that are greater than 200'. For the small to medium structures we have a little more flexibility and length is less of a concern, but still want to keep those culvert lengths less than 300'.
 - v. There will be 1' of substrate through the culverts and for culverts that are 6' or larger, we also want to provide some small mammal cover in the form of woody debris, rock features, or a small 6" pipe
 - vi. We want to retain as much natural vegetation cover as possible in the approaches to a crossing and augment with native plantings
 - vii. As noted for the large crossings, it is an EA requirement to install snow deflection devices to avoid having plowed snow build up in front of the culvert entrances. The snowpack could build up in front of the culverts and obscure the entrances during those times of deep snowpack. The difference is that snow that is plowed becomes very dense and it is very difficult for animals that move under the snowpack to navigate the denser layers. If you put plowed snow on top of natural snowpack you also end up with a much deeper snow level that takes longer to melt.
 - viii. Minimize impacts of recreation on wildlife crossings by locating crossings away from areas with human activity to the extent possible and strategically place boulders at larger culvert entrances to prevent ATV/snowmobile passage.
 - ix. Divert road drainage from crossing structures. These are located in low points, so drainage naturally wants to flow there. We will place sediment ponds and/or drainage culverts uphill from crossing structures and in a few places have incorporated a small ditch around culvert entrance to divert drainage from the hillside into the culvert.
 - x. There will be maintenance considerations to ensure the long-term functionality and durability of crossing structures and fencing.
- b. Julia said the first crossing is at MP 185.8 which is a new location to you. It is located between the Narrows and the Truck Ramp just above Polk Creek. This location replaces one

of the other locations we were considering further up the Pass which proved to be untenable because of steep slopes, lack of approach cover on either side, and there is a new roadway wall planned in that location that would limit the options for where we could put the crossing. This new crossing location helps fill the gap for small animals between Polk Creek and the crossing structures farther up the Pass beginning at MP 187.3

- i. This crossing is nestled into the cliffy areas with really nice tree cover on both sides of the highway. This location is between the two winter track transects that saw the greatest levels of wildlife activity noted in the EA.
 - ii. We are targeting smaller fauna in this location, so we are looking at a 4' culvert which is smaller than our 5'-6' guidance. The larger animals or carnivores can use the Polk Creek Bridge just to the north of this location.
 - iii. The uphill side of the culvert blends into the surrounding landscape and the downhill side comes out below the recreation trail. The fence is between the roadway and the trail.
 - iv. It is skewed a little bit and there is a 5% slope through the culvert so we will probably be installing some baffles to retain the soil substrate over the long term.
 - v. On the uphill side of the culvert the new roadway alignment pulls away a little bit from the existing alignment and the culvert extends 30' beyond the edge of pavement. Our preliminary idea to minimize the snow plowing impacts and deflecting the snow away from the culvert entrance is to put a barrier over the top of the culvert. This barrier would replace the fence at that point to prevent the plowed snow from obscuring the entrance. We will refine this between now and our next ALIVE Meeting to finalize what that would look like at all of these locations.
- c. The next crossing is at MP 188.7. This is in a small drainage area located adjacent to Lower Black Lake. The downhill side has a steeper slope and above the recreation trail. There is some tree cover and we will augment it with additional plantings.
- i. We are proposing a 5'H x 7'W elliptical pipe. It is very perpendicular to the road, so the length is just 144' with a 1% culvert slope. Using this type of pipe at this location allows us to bring the bottom of the pipe higher on the uphill side since the elliptical shape is wider than it is tall. Then we don't have to dig such a bit hole at the uphill entrance to the culvert which reduces the overall impact to the grading. With the dimensions and habitat cover it should be suitable for lynx and a variety of other species.
- d. The next crossing location is MP 189.0. This is located between the Upper and Lower Black Lakes. It is only 3/10th of a mile from the last location.
- i. We considered another location that provided better spacing between the other crossing structures, but this location is in a little drainage area and has much better access to habitat cover on either side of the highway. The location we eliminated had to go through the bottom of a wall that is going to be supporting



