KABATA KNIK ARM CROSSING DOT&PF

Meeting Notes

Subject	Bridge Approach Design Option Agency Meeting	Sheet 1 of 13	
Project Number	21132		
Meeting Date	August 19, 2005	Meeting Location	4th Floor Conference Room
Notes by	Lindsey Kendall; Terry McConnell	Office	Anchorage
Attendees:	See List Below		
Topics Discussed	Bridge Lengths	Abutments	Roadway Embankment Fill

Amanda	Henry	Alaska Department of Natural Resources, Alaska Coastal Management Program (ADNR/ACMP)
Marcie	Menefee	Alaska Department of Natural Resources, Division of Mining Land and Water (ADNR/DMLW)
Don	Perrin	Alaska Department of Natural Resources, Office of Project Management and Permitting (ADNR/OPMP)
Mark	Somerville	Alaska Department of Natural Resources, Office of Habitat Management and Permitting (ADNR/OHMP)
Larry	Peltz	National Oceanic and Atmospheric Administration (NOAA) Fisheries
Brad	Smith	National Oceanic and Atmospheric Administration (NOAA) Fisheries
Phil	Brna	U.S. Fish and Wildlife Service (USFWS)
Edrie	Vinson	Federal Highway Administration (FHWA)
Al	Ewing	Knik Arm Bridge and Toll Authority / Department of Transportation and Public Facility (KABATA/DOT&PF)
William	Greene	Knik Arm Bridge and Toll Authority / Department of Transportation and Public Facility, Attorney General (KABATA/DOT&PF, AG)
Dale	Paulson	Knik Arm Bridge and Toll Authority / Department of Transportation and Public Facility (KABATA/DOT&PF)
Henry	Springer	Knik Arm Bridge and Toll Authority / Department of Transportation and Public Facility (KABATA/DOT&PF)
George	Wuerch	Knik Arm Bridge and Toll Authority / Department of Transportation and Public Facility (KABATA/DOT&PF)
Kevin	Doyle	HDR Alaska
Duane	Hippe	HDR Alaska
John	Horn	HDR Alaska
Lindsey	Kendall	HDR Alaska
Terry	McConnell	HDR Alaska
Robin	Reich	HDR Alaska
Dale	Funk	LGL

Meeting Notes

Chris	Kaplan	LGL
Tim	Markowitz	LGL
Paul	Kendall	PND
Karen	Brown	URS Corporation
Jack	Colonell	URS Corporation
Jim	Glaspell	URS Corporation

Introduction

Robin Reich (HDR)
The purpose of this meeting is to go over Knik Arm Crossing design options. We want to discuss some options with agencies and gather your comments so that the Federal Highway Administration (FHWA) can make project decisions.

Edrie Vison (FHWA)
It is important to capture information regarding the options and your comments to report to FHWA Headquarters. This will help regarding the decisions we have made.

Robin Reich (HDR)
We are planning a meeting with the Corps of Engineers (COE) and the Environmental Protection Agency (EPA) next Friday (August 26).

Robin Reich (HDR)
During the April Interdisciplinary Team Meeting we discussed ideas on the crossing – specifically dealing with the in-water design. You asked for more information about the natural environmental impacts and what has been used in other areas. We found some examples from the Northwest (Puget Sound and British Colombia). Since April, we have also done a lot more concept development. Today we will go over these concepts, our rationale for discussing them with you. We would like to gather your thoughts on these concepts.

Paul Kendall (PND)
Today we will discuss elements of the crossing: the crossing alignment, the bridge length, the abutments, and the roadway embankment and fill.

There are two different alignments. The first is the perpendicular alignment which runs straight across Knik Arm, perpendicular to the tidal flow. The second alignment is skewed. It runs from Port MacKenzie along an alignment that is not perpendicular to the flow. These alignments could be used in combination with any approach roadway. The skewed alignment would be farther away from the mouth of Six Mile Creek and closer to a submarine trench.

Meeting Notes

We have presented 7,000 ft as a basis, which is the narrowest and least cost. The longer option would be approximately 12,500 ft across with a shoreline to shoreline piling bridge. It would have less intertidal fill, but be closer to the submarine trench.

Robin Reich (HDR)
We have two alignments in response to concerns about beluga whale habitat. It appears that belugas whales may come as far south as Six Mile Creek when they are in the Knik Arm. The purpose of the skewed alignment is to move the project away from the mouth of Six Mile Creek.

