Susitna-Watana Hydroelectric Project
(FERC No. 14241)

Initial Study Report Meetings
October 17, 2014
Part A – Transcripts

Millennium Hotel
4800 Spenard Road
Anchorage, Alaska 99517

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SUSITNA-WATANA HYDRO

Clean, reliable energy for the next 100 years.

SUSITNA-WATANA HYDRO

Agenda and Schedule

Initial Study Report (ISR) Meetings

Ice (Study 7.6), Instream Flow (Study 8.5),

Riparian Instream Flow (Study 8.6),

Riparian Vegetation (Study 11.6)

Millennium Hotel

4800 Spenard Road

Anchorage, Alaska

October 17, 2014

ATTENDEES

Emily Anderson, Wild Salmon Center
Julie Anderson, Alaska Energy Authority
Nate Anderson, Alaska Energy Authority
Laura Arendall, (phone) R2 Resource Consultants
Greg Auble, U.S. Geological Survey
Brian Bjorkquist, Department of Law
Jessica Blizard, Tetra Tech
Becky Long, Unidentified
Taunnie Boothby, DCCED
Martin Bozeman, Alaska Energy Authority
Mark Bureti (sp), Alaska Department of Fish and Game
Bryan Carey, Alaska Energy Authority
John Clark, St. Hubert Research Group
Kasey Clipperton, (phone) Golder
Jason Conder, Environ
Justin Crowther, Alaska Energy Authority

Matt Cutlip, Federal Energy Regulatory Commission
Mark Dalton, HDR
Connie Downing, Tyonek
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Kevin Fetherston, R2 Resource Consultants
Bill Fullerton, Tetra Tech
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Harry Gibbons, Tetra Tech
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Dara Glass (phone), CIRI
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Leanne Hanson, U.S. Geological Survey
Mike Harvey, Tetra Tech
Jeremy Hayes, MSI Communication
Sandie Hayes, Alaska Energy Authority
Dan Healy, Northwest Hydraulic Consultants
Eric Henderson, Unknown
Phil Hilgert, R2 Resource Consultants
Chris Holmquist Johnson, U.S. Geological Survey
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Ellen Lance, U.S. Fish and Wildlife Service
Michael Lilly, GW Scientific
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Greg Reub, Environ
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Tim Russo, Unidentified
Alice Shelly, R2 Resource Consultants
Al Shepherd, Unidentified
Alaina Smith, Tetra Tech
Sam Snyder (sp), Unidentified
Marie Steele, Alaska Department of Natural Resources
Miranda Studstill, Accu-Type Depositions
Wayne Swaney, Stillwater Sciences
Cassie Thomas, Unidentified
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Gary Van Der Vinne, Northwest Hydraulic Consultants
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Jeff Walker, Unidentified
Steve Walker, Unidentified

Sue Walker, National Marine Fisheries Service
Aaron Wells, ABR
Simon Wigren, HDR
Fred Winchell, Louis Berger
Whitney Wolff, Unidentified
Mike Wood, Susitna River Coalition
Lyle Zevenbergen, Tetra Tech
Jon Zufelt, HDR

INTRODUCTION

MR. PADULA: Good morning, folks. We're going to get started. Those of you who have been with us all week, this is day three of the formal Initial Study Report meeting and the Susitna project. Today we're going to focus on -- going on the agenda, we get through Ice Processes, Fish and Aquatics Instream Flow, Riparian Instream Flow, and Riparian Vegetation, so only four topics, but four big topics.

Again, my name is Steve Padilla with McMillen. I'll be your facilitator for today. You can't hear at all?

MS. KEEFE: Not much.

MR. PADULA: Well, that's because you're sitting back in the corner.

UNIDENTIFIED SPEAKER: Maybe you're getting hoarse.

MR. PADULA: So, again, day three. I appreciate folks who have made it back, and I think there's a few new faces in the room for today.

Similar remarks for those who have been here this week. If we have any safety issues, again, any of these exits will get you out to the hallway and stairs downstairs quickly. Bathrooms are straight out and down the hallway to the right.

We have folks on the phone. I think we've solved, but not fully, our issues with the microphones. Again, I appreciate everybody paying attention. If you have comments to make, use the microphone, keep it close to your mouth, talk directly into it. That will help us a lot.

Please identify yourself, at least the first one or two times you make comments for the court reporter's benefit. We do have a court reporter. Miranda is back with us for day three.

We'll have our scheduled breaks and lunch per the agenda, states those times. There is, as the last two days, opportunity for caucus if anybody needs that. Please let us know, and we'll work out those details.

Again, identifying yourself -- yes, Cassie?

MS. THOMAS: Several of us had a question about how soon the transcripts will be available?

MR. PADULA: Do you have an estimate, guys?

MS. STUDSTILL: I think (indiscernible - distance from microphone), and then the week after (indiscernible - distance from microphone).

MR. DYOK: I don't know a date, but it would be no later than the 15th of November. But is there a need to have them like as soon as possible, Cassie?

MS. THOMAS: Yeah (affirmative), because those of us who have been trying to do this over the phone, and we've (unintelligible) hear what's really being talked about.

MR. DYOK: Okay.

MS. THOMAS: No one can hear what's really being talked about.

MR. DYOK: As soon as we can have them available for filing, we'll get them on our website and file them.

MR. PADULA: And the mic wasn't on there, but it sounds like as soon as they're available, EPA will let the folks know, and that will hopefully compensate for some of the issues with the folks on the phone not being able to hear everything.

Let's start .....

MS. WOLFF: This is Whitney. That's why you (indiscernible - interference with speakerphone).

MR. PADULA: Yeah (affirmative). So again, Wayne's microphone wasn't on, so we will, again, do better during the day.

So let's start with introductions, and I know, again, for folks on the phone, they're not going to be able to hear this because we're not going to pass the mic around to the room. But everybody will, if you haven't already, sign in on the sign-in sheet. So again, that information is available. Bear with us, we're just going to do some quick introductions in the room.

MR. CROWTHER: Justin Crowther, AEA.

MR. WIGREN: Simon Wigren, HDR.

MS. SHELLY: Alice Shelly, R2.

MR. HILGERT: Phil Hilgert, R2.

MR. REISER: Dudley Reiser, R2.

MR. DYOK: Wayne Dyok, Alaska Energy Authority.

MS. MCGREGOR: Betsy McGregor, Alaska Energy Authority.

MS. GLASS: Dara Glass, CIRI.

MS. LANCE: Ellen Lance, Fish and Wildlife Service.

MS. MCCRACKEN: Betsy McCracken, Fish and Wildlife Service.

MR. VAN DER VINNE: Gary Van Der Vinne, NHC.

MS. WALKER: Sue Walker, National Marine Fisheries Service.

MS. STEELE: Marie Steele, Department of Natural Resources.

MR. KLEIN: Joe Klein, Alaska Department of Fish and Game.

MR. ZUFELT: Jon Zufelt with HDR.

MS. PELTIER: Kathryn Peltier, McMillen.

UNIDENTIFIED SPEAKER: (Indiscernible - distance from microphone).

MR. RYCHENER: Tyler Rychener, Louis Berger (unintelligible).

MR. WINCHELL: Fred Winchell, Louis Berger.

MS. THOMPSON: Rachel Thompson, Alaska Energy Authority.

MR. KRISTAOVICH: Felix Kristanovich, Environ.

MR. HOLMQUIST-JOHNSON: Chris Holmquist-Johnson, USGS.

MS. GLASS: Dominic Glass, Environ.

MR. CONDER: Jason Conder, Environ.

MS. HANSON: Leanne Hanson, USGS.

MR. OTT: Doug Ott, Alaska Energy Authority.

MS. ANDERSON: Julie Anderson, Alaska Energy Authority.

MR. LACROIX: Matt LaCroix, EPA.

MR. MCLEAN: David McLean, Northwest Hydraulic Consultants.

MR. VASQUEZ: Jose Vasquez, NHC.

MR. BOZEMAN: Marty Bozeman, AEA.

UNIDENTIFIED SPEAKER: (Unintelligible), AEA.

MR. REUB: Greg Reub, Environ.

MR. GEIGER: Hal Geiger, St. Hubert Research Group.

MR. CLARK: John Clark, St. Hubert Research Group.

MR. GILMOUR: George Gilmour, Meridian Environmental Services.

MR. PETRONE: Kevin Petrone, R2.

UNIDENTIFIED SPEAKER: (Indiscernible - distance from microphone).

MR. WOOD: Mike Wood, (indiscernible - distance from microphone).

MS. JONES: Kim Jones, Fish and Game.

MR. BURETI: Mark Bureti, Department of Fish and Game.

MR. AUBLE: Greg Auble, USGS.

MR. HARVEY: Mike Harvey, Tetra Tech.

MR. PADULA: Speak as loud as you can, folks, please.

MR. ZEVENBERGEN: Lyle Zevenbergen, Tetra Tech.

MS. BLIZZARD: Jessica Blizzard, Tetra Tech.

MR. GIBBONS: Harry Gibbons, Tetra Tech.

MS. LONG: Becky Long, Susitna River Coalition.

MS. THOMAS: Cassie Thomas, National Park Services.

MR. JAYJACK: Nick Jayjack, FERC.

MR. CUTLIP: Matt Cutlip, FERC.

MR. FULLERTON: Bill Fullerton, Tetra Tech.

MS. KEEFE: Mary Louise Keefe, R2.

MR. PADULA: Thank you. And folks on the phone, if you could, please, introduce yourselves.

MR. SHEPHERD: Al Shepherd (indiscernible).

MR. RUSSO: Tim Russo, Tim Russo from (indiscernible) .

MR. ERTMAN: Steve Ertman from HDR.

MR. WALKER: Jeff Walker with (indiscernible).

MR. HEALY: Dan Healy, Northwest Hydraulic Consultants.

MS. WOLFF: Whitney Wolff, Talkeetna Community Council.

UNIDENTIFIED SPEAKER: (Indiscernible - interference with speaker-phone).

MR. CLIFFORTON: Stacy Clifforton (indiscernible).

MR. ROTHWALL: Eric Rothwell.

MR. PEDERSON: Dirk Pederson from Stillwater Sciences.

MR. PADULA: Thank you very much. Most of that came through pretty well. So again, if you have questions, just give us a heads up, and we will (indiscernible - interference with microphone).

Yeah (affirmative), and we have had some issues with background noise. So if you can put yourselves on mute on the phone, unless you want to speak to us. That might help. I appreciate that.

So again, I apologize to folks who have listened to this for two days already, but just to quickly cover the purpose of the meetings. Again, this is a required meeting after the filing of the Initial Study Report, intended for the applicant, participants, and FERC staff to have an opportunity to discuss the study results to date as well as any variances that might have occurred during the work that's been done to date, propose modifications for upcoming work, and again, the opportunity both for the applicant and others to voice their opinions on whether there's any need for modifications to be considered going forward.

Again, those of you that have been with us for a while, there was a draft Initial Study Report that was issued in February, and the final was

issued in June. We had an extension of time granted by FERC, given the volume of information, which ran through the beginning of this month, leading up to the set of meetings this week and next week.

As you know, last month there were a number of supplemental technical memos that were submitted to bring folks up to speed on work that had been continuing since the filing of the ISR. Again, it was substantial information, so FERC granted, again, another extension of time for folks to have an opportunity to review that information and has also set up a second set of meetings in January that will specifically focus on the content of this latest information in the technical memos.

We have tried to not focus much on the 2014 information so far, but there have been instances where it has been helpful. And we're certainly open to, again, depending on the questions and interests of the audience, to have our folks go over some of the 2014. So again, when that makes sense and folks want to do that, we certainly will.

So the new upcoming major deadlines, January 22nd, which will follow the next set of ISR meetings is now the deadline for AEA to file

meeting summaries on both sets of meetings. Thirty days later is the deadline for any of the licensing participants to file comments on both the meeting summaries as well as their own recommendations to FERC in terms of potential modifications to existing studies or any recommendations for new studies.

A month later, there's response opportunity, and then finally in April, FERC will make its determination as to any disagreements which are raised and their recommendations as to needing modifications to the study plan for future work. And then we have a couple of just placeholders there.

Again, after the next full season of work, we have a similar opportunity here where there will be an updated study report prepared, and then the same kind of opportunities for comment.

We're in day three here of this week, October 17th, and the agenda is up there on the right indicating what we'll cover today. And then there are three meetings scheduled next week, which will continue the set of Initial Study Report meetings.

We can skip that slide. It says a lot of what I've said.

A reminder for folks here just to how the Initial Study Report was formatted. Part A reproduced what was issued in February as a draft ISR. Part B provided supplemental information or errata on Part A, and Part C provided new information. Again, this took us through June in terms of information.

The approach for today will be the same as the last couple of days. We're going to have all of our lead presenters quickly go through approximately a 10 to 15-minute overview, quickly get through objectives, components, and methods. Again, we assume folks to have read that information either back in the study plans or in the ISR itself.

We're going to move on to the focus on variances, again, that may have occurred during the work done to data; summarize results, again, focusing on 2013. And if the AEA is proposing any modifications going forward, we will cover that information. Then we'll open it up to discussion.

And, again, I think there's been some good feedback. I've been

getting some good back and forth technical discussion over the last couple days. We want to encourage that to continue, and that's all.

The last three slides, again, are just the reproduction of FERC's regulations as to requirements if someone is going to suggest a modification to a study or a new study. The information is up on the walls in the back of the room if folks want to reference that.

And, Wayne, anything to say today? Nope.

MR. DYOK: Nope. Just let's keep the dialogue going like we had the last couple of days. It was very productive, and I'm going to encourage Jon and others -- Steve said 10 to 15. I'm going to say 10.

STUDY OF ICE PROCESSES IN THE SUSITNA RIVER (STUDY 7.6)

MR. ZUFELT: You ready? So Jon Zufelt. I'm with HDR, and I'm the study lead for the Ice Processes in the Susitna River Study. And I'm not going to go, you know, word for word over everything here, but basically, you know, you've had this material.

The objectives more or less are to understand what the ice processes

are on the Susitna River currently through a variety of means, direct observations, aerial reconnaissance, remote cameras, time-lapse photography, and historical data from the 80's studies. And through that develop a modeling approach, conduct numerical modeling efforts on the existing conditions, and then with the confidence in those models, be able to simulate proposed project conditions.

And within all of our study there's a large component of interaction with a fair number of other studies that do require information on what's going on in the river during wintertime, during the ice season, which, for this river, is anywhere from -- well, like we've see in the past couple weeks, you know, mid-October to last year, 2013, where we didn't have break-up until the end of May 2013. So it's a considerable amount of time.

The components in this study more or less cover the, you know, were in line with the objectives, and these are described in the ISR Part A.

As far as variances, we really didn't have any significant variances at all. There were very minor ones in the study plan such as suggested locations for time-lapse cameras. Due to better points of view on the river,

we changed those slightly. So not really any variances at all.

Then just a summary of results that are in the ISR, more or less our direct observation results, which is the break-up and the freeze-up observations from the mouth of the river up to the Oshetna, as well as mapping of thermal and velocity open leads in the river a couple times during the winter. Ice thickness, elevation, winter discharge measurements, and basically, you know, that's what's in the ISR.