- the eastbound lanes and that would have required digging out a very large hole on the uphill side that we wanted to avoid.
- ii. While this crossing structure is closer to other crossings we ultimately decided that designing a more functional crossing structure with good wildlife access was more important than the distance between the crossings.
 - iii. The proposed culvert is skewed as it follows the drainage and is a 5' diameter pipe x 238' long. It is a 5% culvert slope so we will probably install baffles to retain the soil substrate.
- e. The final crossing is at MP 189.6. This crossing is closer to the top of the Pass at Upper Black Lake. This is where CPW's lynx collar data documented four individuals approaching the interstate in this area and one successful crossing over the interstate.
- i. We struggled to fine tune this location. Because of the terrain, the offset between the eastbound and westbound lanes and the median area and grading impacts to the tree cover and adjacent human activity, especially at the parking lot that serves both summer and winter parking just above Upper Black Lake, this is our best effort to balance all of the different challenges and provide a good location that is a bit more obscured from the parking area with good access to the tree cover.
 - ii. We wanted to avoid grading a large area and causing a lot of impact and removal of trees so that is why the culvert is skewed at this location.
 - iii. Because of the skew and the presence of the highway median, this culvert is longer than any of the other locations at 278'. It is also a larger culvert 6'H x 8'W elliptical pipe.
 - iv. Because the westbound lanes are higher than the eastbound lanes we have a 4.7% culvert slope. This is another location where we may install baffles to retain substrate. The grading shows impacts to the trees on the uphill side, but I want to be clear that this is preliminary grading, so it is worst case scenario now. We didn't want to get further ahead in refining the grading before we presented this location to you and have a chance to coordinate with some of the other parts of the project.
 - v. We do have some ideas that I think will really help to shrink the limits of disturbance and minimize both the visual and habitat impacts to the hillside. We are looking at ways to incorporate some short-tiered boulder walls that we hope can help us retain some of the existing trees that might otherwise have to be removed. These would be very short, tiered features that species with paws could easily navigate and where we do have to remove trees, we can use the downed logs along the culvert entrances to help provide cover and structure complexity. On the downhill side we plan to incorporate boulders to obscure the entrance from parking lot.



1. Michelle asked if there will be any type of artist's renditions that will look through the structures to give us an idea of what they are going to look like from the animal's perspective?

Julia said we don't have the same type of modeling that was done for the East Vail Pass Wildlife Crossing Feasibility Study.

John said we do have some 3-D models from MicroStation but right now we hadn't planned on doing an artist's rendition of what it would look like.

Julia said three of these culverts have some level of skew and one is perfectly perpendicular. It is important to remember the species we are targeting at this location don't require the same sort of sight lines that ungulates do so we have a little more flexibility in the skew and a slope..

Michelle said she understands that, but I think they still need to be able to see to the other side and with the slopes. She would like to see a follow up with Kerry or John Squires to get their expert opinion on the length and size of these culverts.

2. Michelle asked for more details about the culvert barrier.

Julia said the barrier is for snow deflection. It's conceptual now and we haven't worked it out entirely. But the idea is to have a concrete type jersey barrier going over the top of the culvert along the roadway so that when the plowed snow is being pushed to the side of the road, the barrier is preventing it from being pushed over into the culvert. We also want to protect the wildlife fence where it goes up and over the culvert.

3. Michelle commented that she remembered back in 2018 or 2019 when we were meeting to discuss wildlife crossings we talked about having the pipe open up at the median so it would be two different pipes connected by fencing. I am curious why it is now just one long pipe.

John said he have a sketch of this area had it opened up in the median. But Julia and the collaborative team agree this was the ultimate solution.

Julia said we had John's preliminary sketches to work with. We discussed this option with the design team and the issues with having a median opening is that there would be a lot of plowed snow in the median and you would have to consider impacts to the fencing through the median area. And you're also letting a lot more noise, drainage, and sediment into these culverts with an opening. These species don't require shorter or well-lit culverts, so we felt the tradeoffs of having a single long culvert was better than all of the impacts we'd have by having a median opening.

4. Michelle asked if you looked at moving this crossing a little bit north and closer to the CDOT shed, the median is wider so the pipe would be longer but could possibly be opened up.