Brad Smith (NOAA) If you weren't concerned about the belugas, what alignment would you want?

Duane Hippe (HDR)
The alignment perpendicular to the tidal current is easier to design and construct. The skewed alignment would cost more.

Jack Colonell (URS)
Ice may be a concern with the skewed, but piers will be situated to deal with that.

Kevin Doyle (HDR)
The U.S. Coast Guard generally prefers a perpendicular alignment for marine navigation.

Phil Brna (USFWS)
How do these alignments relate to the on land approaches?

Kevin Doyle (HDR)
It depends on the approach.

Phil Brna (USFWS)
Are the Elmendorf alternatives still being considered?

Kevin Doyle (HDR)
We are still considering all the alternatives. A letter from the military was due today but has been extended to August 31st.

Edrie Vinson (FWHA)
Are flight patterns still a concern?

Meeting Notes

Paul Kendall (PND)
Neither option is parallel to the runway. There is a 10-20% variance which appears to be ok with the military.

Larry Peltz (NOAA Fisheries)
Does one alignment result in greater siltation?

Jack Colonell (URS)
The siltation rate would be about the same.

Phil Brna (USFWS)
So alignment may not make a big difference.

Jack Colonell (URS)
Length of abutments is the key. They are similar but not identical.

Edrie Vinson (FHWA)
What are the Pros and Cons of each alignment?

Robin Reich (HDR)
The perpendicular alignment costs less. The skewed alignment has a higher cost per foot.

Mark Sommerville (ADNR)
Do you expect the deep water trench to grow more if you narrow the channel with fill?

Jack Colonell (URS)
No, it's a pretty stable structure/feature.

Brad Smith (NOAA)
Are the fill approaches versus piling based on the composition of the bottom material.

Paul Kendall (PND)
My understanding is that the bottom is very stiff clay. Fill will go on the mud flats as is. It will be heavily protected with armor.

Robin Reich (HDR)
Do you all (agencies) have a preference?

Phil Brna (USFWS)
Lets go back to the biology.

Robin Reich (HDR)

Meeting Notes

The skewed alignment was explored because of the belugas.

Tim Markowitz (LGL)
When the belugas are in the study area varies with tide and season. When they are in the arm, they go as far south as Six Mile Creek.

Robin Reich (HDR)
The purpose of skewed alignment is to locate the bridge further from Six Mile Creek.

Phil Brna (USFWS)
Based on fish, either would work.

Robin Reich (HDR)
The findings of the fish study show that there is large difference in use of fish between the two landfall areas.

Brad Smith (NOAA)
Is a half mile buffer from Six Mile Creek meaningful when the belugas are to the south?

Tim Markowitz (LGL)
From sound attenuation, distance makes a difference, along with tide and season.

Edrie Vinson (FHWS)
Is there any difference in timing or duration of construction for perpendicular or skewed?

Duane Hippe (HDR)
The alignment wouldn't necessarily make the difference. Construction timing would vary with length of the bridge. The longer the bridge the more piles to drive and therefore more time in the water.

Paul Kendall (PND)
We have explored different bridge lengths from 7,000 ft. to12,500 ft. The base price $200 million is for 7,000 ft. Price for 12,500 ft. is $265 million. Pier supports have 250 ft. separation with a clearance of 50 ft. for marine navigation. The footprint for 7,000 ft. including fill on both sides is approximately 56 acres assuming a 2.1 slope. For 12,500 ft. the fill would be approximately 12 acres.

Larry Peltz (NOAA Fisheries)
So your numbers represent the two extremes.

Paul Kendall (PND)
We also calculated a 10,000 ft bridge, at 33 acres of fill, and $235 million.

Meeting Notes

Edrie Vinson (FWHS)
We want to consider the cost to environment as well. It seems like there is another equation. The shortest distance is deeper. What about the water volume at the proposed crossing?

Jack Colonell (URS)
The difference is velocity coupled with depth. The average velocity at Cairn Point is less than at the proposed bridge.

Larry Peltz (NOAA Fisheries)
Along the fill placed for the embankments, there will be some indirect fill with the accumulation of sediment on either side of the embankments.

Robin Reich (HDR)
Paul did work based on experience with Port MacKenzie. We would cover up some habitat but we might actually be creating some new shallow water habitat. There are juvenile salmon hanging around in the shallows in the fill that has accumulated on either side of Port MacKenzie.