Another couple things in the ISR; we did a very limited assessment of the Lower River water elevations that could occur due to increased discharges in a couple locations in the Lower River at Sunshine and Susitna Station. That's in Appendix A.

And then there was a white paper that was developed. It was a review of existing cold regions hydropower projects around the world, mostly in Canada with some in Iceland, and Norway, and Sweden and what techniques were used to analyze and model those systems in terms of numerical simulations. And that's Appendix C.

And then we're not going to talk about '14.

Really there wasn't any proposed modifications, other than the fact that we did not have access for placing remote cameras on the CIRWG lands, and so we used other means to supplement our lack of cameras. We used additional aerial observation flights, and we also had the benefit of a couple of the remote telemetered sites, the ESS stations. So we were able to use that as well.

And then I'll just end right there, and we'll open it up.

MR. PADULA: Thank you, Jon. Questions for Jon? The mic is on and.....

MR. VAN DER VINNE: This is Gary Van Der Vinne, and I'm with NHC. I have a few questions I guess.

MS. STUDSTILL: Can I just interrupt for a second? You're going to have to talk a lot louder, directly into the microphone because we're not going to.....

MR. VAN DER VINNE: All right. I'll put this here.

MS. STUDSTILL: Thank you.

MR. VAN DER VINNE: That better? Just that and I made some

notes beforehand. So I'm going to go through them.

The FSP identified aerial reconnaissance for 2014 freeze-up, and you said you're not going to be doing anymore? Is that.....

MR. ZUFELT: That is the plan right now. It was felt that there are some budget concerns for the freeze-up observations for 2014.

MR. VAN DER VINNE: So two years is enough for.....

MR. ZUFELT: Two years -- the two freeze-up observation years -- freeze-up tends to progress in a -- I don't want to say uniform. It's not uniform, but it's not as highly variable as break-up occurs. And generally we have a process where the ice cover -- you know, the ice stops moving down near the mouth, and it starts building there; and once it works its way past the Yentna River, it pretty much, in a progression, just leads up stream. There are a few small areas where short ice covers also meet and form a bridge over and progress upstream. They usually tend to progress maybe a mile or two before being overtaken by the main river progression.

The Devil's Canyon area is a mish-mash of happening in the wintertime. It freezes up, blows out, freezes up, blows out, you know,

almost daily it seems at times, and then upstream of Devil's Canyon, once freeze-up progresses through that area, it pretty much is locked in for the winter.

MR. VAN DER VINNE: And that's consistent with the 80's observations as well?

MR. ZUFELT: It is, especially our 2012 freeze-up and the -- and this is in the ISR, but I believe it was the 1982 freeze-up; they tracked really closely together. Even the occurrence of small ice covered bridging areas within Devil's Canyon that tend to form and, you know, maybe progress about a half a mile.

MR. VAN DER VINNE: Because the opportunity is there to collect more data before the program is over, so it would be better if you could do it under a freeze-up program.

MR. ZUFELT: And we do have the remote telemetry cameras still at several of the ESS stations that do provide -- provides things to look at every morning when I turn on my computer.

MR. VAN DER VINNE: Yesterday some of the other studies were

talking about modeling up to Station 29.9, whereas you're proposing just to do the Middle River. Have you considered extending that down to 29.9 to be consistent with their models?

MR. ZUFELT: We have not. Below the three rivers area, we move into a highly-braided river system, many channels. Models just don't exist to model highly complex channel configurations with ice processes.

MR. VAN DER VINNE: Yet, the Lower River has some significant ice processes; does it not?

MR. ZUFELT: It does. Not as, what I would say, vertically dynamic as the Middle River and the upper. Just because we have so many potential channels for ice to move down, or to block up, and the water to just shift to other channels. The impacts on water elevation are less in the Lower River just because we have so many braided channels.

MR. VAN DER VINNE: So how are they going to get information on ice from you if we don't have a model for that area?

MR. ZUFELT: Good question.

MR. VAN DER VINNE: Another issue during break-up, open leads

and ice jamming are a significant phenomenon that they can't be modeled very well from the ice model. How are you going to capture that in the project scenario?

MR. ZUFELT: What specific -- you mentioned open leads and.....

MR. VAN DER VINNE: How are you going to assess the changes in those phenomena?

MR. ZUFELT: The river 1D model that we're using is a dynamic ice processes model. So as discharge increases, there will be forces exerted on existing ice covers. If they exceed the resisting capability in the ice cover or ice jam, it will fail and move downstream.

So if we're looking at future operating conditions, the ice cover itself will likely be different, and the discharge response from our project operations will also be different. But we'll -- you know, in ice jam theory, you're still using this -- well, it's not an equilibrium theory. It's a dynamic equilibrium more or less, and it will be -- when the forces reach a certain level, either the thermal forces by melting out the ice or the dynamic forces, you know, exceeding the resisted forces of the jam, it should fail.

MR. VAN DER VINNE: And the model can do the failure of the jam?

MR. ZUFELT: It will calculate the forces exerted on the jam. And again, this is all a 1D model. So it's a 1D assumption, integration of the many channel characteristics, and the model will be able to decide at this location, due to this discharge and the current ice thickness, if it cannot stay in place, then it will move downstream.

MR. VAN DER VINNE: And the formation of the jams as well?

MR. ZUFELT: Formation of the jams, we do have to input locations. Well, in freeze-up formation, we do have to input locations of ice bridging points.

MR. VAN DER VINNE: And what's the status of the model right now?

MR. ZUFELT: We are in the ice model calibration stage right now.

MR. VAN DER VINNE: So the model has been.....

MR. ZUFELT: The model has been calibrated for open water conditions, and it's responding exceptionally well. It's a mass conservation

model, so it's tracking, you know, wave forms through the system very well.

MR. VAN DER VINNE: Uh-huh (affirmative). But that's the existing part of the model. They were developing some ice components?

MR. ZUFELT: It's all put together.

MR. VAN DER VINNE: It is?

MR. ZUFELT: We're in the process of calibrating to the -- we are calibrating to the September 1st, '12 through June 30th, '13 time period, to simulate the entire winter.

MR. VAN DER VINNE: Does the model have border ice capabilities?

MR. ZUFELT: It does. And what we did this past winter was to gather data from, again, from the remote telemetered ESS cameras at three locations where we were able to superimpose a grid to see how the border ice grew with time because we have, you know, hourly photos of those locations, and we're able to get data in order to calibrate an empirical relation for the border ice development.

MR. VAN DER VINNE: So it's empirical?

MR. ZUFELT: Yeah (affirmative).

MR. VAN DER VINNE: Any idea how that will change with the project conditions?

MR. ZUFELT: Being an empirical relationship, it's going to depend on the water velocity, ice concentration, air temperature.

MR. VAN DER VINNE: Just a minor comment about the panel when I'm reading through these freeze-up and break-up reports. It would be a lot easier to process the information if we had some schematics of where things are happening with mapping, you know, the open leads and jam locations. I know you're much more familiar with the systems, so you know where everything is. It would be a little easier to process the information.

MR. ZUFELT: And the sheer mass of data that goes to (unintelligible)[GINA] is unfathomable.

MR. VAN DER VINNE: Uh-huh (affirmative). We talked about this last time a little bit about doing further characterization of ice

thickness variation, frazil deposition in the Focus Areas to give you a better idea of how to do the 2D modeling. Any more consideration in taking up that?

MR. ZUFELT: Yes, when we were putting together our materials for the Proof-of-Concept meeting last April, what Steve Ertman and I looked at was to run the 1D model. And at the time, since we didn't have our calibrated River1D ice model working, used a surrogate from just HEC-RAS with an ice cover. We looked at the direct observation photos as how ice progressed or how ice conditions changed at Focus Area 128 to Slough 8A. We were able to see, over time that, like Side Channel 8A (or Side Channel 8A -- I believe that's what we're calling it.) that Side Channel 8A would freeze up first before the main channel, and so we were able to input ice conditions for that scenario using the 2D model to run the River2D FA-128 model with conditions like mid-channel 8A covered or the slough cover as it would appear in the aerial observations. And then we ran the 1D model again to a freeze-up jam condition and looked at the ice thickness. Then we're able to put that into the Focus Area-128 2D

model and see how things changed.

MR. VAN DER VINNE: But no direct measurements?

MR. ZUFELT: Yes, we do have some direct measurements.

MR. VAN DER VINNE: Some but not -- okay.

MR. PADULA: And if I could just add, our plan for this winter is to get more direct measurements.

MR. VAN DER VINNE: Okay.

MR. ZUFELT: Basically, water elevations and ice thicknesses to be able to bound the Focus Area that we're modeling and get a better characterization of ice thickness.....

MR. VAN DER VINNE: Uh-huh (affirmative).

MR. ZUFELT: .....and water (elevations).

MR. VAN DER VINNE: And you're measuring solid and frazil.....

MR. ZUFELT: Yes.

MR. VAN DER VINNE: .....components? I think that's it.

MR. PADULA: Thank you. Anyone else have any questions for Jon?

MR. SHEPHERD: This is Hal Shepherd.

MR. PADULA: Go ahead, Hal.

MR. SHEPHERD: I wanted to ask, back on the slide about the objectives, I think you mentioned that this is a current -- excuse me -- current ice flow condition. And I don't know if -- pardon me, if it's not the proper time to bring this up, but whether there would be any future studies for (unintelligible)[ice processes] that's going to incorporate future climate change?

MR. ZUFELT: The plan for the ice modeling is to -- once we have our River1D model calibrated, we will verify the model with the 2013-2014 data, and then we'll go back to our 50 years of data that we have and simulate each year based on climate and discharge in the rivers. We have.....

MR. SHEPHERD: (Indiscernible - interference with speakerphone).

MR. ZUFELT: Pardon me?

MR. SHEPHERD: So when you say 50 years, the data or future?

MR. ZUFELT: Right. This 50 years of data for the past 50 years.

Yes. What we have done for -- similar to what the Geomorph model has done and Instream Flow -- you'll hear the instream flow model I think on the next presentation. We have identified three representative years that correspond to cold, you know, much colder than average winter, which also turned out to be dry; a much warmer than average winter, which actually turns out to be a wet winter; and then another average winter. And those are the three representative types of years that we'll be running through the 2D models of Focus Areas.

With the River1D model, we are able to modify the inputs and input any type of climate change -- you know, either apply a three-degree increase in air temperature or maybe some type of percentage increase in precipitation or decrease to reflect climate change conditions and possibly use those on an average or for a cold or warm winter.

And as John (Hamrick) pointed out yesterday, the operation of the closed dam would allow for a variety of outflow conditions of the dam in terms of water temperature, and that is a key component of the River1D model; the inflow temperature through the system.

MR. SHEPHERD: And just one more question. And the projection of the modeling for future, how far would you project for -- you know what I mean, as far as how far into the future making projections?

MR. ZUFELT: You know, we could -- if we had confidence of what future conditions are, we could basically run pretty much any condition that we need to in the model.

The reason for the 50 years of record that we're going to be running is we have 50 years of concurrent discharge and weather information, especially air temperatures; that's a wide variety of conditions that we're able to model. Yes, they are historic conditions, and they may not represent future conditions; but it is a wide range of variables, you know. We could have a winter where the discharge is higher or more variable. We could have a winter where it starts out extremely cold and then is fairly mild in January, like this past winter.

MR. SHEPHERD: Good.

MR. PADULA: Mike, you want to let Dominique go first?

MS. GLASS: (Indiscernible - interference with speakerphone)

MR. PADULA: Dominique, you want to first introduce yourself.

MS. GLASS: Huh? Oh, I'm sorry. This is Domini Glass. As you go through the instream flow process, there's likely to be some discussion about, you know -- I don't know -- daily flow releases, that kind of thing, to try to address for the amount of habitat that might be affected by the project.

And you just mentioned the fact that the temperature of water release, of course, has an effect on your final results. And the question is, is there any way to kind of bracket what the effect on these or coldest possible releases versus the warmest or just to get (indiscernible - interference with speakerphone).

MR. ZUFELT: With the -- I guess you could say that's more with the integration of the models. We will be looking for inflow temperatures, and the discharges being released from the dam. Then we will be able to model those and respond with this is how the ice would progress under that scenario and where the open water would be, where the upstream edge of the ice cover would be, you know, period of time that we would have

ice cover.

MR. DYOK: Maybe I could help, you know, address your question, Dominique. So the maximum temperature that you're going to have in the wintertime is 4 degrees, you know, Celsius, right, because that's the densest part. And then at the surface I'm not sure what the minimum temperature is going to be because you're pulling from the surface. So it may near zero, but I think that's the sensitivity that it could, you know, run, and give to Jon in his ice model to look at what's the coldest that you could get and then, obviously, the warmest that you could get is 4. That's probably something to answer to your question to bracket what's capable, you know, downstream, and then you could look at the discharges associated with that.

MR. PADULA: Any other questions for Jon? Mike.

MR. HEALY: This is Dan.

MR. PADULA: Dan, hold on just a second. We've got one question in the room. Then we'll come back to you. Thank you.

MR. WOOD: This is Mike Wood. And I just -- there's a lot I'd like

to say and probably some I shouldn't. But I think the significance of Jon's work, it cannot be underestimated here because the way this river freezes is so unusual in the way it freezes up and is (unintelligible) ice covered, and then where the ice goes out. It's huge.

There's two parts to the (unintelligible) thing that I'd like to mention is the work Jon is doing on the ground and about studying the ice and what the effects of operations of the dam would be on that Middle River area, and then just in general, the amount of effort given to the winter studies on this project. It's been -- when this was originally (unintelligible), it was basically a one winter study, one season, 2013-2014 of studies of everything that happens in the winter out there on (unintelligible)[the river].

And, as we know, it's so difficult to get there. The studies haven't been as robust as the summer studies, and I think that's just worth mentioning because of the amount of complexity of what's going on with that ice, especially with fish.

The other thing is -- let me see. The effects of climate change

coming down the road and water temperature, I think is important because over time it's possible this river may not even freeze in 30 or 50 years. We already know of lakes that we used to fish on that don't even freeze anymore, and I think the idea of what climate change could do to the water temperatures is very important.

And overall because the river freezes solid throughout the winter and all the tributary channels freeze solid, the amount of water discharged from the project will add a significant amount of water to the system in different temperatures than exists now.

In our mind, we've set the -- we've all -- like we all have modeling going on in our own brain. And so some of us have decided to quit modeling this process at 29.9. Some of us have decided to quit modeling at the Parkside Recreation. And I think first to all really know what's going on in the process, we need to understand that if that's what you think, that's great, but how can we see that in this model; like how can you prove that you're right in this model?

And I think the ice conditions in particular in this river is important

to understand what the effects of a higher level of water and warmer temperatures in that water and higher velocity could do to the impacts of the ice below the three rivers. What you're talking about now is studying basically to the Talkeetna confluence, and I think extending that beyond is very important.

Again, I think the work Jon is doing is fascinating and has a huge relevance to how this river is made up. I think the amount of time -- and this might go with instream flow -- that we spend on that river is very significant because it's so difficult to be there now. And if you look at the amount of efforts that we've had in the last two years on that river in October, November, December, January, and then in April and May during break-up (unintelligible). And when we're talking about changing the river's ecosystem that relies on this ice, I think more efforts should be given to this period of time. Thanks.

MR. PADULA: Thanks, Mike. Dan, on the phone, you had a question?