Julia said looked at how we could split it up into two separate culverts. We looked at having one culvert under the westbound lanes on the south side of the



shed and having a rather large fenced median area that retains all the natural forest cover and having a separate perpendicular culvert under the eastbound lanes. There are a lot of complications because you have the truck parking area so the culvert under the eastbound lanes would have to be beyond the truck parking area to avoid the added road footprint and also avoid the truck lights and noise and associated human activity. Pat said with regard to the split culvert option that we looked at by the CDOT shed, the other item we were dealing with was the lighting at exit ramp off of I-70 to get to the shed.

It ends up the two culvert pieces are pretty far separate from each other and one of the less desirable things is that we end up further from some of the tree cover where we know we have had multiple lynx activity in the past. We don't have more current data to augment that, so we don't know exactly all of the lynx use of this landscape. But based on the data we do have, they weren't really approaching close to the CDOT shed so that was another less desirable feature at that location. If it is an area that animals aren't approaching that often, it probably not a desirable area to put it.

We originally tried to put it perpendicular from the outlet side on the south to the outlet side on the northeast side, it is hillier so we would have to dig out a pretty large hole which has substantial grading impacts and loss of tree cover. So that's why we ended up skewing it to lessen the impacts. We looked at a lot of different options here and it has been a really challenging location.

Julia said she has confidence the size, shape and design of the elliptical culverts are very functional for lynx. Even the other location with a 5' culvert she feels confident a lynx will use that as well if they are motivated to cross the roadway in that area. She agrees it would be nice to lessen the skews and length if possible but given the terrain challenges and roadway considerations these have the best functionality of the other locations and types we studied.

5. Michelle said anything you can do to limit the disturbance of the trees is important for all small and medium fauna.
6. Michelle it is hard without the memo and being able to see the references you used and seeing these locations and crossing types for the first time it's hard to provide all the feedback that is needed. Once we see the report, we can provide more input.

Julia said the memo is close to being finished and you should expect to receive it soon.

7. Since they are long structures, I encourage you to try to make them as large as you can.

Pat said we take your comments to heart. We tried to get them as big as we could but the limitations with grading and the impacts of trying to put bigger pipes in, as Julia mentioned, it really creates a deep hole on one side and then there are fill requirements over the top of the pipes. We have met with the interdisciplinary design team for the last few months to hash out these locations

and trying to find the best fit both from an engineering and biological perspective. It was a lot of work and we really feel that what we are proposing for the conditions, terrain, and species, these are the best locations and types of crossings.

8. Michelle and Paige said the large crossing locations look good and thinks the span bridge is the best option because it will make it feel more open.

9. Recreation Trail

- a. Julia said the Recreation Trail is still under development. We will share details with you about it when the design refinements are complete.

10. Wildlife Fence Test

- a. CDOT is still working to secure funding for the Fence Test but we are pretty optimistic that we will be able to proceed with this test and get some data from one winter's worth of impacts on which holds up the best and that will inform how we are going to design the fence across the project.
- b. The test area is just outside our INFRA Grant Project below the Polk Creek Bridge around MP 184.3.
- c. There are five proposed fence types. The main difference between them is the spacing between the posts and the presence or absence of wooden stays between the posts, or the addition of a tension wire across the top of the fence.
- d. Julia said they will be conducting a site visit in June with CDOT Maintenance to further discuss the fence alignment, especially where it approaches the road to the crossing structures. We will also need to investigate options for the fence ends around the Vail Pass Rest Area and how the fence will tie into the cliffs around the Narrows area.

11. INFRA Grant Design and Construction Schedule

- a. Mary Jo said the schedule has changed since the last time we met. The FIR/FOR design plan meetings have occurred for Package 1.
- b. There will be an FIR Meeting for the rest of the Packages in September.
- c. Package 1 construction is expected to start in late July or early August.
- d. Some of the ITF Meetings have been rescheduled so we can present the most up to date information.

12. Next Steps

- a. Design of locations and sizes finalized June 2021
- b. Design of fencing details continues
- c. ITF meeting late summer 2021
- d. Interaction with Sweep, Aesthetics, Recreation Trail, and fencing details