Phil Brna (USFWS)
Why are the juvenile salmon hanging around in the shallows? Is it because they can't get by the dock or because they like it there?

Larry Peltz (NOAA Fisheries)
There is a habitat shift, not necessarily a gain. We would like to see numbers.

Paul Kendall (PND)
Assume an embankment with side slopes of 2.1, a 7,000 ft. bridge will probably see 400 acres of sediment accumulation. A 12,500 ft bridge wouldn't have much sediment.

Jack Colonell (URS)
Based on Port MacKenzie, those are a good representation of sediment accumulation numbers.

Phil Brna (USFWS) Mark Somerville came up with 400 acres as well.

Robin Reich (HDR)
In terms of biology, we looked at piling placement impacts on fish and beluga passage. We have talked about beluga passage with LGL. Will the belugas be able to navigate?

Tim Markowitz (LGL)

Belugas use the shallow areas close to shore. They tend to hug the coastline on both sides when entering Knik Arm. We see some mid-channel diving but they tend to stay along shore when transiting. They ride the tides.

Robin Reich (HDR)
Do belugas hang around areas like Port MacKenzie (or like the potential crossing embankment) to intercept salmon?

Dale Funk (LGL)
We have seen a few hanging around Port Mackenzie, but can't speculate that's what they are doing.

Tim Markowitz (LGL)
During the fall belugas circulate Birchwood to Six Mile.

Brad Smith (NOAA)
The project should separate construction effects (short term effects) from long term effects. We should look at the advantages of reducing noise both from construction and over the long term. There is concern over access for recreational boaters. We don't want them to have to find their way through a gauntlet.

Robin Reich (HDR)
In water constructions for 12,500 ft. will take longer. There would be more pile driving therefore increased noise.

Edrie Vinson (FHWA)
Do we know how much more time for the 12,500 ft?

Duane Hippe (HDR)
It almost doubles the number of pilings. I'm not sure it would be another season but there would be more in-water noise.

Phil Brna (USFWS)
The issue is not so much the relative short term of construction, but long term unknown effects.

Robin Reich (HDR)
We do know that Jon Houghton (Pentec) is finding juvenile salmon mid-channel.

Edrie Vinson (FWHS)
While pile driving is a concern, is long term fill placement more of a concern?

Meeting Notes

Larry Peltz (USFWS)
For the biology, the less you change the environment the better. So, a shorter bridge is cheaper for the project, but a longer bridge is better for the biology.

Brad Smith (NOAA Fisheries)
NMFS is under a court order regarding beluga whales. Adverse modification standard and critical habitat will be part of evaluation on effects on upper Knik Arm.

Larry Peltz (USFWS)
Do long term affects to belugas weigh heavier than short term impacts?

Brad Smith (NOAA)
I would think so.

Robin Reich (HDR)
Hopefully LGL's recent work will help define "critical habitat."

Brad Smith (NOAA)
Even though there has been no harvest of beluga whales since 1998 there has been no real increase in beluga numbers.

Robin Reich (HDR)
I suppose we could also consider fill on only one side, like the Mat-Su side.

Paul Kendall (PND)
The west side since bluff is higher.

Don Perrin (ADNR)
Do you have any estimates on maintenance and cost?

Duane Hippe (HDR)
We can get those to you.

Mark Sommerville (ADNR)
Would stormwater runoff drain off bridge or be piped to shore?

Kevin Doyle (HDR)
No special runoff structures are planned. Like other bridges, the project would discharge into the Arm.

Robin Reich (HDR)
Snow would be cleared right off the bridge.

Meeting Notes

Brad Smith (NOAA)
What is the economic window?

Dale Paulson (KABATA)
The time value is most important. The longer we wait, the more expensive this project becomes.

Brad Smith (NOAA)
Is one alternative more expensive than the other? How long until it evens out?

Edrie Vinson (FHWS)
NEPA requires that we look at impacts for 20 years into the future.

Kevin Doyle (HDR)
Bridges are designed to last for 50-75 years.

Edrie Vinson (FHWS)
We are looking at overall costs, including economic and environmental.

Brad Smith (NOAA)
I was surprised that pile maintenance is more expensive than fill with "riprap."

Dale Paulson (KABATA)
The longer the bridge, obviously the greater the maintenance cost.