MR. HEALY: Yeah (affirmative), the think one is a comment. It

may be a suggestion, and that would be to emphasize the characterization of important processes in the study for assessing project impact related to those processes. And those are the processes that are largely prescribed to the models when you tell the models what's happening. The model is not an output for the model.

And there's two things that I think are important that come to mind. There may be others, but one is ice jam occurrence. Where, when, and how often? Is that -- how would we assess that, and that's something we're going to tell the models. And the database for running the models, there's a process going on in there. What's happening in the Focus Area is related to what's happening in the channels. (Indiscernible - interference with speakerphone) and we're using that information as prescribed in the initial (unintelligible)[ice] conditions or the static 1 or 2D hydraulic model in the Focus Areas. It's really not an ice process though.

So I think that there needs to be acknowledged designations of the model, but I think there needs to be emphasis on getting that -- characterizing those processes and some studies for how you assess project

impacts if you have limitations from the models.

(Indiscernible - interference with speakerphone)[Why does bridging occur at each place]. There could be value in putting that (indiscernible - interference with speakerphone)[in the report], maybe not the specific task (indiscernible - interference with speakerphone)[but just in general].

Then the second question and maybe this (indiscernible - interference with speakerphone)[relates to] that understanding of the field data, sometimes you need to run the models to see if you're getting what -- what (indiscernible - interference with speakerphone)[you would like]. Has there been any kind of preliminary modeling just to try to see if we're collecting information that's going to help us get calibrations or, you know, is that -- have you thought about that? Is there any kind of consideration on sort of the (indiscernible - interference with speakerphone)[feedback or data that you need] as you progress along?

MR. ZUFELT: Yes, and that's one of the reasons that -- oh, repeat the questions. Okay. All right. Got you.

All right. I'm going to answer the second one first, which was is

there any model running that would provide feedback to tell us have we collected the correct data, and is there opportunity to collect more data to further refine the models? And that is our plan for this winter season. It is primarily focused on Focus Areas, and to be able to have greater confidence in our River2D model by obtaining both water elevations and ice thicknesses at several locations within the model area of the Focus Areas to better be able to better calibrate those models for existing conditions. So that is planned for this winter.

We have started running two -- we have two of the Focus Areas pretty much calibrated, FA-104 and FA-128. We're working on additional ones as the bathymetry conditions become available on the other models, and we're working heavily with the instream flow and the geomorphology folks to be able to get the most out of all of our efforts for you know, creating the grids and such for the models.

I want to come back to your first comment, which to paraphrase, I believe what you're saying, Dan, was we need to describe those ice processes in a way, based on our existing observations, that we will be able

to use that knowledge in assessing the proposed operational conditions in the future to tell us a little bit more and have more confidence on things like where will the ice cover bridge during freeze-up, or where are the most likely locations for ice jams to occur during break-up based on the fact that we're going to have totally different conditions in future operating conditions, both freeze-up and break-up. Is that correct?

MR. HEALY: Jon, I'm catching about every third word.

MR. ZUFELT: Oh, I'm sorry.

MR. HEALY: I mean, I'm relying on Gary to followup because I just can't hear (unintelligible).

MR. ZUFELT: I apologize for that, but what -- what we are planning is.....

MR. PADULA: Get closer if you can.

MR. ZUFELT: What we are planning as we model the existing conditions is to try to get a better handle on -- you know, we know from observational data, we know where the ice-covered bridge is forming during freeze-up. There is the potential of looking at the conditions that

are occurring at that location. Why does it bridge there? Is it a factor of we have a large surface ice concentration and a narrow width? Or is it a large surface ice concentration moving downstream, and we have a section where there's a tributary mouth? So there's a delta, and there's something strange going on with the velocities in that area. Those are the type of things that we will use to better educate ourselves on predicting, in future conditions, where ice bridging will occur, similar with the break-up processes and jamming.

MR. HEALY: Yeah (affirmative), I think that sounds reasonable. It's just -- the comment is maybe in line with, you know, separate -- even organizing the report, in the reporting, as opposed to looking at cases in general, overall reach. There may be two processes that you survey (unintelligible), you know, why bridging occurs here or doesn't occur there. And that helps a person to suppose what might happen in the post-project condition.

MR. ZUFELT: So it's more of a comment of in the reporting of model calibration or model operation being specific, rather than just in

general terms?

MR. PADULA: Thanks, Dan. Dominique?

MS. GLASS: This is Dominique Glass again. Just a comment, not modeling the Lower River, which essentially is saying we're not going to do an assessment of project effects on ice in the Lower River, is not very comfortable to me. I can appreciate that it's possible that we have negligible differences in flows (indiscernible - interference with microphone) [and ice conditions] at the confluence. And I can also appreciate that there's many modeling difficulties. And what I was hoping to occur, just a little creative thought on how you can address potential project effects on ice in the Lower River, maybe if you model a few of the side channels that are conducive to that, recognizing the limitations of a model maybe. It just has to be a qualitative something, but I don't feel like, you know, it should just be ignored because it's difficult to model. And it's potentially a significant issue.

MR. ZUFELT: In -- it's Appendix A of the ISR. We did do a limited look at the Lower River using HEC-RAS with an ice cover, and we

looked at two locations where we had some limited bathymetry data and channel data, and that was at Sunshine and also at 29.9, which is Susitna Station. Also those locations, not only did we have the bathymetry, we had a better idea of what the discharge might be at those two locations because those are USGS gauge locations. And we reported the results of those limited tests in Appendix A.

And what we did for those conditions is we just increased the -- we looked at the typical wintertime discharge during freeze-up, and then we looked at what would happen if we had a discharge increase of 5,000 and 10,000 CFS, and what was the effect on water levels.

MS. GLASS: Thank you. I didn't read those appendices, so I'll go look at them. Thank you.

MR. PADULA: Joe?

MR. KLEIN: Joe Klein, Alaska Department of Fish and Game. First off, I support Gary's earlier recommendation for maps. What I'd like to see is that type of information. I know some leads are more persistent perhaps than other leads, and if you could capture that information in the

maps, that would be helpful, along with the ice jams and other relevant information.

One question I have is on the -- I didn't hear you mention the PDO in your analysis, and I understand for the geomorphologist study why that's, you know, maybe of not so much importance. But for the ice study, given what I understand about it, it seemed like it would have -- with icing effects and the formation of that ice, a possible greater influence. And I'm just curious if that's being recorded, and if not, why not?

MR. ZUFELT: The -- was it instream flow or was it geomorph that did the PDO -- it was the geomorph.

MR. REISER: Primarily geomorph, but combination.

MR. ZUFELT: Right. It was primarily geomorph combination with instream flow. It basically showed that the variations were within the range of noise. The conditions that we're modeling as we model the 50 years of record, temperature, precipitation and discharge, over 50 years of record, we will cover those extremes. I'm not sure how else to put that other than, you know, when we look at climate change, we could perhaps

do the same for conditions that you might expect during the PDO of, you know, 5 percent more precipitation or 3 degrees colder during January through March.

MR. PADULA: Matt?

MR. LACROIX: Yeah (affirmative), this is Matt LaCroix with EPA. I just had a question. I'm curious whether or not you're far enough along on calibration of the model to have identified specific thresholds, thermal or velocity, for the establishment and makings of the open leads?

MR. ZUFELT: Not at this time, no. We're sort of right in the middle of the initial ice model calibration.

MR. LACROIX: Thank you. But it is your intent to identify those thresholds?

MR. ZUFELT: That is the intent of modeling is to look at where are we going to have the ice cover extent, yeah (affirmative), with impacts of the various project operations.

MR. VAN DER VINNE: I have a couple of questions and comments. In regard to interactions with other studies, I recall reading in

your literature review that some of the earlier modeling wasn't able to predict all the components successfully at the same time, for example, to predict the extent of an ice cover. You weren't able to predict ice thickness very well.

MR. PADULA: Please closer and louder.

MR. VAN DER VINNE: How are you going to be addressing those issues as they come up when some of the other studies are relying on accuracy of all of those components?

MR. ZUFELT: The model that was developed in the 80s, which I believe is called ICECAL, follows a similar line of physics-based modeling that the river 1D does. Some of the theory that existed in the 80s wasn't as far along, we'll say, as they even exist today. We're hoping that we're not going to be vastly different than the 1980's model runs, we're predicting where, you know, the ice cover will be. Those models predicted water levels fairly well. The ice thicknesses were based on equilibrium thickness theory, and they predicted that the upstream edge of the ice cover rarely would make it past about Gold Creek, probably not up into the

canyon too far.

So I'm looking forward, actually, to the model being calibrated so we can actually even use those data that were used for the ICECAL model in the 80's and see if we come up with similar results.

MR. VAN DER VINNE: I was referring to the ICECAL model. There was some reference, I think to River1D and (unintelligible) data or results.

MR. ZUFELT: On?

MR. VAN DER VINNE: I can't recall which river it was on. There was some reference to poor prediction of water levels and ice thicknesses.

MR. ZUFELT: Yeah (affirmative), well, we're basically working with, I believe, a little bit greater amount of field data and field observations in this river than they had for the Peace, which is a little bit larger.

MR. VAN DER VINNE: The other interaction with other studies, I recall talking about ground water inflows last spring and how to incorporate those into the River2D model. Are you planning on going

ahead with those modifications?

MR. ZUFELT: Yes, and through the River2D Focus Areas that have been developed and calibrated, which we are getting very good results on those. There were locations where groundwater inflow appears to be required because we're just not getting our water elevations, and Steve Ertman who is working primarily on River2D models has been able to determine -- this was sort of a nice result. He says, "I'm missing some -- I'm missing my water elevations in this location because I need to have some more water -- groundwater inflow. I'm thinking somewhere around 16 CFS."

And when we looked at the recent technical memorandum from the instream flow folks, who had actually done point measurements during the summertime, this past summer, they're finding that there was one measurement that was 12 cfs and one that was 18 cfs or something like that, so right in the zone. And Steve was able to figure out a way to create an inflow of this addition to the river model. He has to have all the inflows at the upstream elevation. So it is tending to work out better.

And we've also identified the -- well, thanks to geomorph really -- identified where the groundwater inflows are necessary in the Focus Area - 128 model.

MR. VAN DER VINNE: That's good to hear. The rest of it is just sort of a summary of what -- a review of your presentation and what we discussed so far. I think I just wanted to summarize things in terms of, you know, our proposed study modifications.

In terms of data collection, any future ice thickness measurements characterize the solid portions, thermally grown ice, and snow ice, and frazil, be committed to do that because you get better information for your calibration that way.

Another thing is the ice in the side channels, the variation of frazil deposition. I like that you've committed to do some of that, and I think that's important.

As well, the border ice, I think that's a very important thing that wasn't discussed earlier on. You've recognized that as well, so that sounds pretty good.

The ice mapping I think is important for the rest of us to understand what you're seeing out there and being able to see the sequencing and how things change over the winter.

And then to go to what Dan was talking about is establishing a specific task, looking at ice jam initiation and what are the processes there in this river and how we can extrapolate from what you're observing to what the conditions are expected in the future, just an explicit commentary on how that's going to happen. That's all.

MR. ZUFELT: Thank you.

MR. PADULA: Any other comments for Jon?

MR. KONIGSBERG: Yeah (affirmative), this is Jan Konigsberg.

MR. PADULA: Go ahead, Jan.

MR. KONIGSBERG: Maybe I didn't find it and it's there, but information about ice processes in the major tributaries, specifically the Susitna, and the Chulitna, and the Yentna. And I'm wondering if there's sufficient information that's involved on the site plan to accurately characterize the project's effect on those tributaries post-project, and

whether or not that information is to characterize post-project the effects of change in ice cover processes along those tributaries remains, which are consumed with that geomorphology preservation, et cetera.

MR. ZUFELT: Well, the Yentna is a large frazil ice contributor to the Susitna River and is probably one of the factors in the initial ice cover formation down by the mouth. That's not going to change with project operations.

And as far as the Chulitna and the Talkeetna, they're also -- you know, their frazil production, frazil input rates, discharge rates should not change with project conditions. And while the Talkeetna and the Chulitna are inputs into our River1D model, the Yentna is below the limits of the 1D model. So we're not considering, you know, conditions in the Yentna. I'm not seeing that there would be large changes in those rivers with project operations.

MR. KONIGSBERG: Assuming that ice in the main stem are formed later at a low stage, and also assuming that break-up would occur earlier in post project operations, why wouldn't that effect the major

tributaries? I mean, if there's ice that goes down (indiscernible - interference with speakerphone) and Chulitna, wouldn't that affect the outflow ice (indiscernible - interference with speakerphone) Chulitna down to Yentna?

MR. ZUFELT: I think I see where you're going.

MR. KONIGSBERG: (Indiscernible - interference with speakerphone) sooner or different elevation that it would under normal conditions, current conditions.

MR. ZUFELT: True. So you're referring mostly to the break-up conditions?

MR. KONIGSBERG: Right.

MR. ZUFELT: Yes.

MR. KONIGSBERG: Well, when ice forms as well (indiscernible - interference with speakerphone) theoretically. However, I assume for the Talkeetna and the Chulitna it would affect (unintelligible) of those rivers which (indiscernible - interference with speakerphone) [flow into the Susitna]. And that, I would assume might have a potential for prolonged

change to those rivers. The range of ice elevation is greater than normal. But, you know, what would -- I'm trying to figure out whether or not you're going to be able to account for those scenarios.

MR. ZUFELT: Well.....

MR. KONIGSBERG: If they're, in fact, scenarios that you'll be doing.

MR. ZUFELT: We will be modeling the three rivers area near the mouths of the Chulitna and the Talkeetna. So we will be able to see what the effects of project operations would be on water elevations during freeze-up, during break-up.

Both the Chulitna and the Talkeetna tend to, as soon as air temperatures start getting cold, they really shut down their flow fairly rapidly. So neither are, you know, filling their channel at that point, so to say.

But I guess at this point all I can say is we will be modeling the main stems through Susitna water elevation characteristics, you know, existing and proposed project conditions at the mouths of the Chulitna and

Talkeetna Rivers and should be able to make some assessments of what they would do during break-up or freeze-up on those two rivers at their mouths.

MR. PADULA: Thanks, Jan. Mike in the back here.

MR. WOOD: Mike Wood again. I really look forward to the modeling and seeing what you (unintelligible) in a way -- so it can eliminate all of our inner modeling, what we think because I think you and I -- we all have our ideas of what this river would look like in the wintertime, and letting the models do that objectively, I think would be great.

Do you think you have the data that you need for the last year in terms of water in the Middle River, you know, from the gauges that were on the river in order to put into a model to give you accurate results?

MR. ZUFELT: Are you referring to the water elevations or.....

MR. WOOD: Yeah (affirmative), elevations, temperatures, velocities, all that stuff, you know, under the ice from the time of, you know, freeze-up through the winter and then certainly through break-up.

And my question is are you confident that you've got all the numbers and data that you need to make these assessments accurate and kind of eliminate our own assumptions, like how much it will impact below the Talkeetna?

MR. ZUFELT: We were lucky enough last winter that I don't think any of the ESS stations went out during freeze-up, which was nice. We were able to record those massive water level increases as the cover progresses through those areas. Of course, it would be wonderful to have a water level gauge every, you know, 1,000 feet up the river, but that's not possible, you know.

I think based on the characteristics of the river, the location of the ESS stations that we do have will provide a good representation of what's going on in the river, and we should be able to model those well.

MR. WOOD: And I just ask because I know there were some difficulties with that in 2013 -- you know, with the freeze-up in 2013-2014, and then I know you rely a lot on the Gold Creek gauge for 60 years of data or so. But that isn't measuring water level after freeze-up. So I was

just wondering -- that's why I asked that question.

MR. ZUFELT: Yeah (affirmative), the Gold Creek gauge is a downward looking sonar, so it does record the top of the ice, the top of the water, and the top of the water flowing over the ice. So it does provide us a lot of data, and that's a 15-minute data gauge too.

MR. WOOD: Even with ice -- even once it stops freezing because, I mean, I look at that every day as well. Even once there's ice on the river?

MR. ZUFELT: Yes.

MR. WOOD: You're saying you know what water level is underneath that?

MR. ZUFELT: Well, we know what the top of the surface is.

MR. WOOD: The ice?

MR. ZUFELT: Top of the ice surface, correct.

MR. PADULA: Thanks, Mike. Any more questions?

MR. VAN DER VINNE: I got another question related to tributaries. We were just talking about what kind of information you have on the tributaries and main stem above the proposed dam. What are you

planning to do with that? And I don't recall.

MR. ZUFELT: For the modeling effort, the model basically starts at the dam and runs downstream. So we are not -- we are not modeling the reservoir system.

MR. VAN DER VINNE: Yeah (affirmative), the water quality model was going to do ice thickness in the reservoir.

MR. ZUFELT: The model that they're using can calculate ice thickness. It's a thermal growth.

MR. VAN DER VINNE: Right. Are you doing any measurements or observations above the dam?

MR. ZUFELT: We did observations, aerial observations, freeze-up/break-up all the way to the Oshetna River, which would be the upstream limits of the reservoir.

MR. VAN DER VINNE: And any plans to look at the effects in the tributaries and things down below the reservoir?

MR. ZUFELT: Not right now.

MS. WALKER: This is Sue Walker with NMFS. Just a

clarification on the points you just made about the water quality model being able to measure ice thickness. Is it measuring ice thickness, or is it just capable of doing so?

MR. ZUFELT: It's capable of calculating the ice thickness based on thermal exchange with, you know, water to air.

MS. WALKER: During reservoir draw down as well?

MR. ZUFELT: Yes.

MS. WALKER: Yes. Thank you.

MR. PADULA: Thanks, Sue. Any other questions?

MS. WOLFF: This is Whitney. I have a question.

MR. PADULA: Go ahead, Whitney.

MS. WOLFF: I have a question about the ice transport processes, specifically lateral ice, and I've asked this of Jon before. And I know this (indiscernible - interference with speakerphone) model to simulate ice transfer processes. And I'm just curious whether the model will actually simulate water and ice movement that’s occurring during official break-up, during warm periods?

MR. ZUFELT: I'm not sure I got that whole -- I'm not sure I got the whole question there.

The 2D models work with a static ice cover condition, though they do provide us with two dimensional water velocities, so horizontal water velocities. Based on the results of the 2D models, the changes in elevation of the water surface, as an ice cover moves through an area, and the velocities as the ice or water would move into the side channels can give us an indication of where the ice would move into those side channels. I'm not sure I got that.

MS. WOLFF: So is that a yes? (Indiscernible - interference with speakerphone) flowing downstream but moving sideways, which I understood is kind of (indiscernible - interference with speakerphone) [2D ice movement].

MR. ZUFELT: Right. And with the -- also with the ice jamming component of River1D, we'll be able to say if there's ice moving downstream during a jamming situation, the 1D model will assume that, based on water elevations and channel bathymetry, it will move into these

side channels and those side channels.

So the 1D model will give us the water elevations, whether it's an open water condition, or an ice jammed condition, or even the failure of a jam, you know, the change in water elevations. So that could lead to information on where ice may be stranded in the overbank areas.

MS. WOLFF: You know, I specifically asked with regard to the winter 2012 (indiscernible - interference with speakerphone). Your break-up response is only, you know, (indiscernible - interference with speakerphone). So just wondering if the models can pick that up in unseasonable warm times?

MR. ZUFELT: Yeah (affirmative), I guess if we have the records on the water elevations at any location. Yeah (affirmative), we could make an assessment of what's going on. Like, for instance, this past January there was an event.

Yeah (affirmative), if we're modeling a certain event, whether it be a discharge increase or a water -- you know, some reason why water elevation would increase, a jamming event, we should be able to model

that.

MS. WOLFF: It's hard to hear you, but I'm getting that you would be able to assess the flow rate (unintelligible).

MR. ZUFELT: Correct, if we have some indication of changes in flow rate that would induce some type of jamming event, yes, we should be able to model that.

MS. WOLFF: Thank you.

MR. PADULA: Thanks, Whitney. Any other questions or comments?

MS. CONNER: Hi. This is (indiscernible – [of The Nature Conservancy] interference with speakerphone). I just have a followup to Whitney's question (indiscernible - interference with speakerphone) [on the model]. But how is the model organized to provide feedback after the ice jams to return the changing stage of elevation in order to simulate an event that will influence the ice jam on kind of the width of the river influence but then also the new elevation of water?

MR. ZUFELT: I'm not sure I got the whole question there, but, you

know, when an ice jam occurs, there's quite an increase in water elevations upstream, and that also relates to lateral extent of water and ice potential. That's modeled with the River1D model.

And when there is an ice jam failure, of course there is a massive decrease in water elevation with two potential consequences. One would be the movement of ice downstream, ice and water downstream, which can be simulated in River1D model, or just a drop in water level, if it's low enough, you know. The ice is just going to set down on the bed, or on the banks, or in the overbanks and be stranded there. I'm not sure if I answered the whole question.

MS. CONNER: Yeah (affirmative), that was the whole. And then a followup question. I'm sorry if you can't hear me very well. I'll try to speak slowly. A followup question would be how the model would be formed or calibrated, recognizing that the elevations that the river would see during ice break-up because of project operations would be outside of anything measured historically; what information is being used that inform the model to simulate those events?

MR. ZUFELT: That's a good comment. The model is being calibrated based on September 1, '12, through June 30, '13, conditions in the river. This includes temperature, discharge, water elevations at measured locations. Any incidents of ice jamming, whether it was during freeze-up, ice cover progression, border ice growth, the calibration is based on all of those input factors.

I agree that during project operations that conditions would likely be different than what we normally see during a typical or even an extreme freeze-up period or a break-up period. I believe on the break-up side, we will see-- project conditions should be all within what we've experienced in the past. The freeze-up side will be different. They'll be a little bit higher, but I don't believe it will be way outside the range of -- I don't want to say what's been experienced in the past, but there has been freeze-up jams at different locations in the past. So we should be able to model those.

You know, the freeze-up conditions are well below what are experienced during break-up conditions in terms of discharge, and ice

thicknesses, and jamming thicknesses. So we should be okay.

MS. CONNER: (Indiscernible - interference with speakerphone) looking at when you said that there were freeze-up jams at certain locations that (indiscernible - interference with speakerphone) to project operations at a specific event that you are looking at in the calibration?

MR. ZUFELT: Well, as I mentioned, the calibration is September 1, '12, through June 30, '13. We had quite massive break-up events in May of '13. So, yes, we're covering some pretty extreme events in there.

MS. CONNER: Thank you.

MR. PADULA: Thanks for your question. Anything else?

MR. WOOD: Sorry. Mike Wood again. So I just wanted to clarify that I'm on target. So when you're monitoring the modeling, just like lateral movement like Whitney was asking and also integrating what happens with groundwater during these jamming events, will that also be seen in this modeling? So the lateral movement which overflows into the rivers and kicks out the fish that are stranded back there from break-up, will that be modeled, even the groundwater effects?

MR. ZUFELT: The break-up will be modeled with the 1D model.

MR. WOOD: And it will show all the effects of the groundwater.....

MR. ZUFELT: Not groundwater in the 1D model. The 1D model will be able to tell us the extent of flooding from a jam that's formed in the river, or the change in water elevation from a freeze-up cover formation, or a jam failure event and where the water level would recede, which could give us indications of things like where ice may be stranded, where it was previously -- you know, previously we had ice at an elevation that would extend out into the flood plains. The ice jam fails. You could have a reduction in water level. That would give us an idea of where ice would be stranded or potentially sediment would be stranded.

The 2D model is where the groundwater component comes in, and those are only at the Focus Areas.

MR. LILLY: (Indiscernible - distance from microphone).

MR. PADULA: Mike Lilly.

MR. LILLY: This is Mike Lilly with the groundwater study, and where the effects on groundwater are going to be handled is one of the two

outputs that come from the open process, open flow models or inputs to some of the ground water cross-sectional models. So when you look at cause and effect relationships, that gives us that gives us that boundary condition change, where when Steve Ertman's River2D model pumps that water level up, then we can use those cross-sectional groundwater models to say, all right, this is what we see, along with all the empirical data where we look at the current natural events that are taking place to see how those effects are occurring in the natural system.

So the overall understanding is going to be gained by all the empirical data that's being collected in addition to the model analysis that's being done. So there's a backward linkage in that the inputs from the ice processes model for the outputs that they have for their stage elevations are inputs through the groundwater model. So that's where you're going to learn about that through both.

MR. ZUFELT: Thanks, Mike.

MR. PADULA: Time for a break. Please try to be back at 10:15.

10:04:04

(Off record)

(On record)

10:15:55

So next on the agenda is the Instream Flow Study. I think it's going to be primarily Dudley with assistance from Phil. You all know Dudley. He's a really special guy.

MR. REISER: Thanks, Steve.

MR. PADULA: And he has some special needs. So we thought we would help him today. (Laughter) Dudley, if you're ready, Justin, start the clock.

STUDY OF FISH AND AQUATICS INSTREAM FLOW (STUDY 8.5)

MR. REISER: Oh, man, my reputation precedes me. I only have 58 slides. I'm just kidding, just kidding. So, no, my name is Dudley Reiser. I'm the Instream Flow Program lead, and before I get started, I do want to acknowledge two other companies that are actively involved in this work, Miller Ecological and Golder Associates. I believe both of the individuals that are associated with that are on the phone right now, Bill Miller from

Miller Ecological, and Kasey Clipperton from Golder. So I just wanted to acknowledge them as we move forward.

So I am under the gun. I got this clock ticking in the background. I don't know what's going to happen when it reaches zero, but I don't want to find out. So I will go through these rather quickly, just like everyone has and cut to the chase, so to speak.

The objectives are as stated in the ISR, and we don't need to go through all of those. They are targeting instream flows, habitat, fish habitat modeling. Those are the key objectives that we have with this particular study.

So I want to go through these, but I do want to point your attention over to the right side; and this is in -- there's a screen over here for those of you on the phone that can't see it. I'm just going to reference the Proof-of-Concept, Appendix N. There's a figure in here that we have that demonstrates the integration process we're using on this project.

There's been some discussion over the last couple days about how these different models are integrated together. How are we going to use

the information that comes forward from the groundwater, from the geomorphology, from the ice? We spent a lot of time working through that process, through this integration process. We had a similar slide to this in our actual RSP, the Revised Study Plan. This is a little bit of a modification to that, but it basically goes and leads you through, you know, the reservoir integrations model and how these different models are interfaced together from the system inputs, down to the reach scale modeling, to the Focus Area scale modeling, et cetera.

So the group of people that we've had presenting to date have been integrated together. We're all working together on addressing various inputs and outputs and models that are going to feed into the instream flow model as well as others.

Components, I don't need to go through this. I know the clock is ticking down, so I'm going to keep going forward.

The variances, like any study of the magnitude that we have, there's going to be some variances. We've listed those in the ISR. They tend to be associated with some changes in instrumentation, perhaps locations of

where those instruments were based upon field conditions that we had. There was also some scheduling changes, you know. Work was postponed in 2013 and completed in 2014 based upon some logistics in property access considerations.

And then there were a few changes in field methodologies that occurred, and we've listed those variances in the sections in our ISR respectively. And they're highlighted here in these next series of slides in yellow. So, for example, an example of a field modification that might have been made would be the spawning redd dimensions, and we collected about 60-some redd measurements. It takes a lot of time to do that, and we became, you know, convinced that we really didn't need to continue that aspect of it. It doesn't feed directly into our modeling. So we made some adjustments, and we've curtailed those types of measurements.

There's other aspects in the variances that were related to scheduling and some property access elements that took place, and, you know, as everyone prior to me has mentioned, a lot of the work that we've done, completed as of the 2013 studies, dealt with the Focus Areas below Devils

Canyon primarily. There were seven different study areas or Focus Areas that we concentrated our effort on, because of access considerations at that time.

And there were some changes in gauging, you know, scheduling of where tributary gauges might be. We've already talked of the second one here under representativeness. That came up. That was discussed. Geomorphology did some analysis. We did some analysis with them and came up with -- in one of the tech memos, one of the appendices, a presentation or description of the representative years that we're dealing with.

Now, summary of results, stepping through that, you know, there's a lot of work that's been done, just as everyone has mentioned in their respective resource areas. A couple of the highlights here, Version 2 of the Open-water Flowing Routing Model has been completed. That's one of the appendices, Appendix K in the ISR.

We've completed measurements of seven of the Focus Areas, you know. Seven were measured in 2013 for bathymetry, stage, and flow.

There's tributary models.

In terms of the HSC data collection, that is ongoing, continues to be ongoing, and there's analysis that's presented in the ISR as well as in some of the appendices.

One of the key elements in there -- it sort of relates to what Mary Lou was talking about with the fish work, is periodicity piece. So there's some preliminary periodicity information that's presented in Appendix H that will be subject to some modifications based upon other information that we receive from fish distribution.

Pilot winter studies were completed in 2012-2013, and winter studies were likewise completed in 2013-2014.

Now, getting back to the integration or the coordination part of this, we've had two very detailed, multi-day meetings that were looking at coordination between the different models, the different resource models. So there was a Riverine Modeling meeting in November of 2013, and then most recently the Proof-of-Concept meetings that took place in April, where -- this is an example on the slide here that shows on the right-hand

side -- where we brought in each one of the modelers and used this as a test case to demonstrate how the models are providing data and information, GIS layers, into the types of analysis that will lead to fish habitat flow relationships. So that was an important part of demonstrating that this analysis that we've proposed is, in fact, conceptually sound and can be implemented. So that was an important part of that.

And then the Lower River modeling, that was also completed for Birch Creek and Trapper Creek, and we had Appendices I and O of the ISR that demonstrated the results of that.

Some of these -- stepping through these very quickly. I'm sure the clock is winding down. So I guess I won't go through all of the results, again, that we've had. It would be impossible to do it. I assume that those -- you know, most everyone is familiar with the ISR.

The Decision Support System I will mention. You know, it's an important element. We had a discussion of that in the Riverine Modelers meeting in 2013, selecting a particular approach that we're proposing to use.

And then I'm going to go over these very quickly because these are some of the 2014 results. We've had winter studies that have occurred this past winter, 2014. We can talk about these in more detail in January, during the January meetings. There is a TM that's been generated on that.