Robin Reich (HDR)
Anything else about bridge design? Want to talk about abutments design. Abutments are at the end of the embankments. We have heard from you that the reason that their design is important is the juvenile salmon passage.

Paul Kendall (PND)
These four options with varying footprints can be combined with any bridge length.
Option 1 includes an open cell or sheet pile at the end of the embankments. It would cost 9 million dollars and have a footprint of 9 acres.

Option 2 would be a 2:1 slope at the end of each embankment. The embankment would have a circular fan at the end. It would cost 8 million dollars and have a foot print of 10 acres.

Option 3 would have a 10:1 slope extending out over 800 ft from the end of the embankments. It would cost 44 million dollars and have a footprint 45 acres.

Option 4 is a bench option. It is a hybrid of the previous two options with a 2:1 slope over some distance and a 10:1 bench over some. It would cost 44 million dollars and have a footprint of 28 acres.

Robin Reich (HDR)
The bench could be placed anywhere. The purpose of the bench in other projects is to replace salt marsh. We have gravel and rock in our project area. So the bench would be placed for salmon passage.

Jack Colonell (URS)
The circles Robin has put on the print out illustrates where there may be a greater biological concern (referring to the NOAA water level figure handout).

Current concepts for the Knik Arm Crossing (KAC) include earthen embankments extending from opposite sides of Knik Arm to a maximum depth of –20 ft re: MLLW, thereby leaving a gap of approximately 7,000 ft which would be spanned by a pile-supported roadway. Concern has been expressed that the flow around the distal ends of these embankments would pose a barrier to passage of small fishes from one side of KAC to the other, due to the overall increase in flow velocity produced by constriction of Knik Arm tidal flows to the 7,000-ft gap between the embankments.

First of all, it is important to understand that, while the maximum cross-sectional area of Knik Arm that would be "blocked" by the earthen embankments amounts as much as one-eighth (12.5%) of the total cross-section, the expected increase in overall average flow velocity is not simply the reciprocal of this "blockage." That is, the average velocity through the 7,000-ft gap will not be 8/7, or 114%, of the present average flow velocity through the KAC alignment, which would be the case if the flow were uniformly distributed across the Knik Arm cross-section. In fact, the expected increase in average flow velocity is expected to be no more than 6-7% because the much higher flow velocities through the "core" of Knik Arm carry a disproportionately large portion of the total flow.

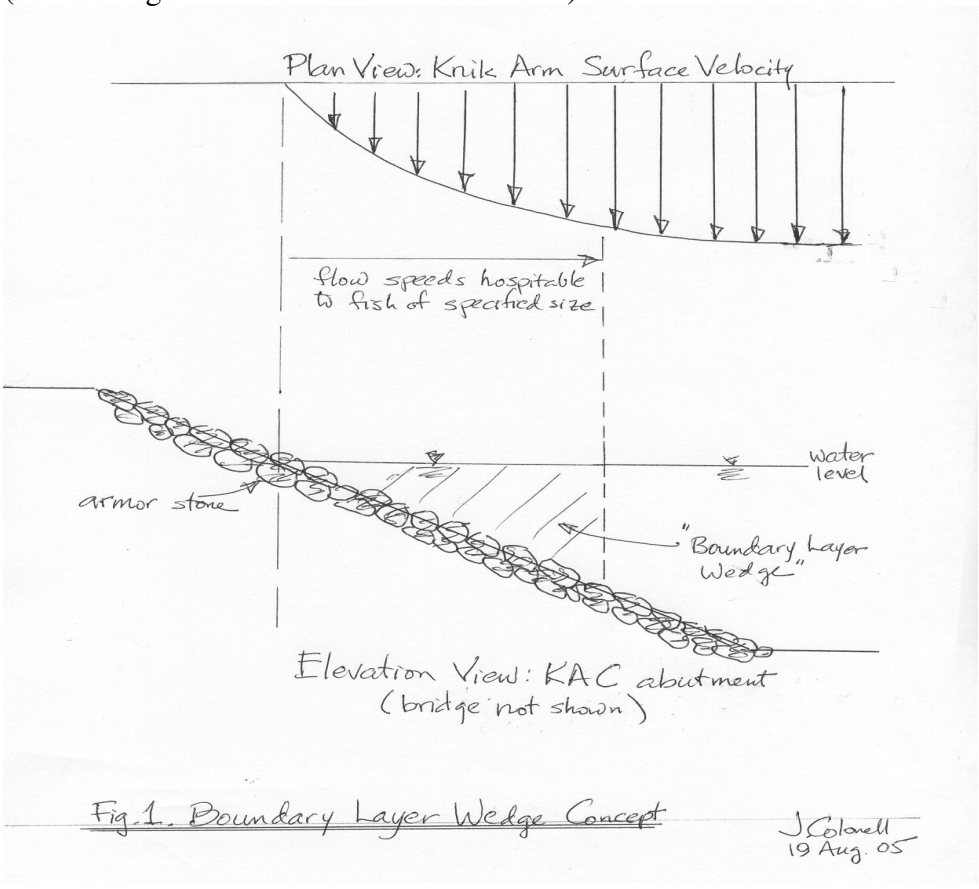
All fluid flows are impeded in the vicinity of solid boundaries. The amount of impedance, or slowing, of the flow is a function of the amount of solid boundary in contact with the flow, called the "wetted perimeter," and the roughness of the boundary itself. Accordingly, flow past the distal ends of the earthen embankments of the KAC will be similarly impeded. Indeed, there will be a wedge-shaped volume of that flow, called the "boundary layer wedge," within which flow velocities will be sufficiently impeded (i.e. lowered) to accommodate the needs of smaller fishes for lower flow speeds to navigate their way past the embankments (see Figure 1).