And likewise, the relationship between fish abundance and microhabitat variables. That was a FERC request that was completed. It was one of the variances where we postponed completing that analysis because of the need for water quality data that had not yet been fully analyzed by the laboratory. So that was just recently completed as well as submitted as part of the September transmittals.

I won't go through these. I do want to mention -- we're not going to go through them in detail, but I do want to mention, in this particular table, this is sort of a summary of the HSC results that we have to date. And under Chinook, up top there, that juvenile should actually be fry. So there's 218 fry observations, and then in terms of juvenile, there's 63 juvenile measurements. So I want to make sure that you're all aware of that.

MR. PADULA: There's your 10 minutes, Dudley.

(Laughter)

MR. REISER: Give me two minutes, two minutes.

MR. PADULA: All right, two minutes.

MR. REISER: So here's proposed modifications. These are outlined in the ISR, and I am not going to go through these or I'm -- I don't know what's going to happen. Wayne is going to come over here.

Just go to the current status and steps to complete the study. We're going to continue looking at tributary gauging. There will be some reach scale modeling done. We're going to measure the upper two Focus Areas. That's another element that needs to be completed for Study 8.5. So we'll have Focus Area -173 and FA-184. FA-151 was already completed this year. In the Lower River, there will be some additional transect modeling done on Sheep and Caswell Creeks. A lot of steps yet remain in the habitat modeling aspect. I'm not going to go through these. There's a number of them here. And the Lower River habitat modeling part will continue, and then the Decision Support System. That's going to be an important aspect

as we move forward in 2015.

There. How was that?

MR. PADULA: Awesome, Dudley.

MR. REISER: All right.

MR. PADULA: Thank you. I know Dudley has a lot of information to share, but we think it would be better if he shared that in response to some good questions and comments. So who would like to start? Chris?

MR. HOLMQUIST-JOHNSON: This is Chris Holmquist-Johnson with USGS, working with the Services. Dudley, I got just a few different comments and things kind of with each of the different objectives, you know, is how I think I might go through it, because it's sort of specific to those areas.

And the first one we touched on just a little bit on the first day, which was the mapping of the current aquatic habitat within the main channel and off channel and both on-the-ground and then the line mapping. And so we had some discussions on that. It seemed like some of that was possibly incomplete, and so I'll just bring it up again here because

it directly ties into the instream flow work and ultimately how we're going to look at a whole river analysis for those microhabitats and how we may extrapolate results from a Focus Area to the whole river approach. So just making sure that all of that is complete and is checked to make sure that we are able to do that.

MR. REISER: Let me respond to that, Chris. You know, basically, it turned out after that issue was raised during the meeting two days ago, that we went back on the ISRs, and the information that was presented in that ISR for the FDA and habitat mapping portion of it; and it looks like there was just a problem with the version control of the maps that were presented in that document.

I think we've committed to getting that information out by November 15th, I believe it is. I think that's the commitment. We have those layers in place. It's not -- you know, it's not going to take us a lot of time to generate that, but it was a version control issue of that particular coverage that was presented. It turns out, that's what was missing.

MR. HOLMQUIST-JOHNSON: Thanks for that clarification. It's

helpful when we're trying to make comments related to that, and that's what we're basing our comments on.

MR. REISER: Sure.

MR. HOLMQUIST-JOHNSON: Yeah (affirmative), and then part of that, too, I think was what Jeff brought up in a few of the ground-truthing points, that some of that was maybe misidentified, such as in Whiskers, that was classified as a main channel. So just some other things like that, that I know you guys have made notes of to look into.

MR. REISER: I think some of that may become clearer once you are looking at the right coverage. So, yes, but we would welcome feedback.

MS. WALKER: This is Sue Walker with NMFS. Is there new coverage for the ground-truthing maps as well then?

MR. REISER: No, the ground-truthing maps, I believe, if you want -- and I defer to Mary Lou on this one, but I believe the ground-truthing maps were correct in the one appendix. But I would say, just to be complete, let's wait and see what we generate November 15th. We'll go

back and make sure that we have the right coverages displayed in that, so there isn't any confusion.

MS. WALKER: So is that a wrong version of mapping? Is that the one that was used for the ground-truthing?

MR. REISER: Mary Lou?

MS. KEEFE: No, it was a simple version control problem when the final version was made into a PDF for the ISR. The side slough layer was shut off. They weren't mapped. That layer on GIS was just shut off. So it was a systematic error across all maps that were posted in February.

MR. JAYJACK: So are the maps in the ISR -- I think what Sue is asking is she's asking about the maps in the ISR. Should they look at the ones that are now on file with us now or wait for the ones on November 15th?

MS. KEEFE: There are Appendix A maps that will be corrected and Betsy will talk to that. And Appendix B maps are correct -- or Appendix D. It's Appendix D. Those are the correct maps.

MR. HOLMQUIST-JOHNSON: Yeah (affirmative), I think the

clarification with that is in the ground-truthing, specifically on the Whisker Slough section downstream of the Whisker's Creek. A portion of that was identified as main channel habitat, and in meetings that we've had with previous TWGs, and discussions, and all that, that was a misclassification. That, that's not actually a main channel habitat.

MR. REISER: Yeah (affirmative), and I think that's okay. I mean, not that it's misclassified, but that there's a difference of opinion, perhaps, on some of these habitat-type calls. That's the purpose of this exercise. My understanding of the study plan determination was to get that information out to the stakeholders so you'd have a chance to look at it, and then, you know, you'll have your comments on it. And I think we can come to a resolution on some of those differences of opinion on those types of calls.

MR. HOLMQUIST-JOHNSON: Okay.

MS. MCGREGOR: This is Betsy with AEA. Just so I can clarify, we're going to issue an errata for the appendix where the side sloughs were missing. On November 15th, we're going to -- or by November 15th, we'll

put out a set of maps that have both the macrohabitat and the mesohabitat from the remote line map.

The ground-truth maps from both the 2013 and the 2014 data collection will be available at the end of the year. I'm sorry -- actually by February 1st.

MR. HOLMQUIST-JOHNSON: I guess one suggestion I would have on that with using the ground-truthing to -- {compare with} in with the line maps, if we are regenerating all of that, I don't know if it's possible to have those, rather than separate appendices, have those as a single appendix, where they're actually overlaid on each other. It would just, from a simplification standpoint, be a lot easier to make those comparisons than having to have numerous maps that we have printout copies that you're then trying to do overlays on. I know we've done that with some of the Focus Area sites, where we're showing examples and how they overlap. This would be one of those examples that could be very helpful and expedite the process.

MS. MCGREGOR: We agree. That's how we do it for the ground-

truth -- for the maps that have the ground-truth information. They'll have both the ground-truth and the remote sensing -- not remote sensing but the remote survey.

MR. CUTLIP: So wait, February 1 will be line map that shows.....

MR. PADULA: One at a time, please.

MR. CUTLIP: Matt Cutlip with FERC. So it's my understanding that on February 1 you will produce a map that has been updated for the ground-truthing; it's a final map?

MS. KEEFE: That's correct.

MR. CUTLIP: With the correction built in from the ground-truthing?

MS. KEEFE: Yes.

MR. CUTLIP: Okay.

MS. KEEFE: Yeah (affirmative), and so that's a little bit different.

MR. CUTLIP: Yeah (affirmative).

MS. KEEFE: So that's what I wanted to clarify. That's a little bit different than overlaying the ground-truth layer on top of the remote layer.

That is not what we're planning on doing. What we're planning on doing is making corrections to the remote layer based on the ground-truth exercise in those final settings.

MS. MCGREGOR: And just to clarify, that's not for the study plan determination. That's just continuing implementation of the studies.

MR. CUTLIP: Sure.

MR. PADULA: Thanks. Chris, back to you.

MR. HOLMQUIST-JOHNSON: All right. Next one I guess would be the second objective, which was the selection of study areas in the Focus Areas that we've worked on through the whole process. And you have provided some clarification on that today, and I just want to, I guess, follow up on that. But we originally had agreed on 10 Focus Areas that we were looking at; 3 of those upper sites were not accessible in the past two years. My understanding is you now have collected data in those sites, and I guess what I'm looking at then is in the ISR there was a comment that after analyzing the existing data in the seven Focus Areas, that the amount of effort that would go into the remaining Focus Areas would sort of be

determined. And so I had some concerns on that, that there was a chance that we may not get data in those areas?

MR. REISER: Yeah (affirmative), a couple comments on that. I think maybe I made a confusing statement during the discussion here because I was under the gun. Now I'm relaxed and can discuss it. The upper three study areas that were deferred in 2013, this year, 2014, we collected suitability criteria data. So there's been active data collection efforts in the upper two Focus Areas. {For the lower Focus Area of those three, Portage Creek, FA-151, bathymetric surveys were completed needed to allow 2D modeling.}.

For 2015 then, the effort would be shifted to the upper two. But there's also -- if you remember Bill's discussion yesterday, there's some consideration about whether we need to go there? And I think that's consistent with the RSP. And I don't mean not go there entirely, but I mean, go there {and complete studies} with the same level of effort that was presented in 2013 for all of the other Focus Areas.

So there's just some consideration {being given to this}. We haven't

arrived at any decisions at this point other than to say let's take a look at it. Let's take a look at the data, and then bring in the stakeholders for input. We wouldn't make that decision blindly. AEA would not make that decision without {stakeholder} input, but that's what that statement was, just sort of leaving it open. {Data will definitely be collected at each of the upper three Focus Areas.}

MR. ROTHWELL: I don't know if you can hear me or not. (Indiscernible - interference with speakerphone)

I guess my followup question to that is when will that be? In the Instream Flow Study, [we divided the Middle River based on geomorphic reaches, then selected Focus Areas, and then were going to extrapolate information and relationships from the Focus Areas to the entire reach. Are we going to have relatively similar efforts in each reach to understand the processes?]

MR. REISER: And I think the answer is yes.

MR. ROTHWELL: The same question applies to other river process studies, such as groundwater and microhabitat data collection? Obviously

2 years of data would be nice}

MR. PADULA: Thanks, Eric.

Do you want to restate? It was a little difficult to hear.

MR. REISER: Well, I think, Eric, I think I picked up the gist of the comment or the question. Basically, the intent of the Focus Areas, you know, was that we would have these different areas representative of different sections of the Middle River that could form the basis behind some type of an extrapolation process that we would use to bring it to other parts of that Middle River. So we recognize, you know, it's a big river segment. You can't sample everywhere. So you have to come up with an approach to be able to expand that. Going to a side discussion about that, we had some discussion about extrapolation, you know, the spatial extrapolation, and we haven't landed on any particular approach right at this point in time for doing that.

I think Eric's concern is whether we will be putting less effort into a couple of the Focus Areas, you know, the upper Focus Areas than we would the lower Focus Areas. And I can say right now, as I'm standing

here right now, we don't have a basis for saying no. We are going to put that effort forward, but part of the study plan is to take a look at the data that you've collected over those years and see if there's any need or justification for making some modifications in that. And that's all -- that's all that statement was intended to imply.

We haven't made any decisions on it. Right now, we will be doing those -- the survey work at the same level, unless there's some other information that comes forward that would say, well, maybe we don't need to go to quite that level. Maybe the [density of measurements of the topographic surveys] that we're using doesn't have to be quite as dense, you know, as we would at the lower sites for some reason. That's really what I'm saying. Hopefully, Eric, that helped a little bit.

MR. ROTHWELL: I dropped the call, so I didn't hear a single word you said.

(Laughter)

MR. REISER: Probably just as well.

(Laughter)

MR. ROTHWELL: I was probably completely satisfied by the answer.

MR. SHEPHERD: This is Al Shepherd. –[I guess my question relates to the integration slide {Figure 1 of ISR Part C Study 8.5 Appendix N} and whether you are pulling all the other studies shown in the slide that are not directly related to instream flow, like fish count, habitat, and other type of studies? Also, are you pulling those from existing modeling or studies that are being done by somebody else, or are these studies specifically related to, habitat and instream flow? In other words, are you overlapping with other studies?

MR. REISER: So I'll try to repeat that question, if I heard correctly. Did everybody hear that on the phone? Maybe I'll just assume they did. I'm not sure I can rephrase it.

So the answer …I think you have to step back for a second and think about the objectives. You have to go to the objectives of the different studies that are presented. And we've gone through the fish studies, and those have specific objectives associated with them. The Instream Flow

Study has specific objectives tied to developing the tools behind the analysis that's going to really help to answer the questions of how project operations may affect fish habitats.

The IFS studies have linkages between them. The other studies have linkages to the IFS that are not as direct as the specific resource studies highlighted in the figure that are directly a part of the IFS integration, but there is a relationship; and we will be gathering information and using information from those other studies.

I think I cited to the periodicity work. I used the term, you know, periodicity. Well, you know, the escapement work that's being done, the [PIT tagging data, rotary screw trap information, and the FDA information, you know, all relate to the timing of when fish are moving within the system]. That's all going to feed into the development and fine tuning of the periodicity information that we have that will feed into the analysis that we're doing on instream flows.

So there are various aspects to it. The habitat and mapping component, certainly that has a direct linkage to the IFS and what we're

talking about doing and will feed into it.

MR. SHEPHERD: [It appears there are many different agencies and consultants doing different studies in the ISR. I guess my question was whether you are] working with those agencies and consultants to incorporate their data, or are you doing different studies?

MR. REISER: No, we're definitely working together on this. The instream flow [study is being conducted by a group of scientists and engineers]. The resource specialists that have presented over the last couple days are all [contributing information that will be used in the IFS.] So we're not duplicating efforts. The individual studies may have different objectives. The data will come together and be used in a cohesive fashion in terms of how we assess the effects of the project. So it will be brought together.

The one aspect, just to bring it into play here, and there may be further questions on it, is the Decision Support System that will bring in these other elements. It will bring in considerations of recreation, the wildlife component, energy production. That will be an important part of

the Decision Support process that would be used on this. So there will be much more discussion related to that in 2015.

MR. SHEPHERD: Thank you.

MS. O'NEIL: Hi. This is Sarah O'Neil. Related to Al's question and I guess (indiscernible - interference with speakerphone). I was wondering – looking at [the table of fish species and life stages shown earlier was the sampling and a number of fish that were identified based on where they were?

And then a followup to that. It would be related to Eric's question about noticing trends in different key river sections, and whether those trends would be used as a basis for extrapolation to other Focus Areas, and if so, if the process would be documented for extrapolation].

MR. REISER: Yeah (affirmative), I'm sorry, but I didn't get that-- I was referring to slide 16. Was there a specific comment? I've got that slide up on the screen right now. Was there a comment about the distribution of those species and -- I'm sorry. I just couldn't really pick up that question.

MS. O'NEIL: Yeah (affirmative), [the number of species and life stages listed, are those intended to be extrapolated in all of the Focus Areas]

MR. REISER: You're definitely breaking up there. I think I got the gist of that question though. The species that are listed on the HSC Curve Development slide -- it's in the front now -- those are just the tally of observations that we've assembled or we've collected to date for the various life stages and various species. These are going to be used in the development of suitability criteria that will then be used as input into the habitat flow modeling to help define areas within Focus Areas that represent habitats for the specific species and life stage.