The boundary layer wedge will expand and contract as tidal flow speeds wax and wane with the tidal cycle. Flow speeds will be maximum at mid-tide, both flood and ebb, and will be

near-zero at flood and ebb slack water. Thus the boundary layer wedge have its minimum volume (i.e. minimum cross-sectional area) at mid-tide, an occurrence which will determine the volume of the flow cross-section within which flow speeds remain navigable for small fishes. The criterion for determining the size of the boundary layer wedge that is suitable for small fish passage is established by the maximum swimming speed that can be sustained by fish species of concern. As a rule of thumb, it is often estimated that fish can sustain swimming speeds that are equivalent to one fish length per second.

Analyses are underway to determine both minimum size of the boundary layer wedge (for a specific fish length) and the duration of least hospitable wedge size (again a function of the fish length). Initial results indicate that the wedge size is more strongly related to boundary roughness than boundary slope. Results will be presented in a manner that depicts size of boundary layer wedge as a function of time within the tidal cycle, with boundary roughness and slope as parameters.

(Refer to figure below for more information)



Meeting Notes

Robin Reich (HDR)
In Puget Sound, they like different kinds of substrate to be filled in between the armor rock. That wouldn't work here, since the fill would be taken away be the currents. Pentec said predation by larger fish isn't really a factor in murky water, but current could be. What is interesting about Jack's work is that slope doesn't slow currents as much as roughness from the arm rock.

Phil Brna (USFWS)
When does slope become issue?

Jack Colonell (URS)
When it becomes steeper.

Robin Reich (HDR)
We've looked into threshold of fish.

Jack Colonell (URS)
Fish swimming capability is about equal to their length (i.e. six inch fish can sustain 0.5 fps).

Edrie Vinson (FHWS)
If we use abutment examples, number two would be the maximum slope you would want to use?

Jack Colonell (URS)
Yes

Larry Peltz (NOAA Fisheries)
This is a good explanation of these issues.

Robin Reich (HDR)
Any other abutment questions?

Phil Brna (USFWS) Please include Jack's drawing (and notes) in the meeting notes.

Break at 3 pm

Robin Reich (HDR)
We have talked about the bridge itself and not a lot about the roadway (bottom of the bluff option).

Paul Kendall (PND)
These are the five roadway embankment options.

Meeting Notes

One option is a roadway aligned along the shoreline with a 2:1 side slope. The road would be about 8,000 linear ft and have a minimum footprint of 32 acres. It would cost about 19 million dollars not including utilities placement.

Another roadway option would have a 10:1 side slope. This is the slope typical of the area north of Cairn Point. The footprint of this option would be about 92 acres. It would cost about $73 million dollars.

Duane Hippe (HDR)
What do the cost include?

Paul Kendall (PND)
Everything except guard rail.

Robin Reich (HDR)
Would it be a two lane road?

Paul Kendall (PND)
It would be a four lane road.

Another roadway option would be the benched option. It would have a 2:1 side slope to +25 ft elevation. At +25 ft it would have a 10:1 slope down to -15 ft and then a 2:1 slope. It would be in the range of 200 ft wide and have a 55 acre footprint. This roadway would cost $35 million.