So for example, chum salmon spawning habitat within each of the Focus Areas will be defined through the development of suitability criteria data and then through the modeling and calculations of habitat area . And that will give us a comparison then of those habitats under different flow conditions, so we can see how project operations might affect those quantities of habitat. So these are the species and the life stages that we

have assembled that will be used in the development of those curves so far.

MR. PADULA: Any other questions?

MR. PHILLIPS: Guy Phillip, Kier Associates. I'd like to go back to the previous, previous question, and that was when we were talking about the progression of the integration and the models ultimately leading to an integrated model and the Decision Support System. And my question really pertains to all of the studies, but I'll ask you on the narrow subject of yours.

As you go through this process of what I'll call the hand-off of the information from one study into yours, that hand-off being anything from, I suppose, raw data to being resulting from their work, to their own models and sub-models; as each of those hand-offs are occurring, are you documenting the hand-off as built as compared to the conceptual framework that we have here? Are you actually documenting all of those points of linkages?

MR. REISER: Yes. The answer is yes we have already as part of the Proof-of-Concept, demonstrated this process. Certainly we made clear

that those were not robust results. They were not anything final. So we put enough qualifiers on that, but the Proof-of-Concept meetings were an example of how the different model outputs would be input into, in our case, fish habitat. How the different model inputs were linked into the effective spawning-incubation habitat models. Bill Miller has been working on those.

We'll have documentation of all of the inputs that come out of each of the models, and what will happen is we'll have specific operational scenarios. Each one of the modelers will be running the same model, the same operations model, that provides outputs from the reservoir model down.

So we're going to use the same operating scenarios through each of the models. The respective model outputs will then feed into the effective spawning-incubation and rearing habitat models.

MR. PHILLIPS: Thank you.

MR. REISER: And they'll all be documented.

MR. PHILLIPS: Because the distinction I'm making here now is in

between Proof-of-Concept and “as built”, there have been variances and adjustments. So I'm very interested in how you document those changes that have occurred along the way to result in an as-built system.

MR. REISER: Right. No, those are good comments. Any changes that we're making as part of the models, as part of the calibration, those are all documented.

MR. GEIGER: Hal Geiger. Dudley, I have two questions for you. I'm not sure I perfectly understand that graphic. So, for example, Chinook juvenile number there, is that 218 individual fish, or is that 218 counts of the presence of fish -- or measurements of the presence of fish?

MR. REISER: Well, it depends on the technique that we used in collecting those data. So, for example, if we were using a seine net because of the water turbidity issues, you know, where you really can't snorkel. So there are different techniques that we use in collecting those data. If in that situation where we've collected a number of fish within a particular area, and then we've gone in and measured that area, that represents one observation for the species that were present within that

area. So that would represent -- you might have five fish within that area, but it's going to represent one measurement.

MR. GEIGER: So those numbers represent the numbers of measurements?

MR. REISER: Correct.

MR. GEIGER: The other question I have, is habitat suitability curves, as I understand them, are basically going to be a regression that's going to give us a probability of occurrence. It's a good way to look back and say this is where the fish were, to cut away the technical talk.

But then I'm sitting here wondering -- and I brought this up the other day -- this is a period of low Chinook salmon abundance, and even more importantly, Greg brought up, this is a period of even lower abundance for the older and larger Chinook salmon. So is there going to be a way to make any kind of adjustment for that -- for maybe you want to look at this habitat suitability curve as kind of what's typical and make some type of adjustment for what might be typical in the future when abundance goes back up?

MR. REISER: We've had -- over the years that question has come up on several occasions when we're involved in these types of studies, and, you know, the question really is whether or not fish density plays a role in where these fish may be using their habitats. So if you over-seed an area, do you find fish being pushed out into areas that they're not -- wouldn't normally be because of the sheer numbers?

Like spawning is a good example in a way. There's a huge run, and you get -- you'll have superimposition of redds; and you'll have fish using, potentially using areas that maybe, if they didn't have all these other fish in there they wouldn't use, -- so the short answer is, no, we're not going to be making any specific adjustments for that. We're assuming that where these fish are aligning are those areas that they would select; you know, that they're basically preferentially selecting, and we will be basing our data on that.

But that issue has come up. I don't know of a way to try and compensate for that adjustment.

MR. PADULA: George in the back.

MR. GILMORE: Thanks. George Gilmore, Meridian, [consultant to the] Services. I apologize in advance if this question has already been addressed at previous meetings, but I'm a new guy. So I'm hoping I can get a little more info. And that kind of builds upon what Guy was talking about earlier, and the Decision Support process. Obviously, it is still early in the process, but a very pertinent point of the integration of all these studies is the formation of alternatives that will then be plugged into these models.

Can you explain the structure of that Decision Support process? Who is to be involved? Are there going to be representatives from each resource area combined with AEA and stakeholder personnel? I just -- again, I know the process is in the early stages but would like hearing about that.

MR. REISER: Sure. I will give you as much information as I can right at this point. The Decision Support System, you're right, is very important. We identified that in the RSP. It's something that I thought we had some really good discussion, in the November 15th Riverine Modelers

meetings in 2013.

At that time, Alice Shelly, who is sitting to my right here, presented several different options for how one might proceed with the creation of, a Decision Support System. Chris Holmquist Johnson from the USGS presented some examples of what the USGS has done. Through the review process we basically selected a matrix style, a matrix approach rather than the -- I would say more sophisticated but more time intensive approach that we didn't feel we could go down because of just the sheer time and effort that would be required. Because I remember, Chris, it was like seven, to eight, or nine years or something like that where you had been working on that one. It was nice and very well presented, but for our purposes, we didn't think that's something that is needed, that level of detail at this point. So we're going to be approaching it with the matrix approach. That's the first part, just giving you that information so you can look at the ISR in Section 7. There's a description of the rationale for the matrix approach. There's some options that we presented that were reviewed, and it's sort of the steps moving forward with Decision Support

System that are presented there.

What it comes down to is that, yes. The answer to your question is there will be more discussions with the agencies and stakeholders moving forward. That's an obvious thing that needs to be done with Decision Support. There will have to be linkages with other resource modelers that aren't even present in this room right now that have to do with terrestrial resources recreation resources and other studies. There will have to be some discussion with those individuals too because that will be brought in to this decision format.

And then, ultimately, you mentioned operations, you know. How are we going to make these trade-offs and evaluate them? There will be certain operational scenarios that AEA will be considering and running, and that's the information that we will use in looking at trade-offs.

The short answer is more to come. In 2014, we've been gathering more information that will serve to help refine what that Decision Support System might look like; but we haven't advanced it to any substantial degree beyond what was displayed in 2013. On the other hand, a major

effort will be put forward in 2015.

MR. GILMORE: Based on that, can I add one question to that? I appreciate your answer, and I'm getting a pretty good understanding of where you're moving with this. But I want to make a point that I think it's critical that not only AEA be involved in the development of operational scenarios, what they see as a more appropriate project. But that the agencies also become very involved in the process and develop a suite of scenarios that not only maximizes generation or results in a project that is more energy efficient but that also emphasizes the environment and specifically considers environmental impacts. Yeah (affirmative), essentially that.

MR. PADULA: Thank you, George. You'll be next, Phillips. Go ahead, Ellen.

MS. LANCE: Ellen Lance, Fish and Wildlife Service. That's a great lead-in to what I'm sitting here thinking and what we expressed in our September 22nd letter regarding the Decision Support System.

It seems to me that the building of that Decision Support System,

understanding and getting the collaborative process going, needs to happen sooner rather than later because what happens when you get to the end and you realize that you have a data gap. You missed something that you really need to inform that decision with. So it seems to me like you need to start that process as soon as possible so that you're sure that you're getting all the right inputs.

The second point that I wanted to make is kind of tiering off of the instream flow integrated model efforts, but I'm going to expand that to by and large all of the studies.

And I know Sue mentioned this early on, and you've heard Guy talking about this. But I just want to make it public that the Fish and Wildlife Services is going to be requesting a new study, which really probably isn't a study but maybe a modification to all of the other studies where they clearly express what their output is going to be from the study, and how it fits, and how it links with the other studies, and what the assumptions are, and various other things.

Do you have something to add to that, Guy, or can you expound on

that idea more?

I'm relying on him because he's the expert.

MR. PHILLIPS: Well, I think fundamentally if we roll back to yesterday, I talked about how we are collectively building a book, and the book is what are the various issues and considerations in designing and building a project of this scale in watershed, about which we know relatively little; but we're learning a lot more every day. And then the discussion that we just had about the process of going from data collection to resulting in some sort of Decision Support System.

I believe the Services are going to be making a request for a modification of the studies that will reflect the process of building that, as it was actually built. So that as the models have been built in all of the -- the discussion we just had, but for all the studies. Where the hand-offs occurred; what are the assumptions behind those hand-offs; how do the models relate to one another spatially, temporally, all of that sort of stuff and put it all in one place, so that people can read that at one time and not have to search for all of the interconnections and so forth and try and

understand what they mean. I think that's what Services has in mind.

MR. PADULA: Thanks, Guy. Yes.

MR. KRISTANOVICH: Felix Kristanovich with Environ. [How are you going to be determining breaching flows within a Focus Area]?

MR. REISER: I may solicit some further input from Phil over here as well. But the primary -- one of the primary areas for information sources that we would use for determining breaching flows is the geomorphology, the SRH-2D modeling that Lyle discussed yesterday. That information provides detailed grids set up for the entire Focus Area. And for the different side channels and side slough areas within a Focus Area, that model will be able to predict at what flow, what stage you begin to have breaching into those different side channels; what flows are less than breaching flows. Therefore, you're starting to dewater those side channels. That in a nutshell is what we're talking about in terms of breaching flows.

Phil, you -- and I know there's 2015. There was some discussion about additional data collection.

MR. HILGERT: This is Phil Hilgert. Within the Focus Area, we're using the bathymetry, and all studies use the same bathymetry. What we have are very detailed measurements of those inlet elevations and how, as flows change, those side channels will become wetted or dewatered, so that there's consistency among all the different studies.

One of the things we had a question about is we have Focus Areas, and we have the breaching elevations within those Focus Areas to understand how those side channels and lateral habitats become wetted and dewatered as flows change. Are those Focus Areas representative of the rest of the river? We only have those detailed measurements within those Focus Areas. Let's go out and go to other inlets, other side channels and sloughs outside the Focus Areas, measure those inlet elevations, and see if that relationship between how side channels and sloughs are wetted and dewatered and if that relationship holds the same between the Focus Areas and outside the Focus Areas.

Does that answer your question?

MR. KRISTANOVICH: Yeah (affirmative).

MR. REISER: You know, just one other thing related to this discussion because it pertains to Kevin Petrone's discussion on the barrier analysis. Geomorphology, the bathymetry information that we're going to be using for the Focus Areas for looking at breaching flows, it's the same coverage that we would be using for looking at passage conditions within those Focus Areas. So there's a lot of interconnectivity between the different study elements here. They're using the common sets of data and common sets of models.

MR. HOLMQUIST-JOHNSON: This is Chris. I have a followup to that. In terms of looking at the geomorphic change in those Focus Areas, we're doing, you know, various periods in time. I think right now it's 25 and 50-year projections of the geomorphic change. Will that analysis also be done on those altered channels within the Focus Areas to see how those barriers and access points will change as a result of potential channel change due to project effects?

MR. REISER: You mean in terms of the barrier analysis?

MR. HOLMQUIST-JOHNSON: Yeah (affirmative).

MR. REISER: I don't know if the scope of work actually -- or the barrier analysis speaks to that at this point. The habitat work, however, we'll take that information from the 0, 25 and 50, and run those bed changes through the habitat models to see what -- you know, if there's any changes in the models of habitat, versus flow relationships.

Beyond that though, I want to point out that I think a lot of what we're going to be focusing in on is the smaller time steps that will be looking at the same general characteristics, the same topography. We are going to be looking at much shorter time steps than 0, 25, and 50 years. We'll have results that are monthly, daily, and in some cases even hourly. So there's going to be a range of time steps that we'll be looking at, but the 0, 25, and 50, that elevation information will be considered into the habitat piece.

MR. CLARK: This is John Clark with St. Hubert Research Group. I have a comment. One, I want to follow up a little bit on Ellen's comment on having model transparency or actually, you know, looking at the data here. And assuming that the model will output some estimates, and there

will be a measure of precision associated with those estimates. So you'll have an output of reduction of spawning ground by 20 percent, and the estimates will be between 10 to 30 percent or 90 percent certainty of 10 to 30 percent. And it's that precision of those estimates that really we need to use to evaluate things like variance that was seen -- actually variance is bit confusing because we look at variance in estimates in all these different studies. So, for example, fish distribution, how critical is it that you have a variance that we did not sample a certain area? How does that translate into the output from the model? So basically this sort of really dictates how important a lot of these variances are. Some may be very important. Some may not be, and it really helps us focus on the ones that are important. That's my comment.

Now I have a question on integration, and I guess it's very specific, so maybe I can talk to somebody afterwards. But how are you going to integrate the habitat suitability curves with the fish distribution and abundance studies because they're measuring very similar things? And it -- again, it helps to see how important some variances are if you integrate

these with another study that may be very accurate and the first study may not be accurate at all.

MR. REISER: I think I understand your question, and.....

MR. ROTHWELL: I'm sorry. Eric Rothwell. Do you mind paraphrasing the question because [I couldn't understand it].

MR. REISER: The question is to what extent are the different studies, for example, HSC, habitat suitability criteria data -- what's the overlap with that information with, for example, the FDA, the fish distribution and abundance data? How are those two studies related to one another? Is there a direct feed of the FDA data into the instream flow piece so that one can get some sense of where to focus efforts, when evaluating variances et cetera?

And the answer to that is again, I go back to the objectives of the study. So there's different objectives that these studies have. Some of them are collecting data that will be useful but not essential to the instream flow piece. So in that case we've got data with the habitat suitability criteria that are specific to the instream flow. We're going out. We're

locating fish. We're locating areas where fish use is occurring, and we're taking detailed measurements of depth, velocity, and substrate. We get measurements of upwelling. We get measurements of turbidity, a variety of parameters that we're bringing in to define what those suitability criteria will be that feed directly into the modeling.

The FDA work is -- I use a terminology, it's a little more broader because we're looking at where the fish are. From a baseline standpoint, you need to understand, just from a baseline characterization standpoint, where we are finding fish. There's useful information though, as I mentioned, that can be and will be brought into the overall instream flow analysis. And I'll go back to using timing as one example, just the timing of when fish use specific habitats. When are fish moving out of the system; when are they moving into the system? So there's going to be types of information that will come from other studies that will feed in to the modeling, but the data are not absolutely essential for the modeling. They're not the piece that's going directly into a suitability criteria development.

Does that help you?

MR. CLARK: Yes.

MR. REISER: Somewhat anyway.

MS. MCCRACKEN: This is Betsy McCracken with Fish and Wildlife Service, and I have a question related to the habitat suitability and if the Instream Flow Study and the water quality study are addressing the changes in the fresh water, salt water lens, and the salinity, and the fresh water in the Lower River are being addressed to (unintelligible) and returning adults?

MR. REISER: So the question was related to habitat suitability, in particular the Lower River, with salinity and whether HSC is actually covering that aspect of it. And the answer is no. That's not one of the attributes that's being brought into HSC curve development.

The followup question was is anyone doing that, and I would say the water quality model may have some aspect of that in there; but it's not directly factored into habitat use, you know, and habitat associations with where fish might be found.

MR. PADULA: Dominique?

MS. GLASS: Dudley, the answer to your previous question confused me rather than made it clearer. I got a little bit confused somewhere on the HSC curves and how this is going through. I know with the fish that you're collecting, they are being collected by a variety of different non-comparable sampling methods that have different amounts of efficiency.

The answer to the question implied that you're doing sort of a binary fish are absent, fish are present approach as opposed to lots of fish are in this particular temperature range, and fewer are in a different one.

And so, first of all, are we dealing with binary, just presence/absence, or are we doing the density? And if we're dealing with the density, what, if anything, are you trying to do to adjust for the differences in efficiency of the gear types?

MR. REISER: So we're not dealing with binary. I mean, there's some parameters that we would be considering, for example, upwelling might fit into that category of binary, but in terms of depth, and velocity,

we're taking actual measurements; and these are going to be brought into a logistic equation framework that I can turn over to Alice, if she wanted to discuss it. But it's not just a binary approach. There's elements of it that would be considered that, but it's not -- there are definite measurements.

MS. GLASS: Yeah (affirmative), not binary on the physical. I'm talking binary on presence/absence of fish.

MR. REISER: Oh, the fish count part. We're not doing density estimates, if that's what you're asking. Yeah (affirmative), in terms of the HSC data collection, we're not trying to make any relative abundance elements. We have a sampling protocol that we follow that's described in the ISR. That essentially our crews follow going out, and if they're able to snorkel, then that's the preferred method because you can visually see the fish, and establish its location, and then you go in and collect data points at those locations. If it's a situation where you've got turbid water and you can't snorkel, then they go in and apply other techniques, whether it's electrofishing, or we might use some seining techniques over small areas. In that sense, you know, we're looking at an area rather than specific focal

point locations, and we're making an assumption that these areas are, you know, areas where these fish are from. But we're limited by the observations and the conditions there for sampling.

MS. GLASS: So binary rather than a fish density approach. In the HSC curve, if you're making a wider range of habitat equally valuable to various species life stages and alternatives sort of dampen out the habitat relationships that you're developing here. And so you want to comment on that?

MR. REISER: Alice, you want to maybe explain a little better than I am as far as what we're doing with HSC?

MS. SHELLY: Yeah (affirmative), Alice Shelly, R2. The HSC sampling method is a little smaller scale or closely tied. So the observations are -- there's a lot of them. There's not, you know, big clumps of numbers. I had some information that we put together just sort of percentage wise and 68 percent were ones. So when there are observations, they're generally single fish, and then sometimes there's maybe two to five or six or greater. So we don't think that using a logistic

regression as opposed to, say, a Poisson regression would change the results. Also we have large numbers of zeros in the modeling process, so it would cause some difficulty in the modeling process to use counts as opposed to presence/absence, just not a good distribution to try to fit. So we think that there's not really a big impact, as you would suggest.

MS. GLASS: Well, the standard HSI approach would be looking at, you know, what a temperature adds, just to pull something out of the air. It sounds like your fish densities are so small, your catches are so small that you aren't able to pick out the fact that fish may use shallow water versus deep water or something like that because you just got presence/absence rather than, you know, a density because you don't have big enough counts.

MS. SHELLY: It's not that we don't have big enough counts, but we have individual measurements of depth and velocity for individual fish. So we have -- did you see the counts earlier? We're measuring the microhabitat characteristics at each fish. So sometimes it's two fish or sometimes it's six fish, but usually it's one fish that has its own

microhabitat measurements associated with it.

MR. PADULA: I think we've got some more.

MS. WALKER: This is Sue Walker with NMFS. I just wanted to add to Betsy's comment on the salinity effects of increased freshwater discharge in winter. And that's an interesting area. It's one undergoing quite a lot of current study. It's part of the Chinook task force, the state, NMFS is doing extensive research on the effect of naturally increasing or actually decreasing salinities due to the increased freshwater input in the coastal current of Alaska as glacier melt is exacerbated.

This would be something that we should probably at least consider. It could be actually a useful research tool if this project were to artificially increase the extent of freshwater input. So it's kind of an aside, but it's worth considering.

MR. PADULA: Next comment or question for Dudley? Chris?

MR. HOLMQUIST-JOHNSON: I guess tying in with the HSC data, one of the things I wanted -- I guess pointing out and ties in the DSS as well from the linkages standpoint is coming up with our HSC curves that

are based on, you know, our physical attributes that are in the river, you know, whether it's depth velocity, substrate, temperature, groundwater, all of these. An issue we can have with that when we go to look at project effects is if we're not able to predict those variables under future project conditions. And so if temperature or DO, any of those type of variables, are in our equations and are important variables, if we're not able to predict those on the appropriate scale, going under future conditions, that's something that can be very helpful in the Decision Support tool to show what those different models are, what the scales are at, and what kind of data they're going to be able to provide to answer those questions that we need to know, on a finer scale.

We've talked about that a lot in some of our technical team meetings and things, but that would be very helpful for us to, I think, lay out. And in our discussions, I think that's helped you guys and us understand where some of those shortfalls are, but that's a limitation. Not a limitation of the process, but something that needs to be, you know, addressed with how -- if we can't predict those variables, how do we address that, if we are using

that HSC?

MR. REISER: Right. I don't think John Hamrick is on the phone right now, but John, yesterday described, you know, the water quality, the Riverine water quality modeling. And then during the proof-of-concept, at that stage anyway -- that was in April, and I know he's made some advancements since then -- demonstrated, you know, some of the interactions that he had at the Focus Area scale, and how he's going to be looking at temperature changes in there.

Very useful meeting because it identified -- we view them as working sessions, and it helps actually pinpoint areas that need finer -- a little bit more work, you know, and how you're going to bring that piece of information in. As an example, bringing in temperature data that's been collected from other resource areas, which there's a lot of it, but John can use those other data sets in his model to calibrate. So that was a useful exercise, and the same thing holds true with DO as well.

So I agree with you, Chris. I think those are important points.

MR. HOLMQUIST-JOHNSON: And I think just a follow up to

that, as you mentioned that, that was a very useful meeting, you know. I think we would recommend that we sort of continue some of those meetings as we move forward with this so that we can continue, as more data comes out and more of the models are being calibrated, and able to actually have that field data that, up to this point, it's been more of a theoretical process of, you know. This is the models that will be integrated, but we don't really have the data to test it yet. That Proof-of-Concept, you know, we did with some data, but again, the ice process we didn't have. We ran HEC-RAS with ice cover as a surrogate for it.

But as some of those are coming together, I think we would appreciate, you know, the opportunity to have some more of those kind of followup meetings. I think it's helpful to everybody.

MR. PADULA: Dominique?

MS. GLASS: So the fact that HSC curves and temperature in particular -- at the last meeting you guys had a draft set. I know it was an incomplete data set. First one, temperature on that was [not] significant. Temperature, of course, is a non-trivial parameter because changes in

temperature, particularly where it can have effects on incubation, and [growth], and you know, all the rest of the biological stuff. I imagine that, if in the long-run, unless you got a full data set, it still isn't coming out. It might be a reflection of the lack of variability in temperature in the river rather than a lack of temperature dependence of the species. And if you get to that point where it starts coming out as a significant variable, do you intend to drop it, or have you considered bringing in a temperature from other well-documented temperature relationships?

MR. REISER: The answer -- and Alice can correct me if I'm wrong, but I don't think she will -- is that -- because I don't think I'm going to be wrong. The answer is we will bring temperature into the analysis. It's an important part of the effective spawning and incubation habitat analysis that we're going to be doing. We know that incubation is very much dependent upon, you know, the number of temperature units that the fish eggs and the embryos are exposed to and the fry emergence likewise. It's going to be a parameter that will be looked at. It may not fit -- and this is where she may disagree with me. It may not fit explicitly within the HSC,

but it will be brought into that analysis because it is an important parameter that's part of what the effective spawning incubation habitat piece would be. And we also know that temperature affects growth, you know. It's affecting growth, juvenile growth during the summer time. If there's temperature changes in the summertime, how would that affect your rearing habitats on the temperature perspective? So that will have to be brought into the equation as well.

You want to add to that, Phil?

MR. HILGERT: Dominique, the one thing I'd like to point out is that there is a TM submitted in September that looked at that evaluation of relationships between fish abundance and specific microhabitat variables. That will be a topic, I'm assuming, for January. So you will have a chance to read through that and ask more pointed questions.

Dudley is right in that we are looking at temperature. We look at temperature for the matter of the effective spawning analysis, but in some cases temperature may not come to the level of an HSC. As you mentioned, Dominique, it may be because we don't the range of

measurements that we have right now that don't show a relationship between fish distribution and temperature, but perhaps under our post-project conditions, we might see that temperature change.

One of the things we're considering is using a threshold value that says, okay, under this range of conditions, we don’t see a response in fish distribution with temperature. However, outside that range, that will be a red flag from a modeling standpoint that says, okay, it's outside that range of what we have from the pre-project conditions. We need to take another look at how that HSC may be adjusted to account for that.

MR. HOLMQUIST-JOHNSON: This is Chris. Along those lines, is that something that could be rather than incorporated into an HSC value, part of sort of the DSS component to where you were looking at that layer approach to where you may have effective spawning and incubation habitat that then, on top of that, you say, okay, yes, this was active; now, does our temperature layer under future project operations fall within a certain range and that would then, you know, activate it or deactivate it, rather than trying to incorporate that in an HSC-specific curve?

MR. REISER: When we think of evaluation metrics -- I'm looking at this stepwise progression as we go through system inputs, reach scale modeling, Focus Area scale modeling, and then we get to the evaluation metrics. From a fish habitat standpoint, we have various evaluation metrics, juvenile rearing, over-wintering, effective spawning incubation analysis. But other riverine process studies also have evaluation metrics, and that's where you'll have an overlay if a specific temperature or a change in substrate composition is an evaluation metric for those other studies. Those would be keys that we look at and say, okay -- as we start getting into those different evaluation metrics and we go to Decision Support System, they will come to the table and say, okay, this is fine. You guys are doing fine for fish habitat, but by the way, we've increased the water temperature or reduced the water temperature outside the acceptable bounds. So that Decision Support System where we look at those other studies, it doesn't all fall through IFS.

MR. HOLMQUIST-JOHNSON: Sure, thanks. Along those lines -- and, Alice, you might be able to answer this, one of the things that was

described in the ISR was the way the useable area, you know, metrics is kind of one of the, I guess, decision variables at the end that kind of may be used to see how things are changing under the project operations. And wondering, I guess -- there wasn't a lot of detail on how that might be modeled or calculated. In terms of looking at the time series, you know, we can calculate that for a given point in time, but then as we go through the entire time period, you know, how that's really utilized to come up with that decision variable for a comparison standpoint.

MR. REISER: Well, I'll take a first response on that. The time series type of analysis -- and Bill Miller is on the phone too. So Bill is an integral part of this analysis that we're doing. I think everyone that has worked with 2D modeling recognizes that the level of detail that goes into 2D models and the computations that are required as part of that. So Bill is working on the habitat models that are going to be the sort of engines behind calculating a lot of these different parameters, and he's working out details right now on, you know, the massive data. For example, effective spawning habitat, looking at each one of the points, you know, the cells

and grid and those cells within there, calculating information on those, and keeping track of that, and then summing it all up into something that we can all digest in terms of a curve. So he's working on those. The time step piece, which we indicated in our study plan, is going to look at different water year types, but it will also have a varial zone analysis that will be looking at using the bed elevation models and the hydraulic models, the 2D hydraulic models, how habitat areas are inundated and changed. There will be a variety of time steps that we'll be looking at it. It's not all been worked out. I will just, you know, say that right up front, and that's part of the challenges that we have, and part of the work that still needs to be done, and reasons that we interact with the various modelers. But those are good points.

Phil, you may -- do you have anything?

MR. HILGERT: Well, one thing I wanted to add -- I was looking for an opportunity sometime today. We talk about integrating and working together with other modelers. Instream flow isn't by itself. When we think of the 2D hydraulic models, they're actually being done by Tetra

Tech, and the fish habitat model is taking the output from the 2D Focus Areas. Bill Miller takes that and takes the HSC that R2 provides and comes up with a habitat model. Because we know that in the Proof-of-Concept last spring, we have to make sure that the output from one model is good input to the next model. So one of the things we did in this last summer, in September Bill Miller went out with the 2D modeler from Tetra Tech. I went out with him. We coordinated with groundwater modelers so we could go out and look at each Focus Area and look at these specific features and say, how would we model that; from a hydraulics standpoint, how are we modeling it, and how is that input going to feed into the fish habitat model?

So we are more of a coordinated effort than a bunch of individuals, but I will say, it is a challenge. And we recognize it's a challenge, and that's why we're trying to pay attention to it.

MR. PADULA: You have some more, Chris?

MR. HOLMQUIST-JOHNSON: Yeah (affirmative), I guess as long as we're talking about the kind of integration component, I guess some

things that are just of -- things to consider. I'm sure you guys have considered them, but I want to bring up -- one idea is the breaching flows in habitat activity. We talked about that a little bit under the current conditions and just how that might then be addressed under the geomorphic change components, you know. That, that could be a very important thing.

My understanding is we'll run the geomorphic change, you know, to those -- right now the 25 and 50-year, and then sort of a fixed bed habitat analysis would be done on the hydrograph from that point forward. And I think -- is that right that, Dudley, that, that's how that would be?

MR. REISER: That's where we are right now. Excuse me. I guess I have to voice activate it. That's where we are right now, yes.

MR. HOLMQUIST-JOHNSON: So just, I guess, making sure that in that state when we then take that new geometry, that those breaching flows and things are then also looked at under those new channel geometries to see how those project effects and changing geomorphology could potentially alter or, you know, increase or decrease, you know, what

those breaching locations or access would be.

MR. REISER: I'm looking at Lyle back here, and he's nodding yes. So, yes, there would be.

MR. HOLMQUIST-JOHNSON: I guess the other question or point is that the effective combination of fish response curves, measurement of physical conditions and, you know, predicting those under project alternatives -- we talked about that briefly with the HSC data -- but as well with sort of integrating all the models together, as Phil brought up, you know, lateral habitat, groundwater and water quality, and again, under future conditions, you know. How well we're able to predict those in those areas under the future conditions, and how that ties in to the instream flow and the other components, and then extrapolating that to a whole river process. Again, looking at the resolution of some of those to make sure that we can bring those values in.

And another one was channel change. We definitely recognize that, that's not being ignored. You know, looking at both the 1D mobile bed for the entire river system and then 2D in the Focus Areas. That still seems

like it will be challenging to integrate these multiple altered channel geometries with the habitat variations that are calculated from a fixed geometry, especially looking at the episodic and difficult to model geomorphic effects for mechanical ice break-up. So we've talked about whether or not what we're predicting with the open water channel change, is there a chance that the ice break-up conditions that are occurring actually cause more disturbance than what we're modeling with the open water components and how that might be addressed looking at project operations.

MR. REISER: Chris, you're not expecting a response on each one of these, right?