Paul Kendall (PND) Based on a cost review completed by RISE (another consultant), this road would be on 40 ft of fill.

Kevin Doyle (HDR)
This means it would cost approximately $15-20 million per mile.

Paul Kendall (PND)
Our cost estimate show it to cost about $12 million per mile.

Robin Reich (HDR)
In Puget Sound agencies ask projects to re-create intertidal zones. For some projects, they have put in spur dikes which fill in with sediment and then naturally replanted themselves or were replanted. Although we don't have salt marshes in the project area, we wanted to show it anyway.

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Paul Kendall (PND)
The spur dike option would have 200ft long spur dikes coming off the roadway approximately 400 ft apart. Assuming sedimentation on both sides of the spur dike, the footprint of the fill would be 55 acres for the structure and 32 acres for the sediment accumulation. It would cost $44 million for 20 spur dikes.

Another option would be to build an elevated viaduct four lanes viaduct. There would be no real footprint associated with this option. It would cost around $120-160 million for the roadway to the perpendicular alignment. To get the skewed crossing, the viaduct would cost $75-100 million.

Robin Reich (HDR)
Any thoughts on the spur dikes? We don't believe it is a good answer here.

Mark Sommerville (ADNR)
Not with the sediment accumulation here.

Larry Peltz (NOAA Fisheries)
I don't see any advantages.

Mark Sommerville (ADNR)
Is it the actual slope shown on the figures?

Paul Kendall (PND)
The slope is approximate.

Robin Reich (HDR)
Any thoughts on the benched option?

Mark Sommerville (ADNR)
The 2:1 sloped option makes more sense for a lot of it. I like the bench, but the fill into the intertidal is a problem.

Phil Brna (USFWS)
Based on time evaluation, how much time will water be on this section?

Robin Reich (HDR)
It depends on elevation of bench.

Phil Brna (USFWS)
We're talking about an insignificant amount of time spent in the water.

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Robin Reich (HDR) During much of the tide, water would not be covering it. Biologically, it might be important for the birds, but based on our surveys there isn't much bird use of the shoreline.

Phil Brna (USFWS) It is good to know the bird use of the area. If we have the Elmendorf alternative does this all go away?

Paul Kendall (PND)
The above the bluff alignment would have about 1,000 ft section along the bluff.

Phil Brna (USFWS)
When we started looking, we were concerned about the effects on fish, but it looks like that is not the case from these studies. It looks like the effects on Government Hill are more important.

Robin Reich (HDR)
We are seriously thinking about keeping it below the bluff as an alternative for the EIS.

Brad Smith (NOAA)
Does icing and snow removal factor into the design?

Duane Hippe (HDR)
Snow would be plowed off the bridge.

Paul Kendall (PND)
Wasn't KABATA looking at thawing scheme to keep it deiced?

Henry Springer (KABATA)
Yes, chemical removal such as simple green, wind turbines, use electricity to pump air or liquid through deck, also it is a high wind area. We expect the bridge will stay pretty clean due to the winds.

George Wuerch (KABATA)
The Municipality of Anchorage has gone to chemicals.

Robin Reich (HDR)
We are trying to get a DEIS written and narrow down the alternatives. In a week or so, we are trying to come up with what we are going to take forward. Please share your thought with me or Dale.

Phil Brna (USFWS)
Can you put together a draft of your analysis of options and send it to us?

Meeting Notes

Robin Reich (HDR)
We can put together a memo.

Edr*ie Vinson (FHWS)*
I'm hearing to focus on overall long term effects more than short term and lesser footprint.

Mark Sommerville (ADNR)
A 2:1slope looks good.

Phil Brna (USFWS)
A 2:1 slope based on analysis of fish might be best. In terms of length of bridge that is preferred. A longer bridge, with less fill, is our preferences from a biological stand point.

Brad Smith (NOAA)
Will DEIS keep all these alternatives? For some options may not be functional distinctions.

Mark Sommerville (ADNR)
In terms of the bridge length comparison, a volume picture in presentation would make it clearer.

Larry Peltz (NOAA Fisheries)
You should flesh out fill on one side and not the other.

Robin Reich (HDR)
We may be a meeting with COE and EPA, Skip Joy and Steve Duncan, next Friday 10 am. If you want to come to that meeting, you are welcome.

Meeting Adjourned 3:35 pm