MR. HOLMQUIST-JOHNSON: Of course. I think just things that -- you know, we've discussed some of these in the past, you know, and wasn't any real direct information in the ISR related to some of those. So I think it's just bringing them up again to make sure that, as we move forward, that these are all being considered, and you know, when we get to that Decision Support in the end, these are all things that feed into that

with all of the different study components coming together to ultimately look at what is that decision variable that we're looking at. And they all provide inputs or effects on that.

MR. REISER: Well, they're good comments. It's just a matter of I can't respond at this point in time for sure.

MR. HILGERT: Along those lines, Chris, if you're reading from some notes that you have there, it would be great if you could submit those.

MR. HOLMQUIST-JOHNSON: Part of that is from myself, just nervousness.

I think one other thing that would be -- we've talked about the load-following components and the varial zone, changes with that, and we've run the OS-1B situation through a lot of these scenarios. And we've had talk about what other alternatives might be with the operation components of the dam. And while I know OS-1B was used initially for kind of the worst case scenario to see how far downstream project effects might be, to see how far down modeling would contain, but I think as we have some of

these additional TWG meetings and work groups, you know, looking into what our potential realistic operations that might actually happen and how those are going to go into these models. Because at some point when we're doing all of these analysis, we really want to be looking at what the realistic options would be, not basing all of our critiques and decisions on sort of the worst case scenario that I think everybody has kind of agreed that isn't really going to be operated in that fashion. And so being able to, you know, as a group come together and find out what are some of these alternatives that really might be utilized, you know, in the system, both for hydropower from an economic standpoint, you know, instream flow, whether it's, you know, fish habitat, whether it's flushing flows, all of those kind of components, you know, really working together to come up with what those alternatives might be, so that we can really look at what the effects are; so that we don't wait until the end and say -- you know, at the very end we're now putting these five scenarios together, and everything has been based on the worst case scenario.

MR. REISER: Right. I would -- that's an important aspect of the

work that we're doing, and I'm sure AEA is thinking about that. I know that has come up. I think Sue brought that up at one.....

MS. WALKER: Many times.

MR. REISER: Several times anyway. And so I'm sure that, that's a consideration. I heard the term -- I heard channel maintenance being brought up yesterday. So there are other aspects of the flow regime that are definitely going to be looked at down the road. Those are important that you just mentioned.

MS. O'NEIL: Hi. This is Sarah (indiscernible - interference with speakerphone). Let me just echo Chris' comment and also just make.....

MR. PADULA: Sarah, could I ask you to just speak a little slower and a little louder, please.

MS. O'NEIL: Yes. This is Sarah with the (indiscernible - interference with speakerphone), and I echo Chris' comment and place some urgency on providing the equilibrium process with more information on realistic projects now in order to allow them to be able to review the various models and determine whether calibration has been done within an

appropriate range of reasonable operations. Right now we don't have the information available to review that (indiscernible - interference with speakerphone).

MR. REISER: I think, if I understand your comment, that you're expressing some urgency in obtaining what these, as Chris characterized them, you know, more realistic operating scenarios might be, and that there's an importance in getting that understanding out there and what those might be. Is that correct?

MS. O'NEIL: That's correct.

MR. ROTHWELL: This is Eric. And I also share the same sentiment.

MR. PADULA: Sure.

MR. ROTHWELL: Is that okay now?

MR. REISER: That's fine, yes.

MR. ROTHWELL: (Indiscernible - interference with speakerphone).

MR. REISER: Well, Eric, I think I understand your question about

the different variables. Are you referring right now to.....

MR. PADULA: Restate his question.

MR. REISER: Well, the question is you've got some concern about the fact that there may be variability in different parameters that we're not picking up in the suitability curve development, and therefore, they don't come out as being an important part of it? Is that generally what you were alluding to?

MR. ROTHWELL: (Indiscernible - interference with speakerphone).

MR. REISER: Well, I'm not -- it's not crystal clear to me how we might do that. I would say that in the microhabitat analysis that we did, one of the key elements that we were looking at in terms of whether to bring in other parameters into the analysis -- and we can go through this in January in more detail -- was whether or not we would see a direct sort of flow dependency on that parameter that would be sufficient in order to effect a change on where what fish might be in the time frame that we're using our habitat assessment, our habitat models. And for some of those

parameters, they just don't have that linkage back into the habitat modeling.

Nutrients, I'm not discounting that they're important, but they don't have that sort of immediate effect when you change the flow. During a load following cycle, for example, you're not going to get an immediate response of those fish if the amount of nutrient material just happens to vary a little bit within the time step that we're looking at. On the one hand, depth, velocity, potential groundwater upwelling turbidity, those are more immediate effects that we would factor directly into the habitat analysis that we're looking, the habitat flow analysis. That's not discounting those parameters though, and we're not dismissing them.

We've looked at it, and a lot of the parameters that are in there are being picked up and evaluated as part of other studies. You know, river productivity is being looked at. Phil is looking at me, so he must have something to contribute.

MR. HILGERT: This is Phil Hilgert, Eric. If I could restate your question a little bit differently, are you suggesting that if we increase the

number of HSC data points, we could then evaluate whether those relationships between fish distribution and say temperature could be macrohabitat-specific? Is that what you're suggesting?

MR. ROTHWELL: (Indiscernible - interference with speakerphone).

MR. HILGERT: I think we understand your question now a little better, and we'll take a look at that. One of the things, keeping in mind is a lot of the HSC measurements that we have, the fish are heavily distributed according to macrohabitat. We're not finding lots of Coho juvenile or Coho fry out in main channel or side channels. A lot of them are in those backwater sloughs. So that's going to limit the ability to look at different macrohabitats if a lot of our HSC are concentrated by macrohabitat, but it's something we would take a look at.

MR. ROTHWELL: (Indiscernible - interference with speakerphone) Is that something that would be presented in all of the analyses of all the variables from the study determination that we're asked to be captured in that summary provided to the stakeholders?

MR. HILGERT: The analysis that was done in response to the study plan termination determination was a tech memo. It was submitted in September, and I think at this point that's what we're going to be asking you guys to review and provide comments on in January.

MS. MCCRACKEN: I have one more question.

MR. PADULA: Thanks, Eric. Betsy?

MS. MCCRACKEN: This is Betsy with Fish and Wildlife Service, and I just wanted to ask, if in that tech memo, do you have macrohabitat sites with the HSC variables collected where there's fish presence and where there's fish absence?

MS. SHELLY: I'm sorry. Could you -- I'm not sure I understand your question. Could you restate it?

MS. MCCRACKEN: Yes, so we at the Fish and Wildlife Service and I think both services have originally asked for the Focus Areas and the HSC study sites to consider sites that both have fish presence and those that where there is fish absence or did not have fish presence, so you could distinguish between the two habitats and what variables might be more

influential to the fish habitat site selection. And so I don't think that, that was conducted. I guess that's my question.

MS. SHELLY: Are you referring to the tech memo that we just put in? I just want to know which analysis you're referring to.

MS. MCCRACKEN: The HSC. It sounds like if it was going to be somewhere, it would be in the tech memo that Phil was just referring to. But.....

MS. SHELLY: So for the HSC analysis we have lots and lots of availability measurements were fish were not present in the overall HSC analysis, yes.

MS. MCCRACKEN: Okay.

MS. SHELLY: And in the tech memo that's regarding the other microhabitat parameters, we also looked at -- that was fish distribution and abundance data, so it was zeros also, compared to whatever was available that was overlaid with any fish captures or non-fish captures.

MS. MCCRACKEN: I think I need to look at the tech memo. Thank you.

MR. REISER: Yeah (affirmative), I think that's the key is just look at the tech memo, and we'll be happy to go through that, step through that in January and, you know, entertain your comments at that point.

MR. HOLMQUIST-JOHNSON: Along that line, by the way, taking a quick brief skim of that the other night, some things that were very helpful in that were some of the tables that show some of the linkages I think we've been looking for, asking for in terms of what data is there, how it feeds to other models, or what models or study areas are utilizing that. So in those tables, there's some of that data identified.

So I just want to say thanks for that, and that's sort of what we're looking for going forward when we're trying to -- because there's so many that all of this links together, knowing how all those come together and who used it or where it came from is very helpful.

MR. REISER: Thanks, Chris.

MR. PADULA: Any other questions or comments for Phil and Dudley? Over here, Dominique.

MS. GLASS: I had a question regarding the pre-proposed or

alternative methods for expanding the data beyond the Focus Areas. Before I get into that, is there a tech memo I should be reading? (Laughter)

MR. REISER: No, nothing.

MS. GLASS: Each of the three habitats (indiscernible - interference with microphone) because the original input data wasn't (indiscernible - interference with microphone). But primarily all three of them have a problem whenever you try to expand into the Lower River where data that's required for input is largely missing. So any thoughts on how that expansion could be improved into the Lower River?

MR. REISER: Right. The extrapolation process that we've outlined and been reviewing to date is all, you know, targeting the Middle River segment. As you know, we had a different approach when we came down to evaluating flow issues in the Lower River just because of some of the things that have been brought up from the ice processes and geomorphology as well, the complexity of it, the complexity of the habitats.

In looking at how we were going to approach that from a fish habitat perspective, we looked at the 1980s data too, and they went through the same process. They recognized that it's complex. They also, at that point, which we have likewise, realized that the primary effects in terms of habitat and where the actual -- a lot of the activity that's going on is the Middle River segment.

When we get down to the Lower River then, we took a different approach. We keyed into different tributaries and have put in several, you know, transects. We've identified a series of tributaries, five different tributary areas that we'll be looking at and developing. And Kasey [Clipperton] has been part of this from Golder, developing habitat flow relationships.

The short answer is there's no intention of extrapolating -- we don't have the same level of data that we've collected in the Middle River in terms of all the habitat mapping that we would take that and expand that down, and it wouldn't even be appropriate because of the changes, you know, the differences from the habitat regions.

Does that answer the question?

MS. GLASS: Yeah (affirmative), and the question that follows is so -- this goes back ancient history before I got involved, but the question is why haven't we collected the data that we need in the Lower River?

MR. REISER: Well, I think the short answer that I just mentioned is the flow attenuation model, you know, we relied on that fundamentally to, first of all, figure out where we were even going to limit the extent of our studies. When the results of the first early model, the water flow routing model came in and then the geomorphology analysis, hydrologic analysis that was done by Tetra Tech, you know, working collaboratively and evaluating the outputs of those, we recognized, no, there's going to be some potential stage elevation changes. We need to move down into the Lower River.

At that point though we decided -- and sort of looking at the river, we decided we cannot go with the same level of effort that we have in the Middle River, establish 2-D Focus Areas and break it into all these different segments, nor do we think it's warranted because of -- you know,

we think the depth is going to change as much as the depth changing in the Middle River. The Lower River in particular is moving around a lot. It's a lot of sand down in those locations. So just the level of detail, the cost, and impact potential of where do you put the effort, and the effort was primarily in the Middle River; but some analysis extending down into the Lower River at key locations that we felt could give a good handle on habitat versus flow relationships.

I know that's a little bit of a ramble going at it, but I'm trying to give a little history of, you know, the thought process that went into where we are right now.

MS. GLASS: I can appreciate it. Thank you.

MR. PADULA: Anyone else?

MR. HOLMQUIST-JOHNSON: Tying into that Lower River, I guess, knowing that there's additional -- I won't call it Focus Area because that's not quite what it is -- but where we're going to do those more detailed Lower River1D transacts, have you looked at all in terms of the data that's been collected at this point with the escapement studies, and the

fish distribution, and abundance data, utilizing some of that to help with where you might put those studies, rather than relying maybe on, you know, the 80s data and some of that, looking at what's currently being utilized as where you might be able to put those study sites?

MR. REISER: At the time when we were selecting those sites, we didn't have those data. I think that's a worthwhile piece of information that we now have, and we can take a look at it and see. But we have -- in our study plan we've identified certain locations that are in the study plan determination that we will be targeting.

MR. HILGERT: One of the things we concentrated on the Lower River was we were looking at the tributary confluences, and so we've concentrated a lot of our study efforts at those tributary confluences. At least based on the information I've heard from fish distribution abundance and HSC, that holds true today as it was in the 80s. The escapement study might provide us with information about which tributaries the fish are going up, but the modeling efforts are right down there near the confluence.

MR. PADULA: Any other questions?

MR. HEALY: This is Dan.

MR. PADULA: Yes, Dan.

MR. HEALY: I have a comment on the effect of the quality of calibration. It seems to focus (indiscernible - interference with speakerphone), and that's something that's been presented in looking at those (indiscernible - interference with speakerphone). So if we look at the different players involved in the (unintelligible) process, they each have a relevant contribution, which could be (indiscernible - interference with speakerphone).

MR. REISER: I apologize. Could I ask a question -- sorry. Could I ask a question, is this regarding the open water flow routing models or some other element?

MR. HEALY: It's regarding the open water flow model.

MR. REISER: Well, I will say we're having a difficult time trying to understand. Again, it's the audio piece on picking up the point, the points that you're bringing forward.

And I will say that, you know, the calibration details are presented in the appendix -- I don't have an exact appendix -- but of the ISR done for the open water flow version 2. In addition, Stuart Beck, who was involved in that or actually developed that model, is not present. So I would just request comments like that being on the ISR maybe in writing. That would be the appropriate way. It's Appendix K

MR. HOLMQUIST-JOHNSON: Dudley, I might be able to shed a little light on that.

MR. HEALY: So you're saying it's not relevant to the discussion?

MR. REISER: Well, no. I'm not saying it's not relevant to the discussion. I think it's important. It's just that trying to really understand, but maybe Chris has a.....

MR. HOLMQUIST-JOHNSON: I think -- Dan, let me know if this isn't along the lines of what you're thinking, but I think part of the question with the 1D routing model was looking at project operations when you're getting into some of the load following, you know, the inter-daily peaks that are occurring and how that might effect, you know,

storage that's occurring in the system as far as maybe groundwater recharge, you know, storage that's occurring in all channel habitats as sort of that, say, flood wave goes by, for lack of a better term; how that might affect what's going on in the system under those future project operations and can that be addressed in the model, or are those being considered, I guess, in the modeling that you're doing and the effects that, that might have, specifically with kind of off-channel habitats and what would be involved with that.

MR. REISER: We'll pass that along to Stuart.

MR. PADULA: Any other comments?

MS. WALKER: (Indiscernible - interference with speakerphone).

MR. PADULA: Sure.

MR. WALKER: My name is Jeff Walker with (unintelligible), and I wanted to go back to the Decision Support System. (Indiscernible - interference with speakerphone). But my question is if you could provide specifics about how the results of the DSS will actually (indiscernible - interference with speakerphone) will be used for because when you read

about it (unintelligible) decision, but it's not clear from the (unintelligible). (Indiscernible - interference with speakerphone) description.

MR. REISER: The details on how the Decision Support System will ultimately be used, I think are to be determined. Clearly, there will be -- AEA will have inputs into it. There's going to be a variety of different parameters that would factor into this. It will be worked out with stakeholders, what parameters are we really looking at that are most important. There are probably several of them that are going to be important, flow sensitive parameters that will come into play.

It's not been -- in my view anyway, and you know, I'm not a Decision Support specialist, but in my view this is going to be a tool that's going to allow all the stakeholders to begin to understand, okay, if you operate -- if AEA operates in a particular fashion with OS-1B or some other alternative, what are the tradeoffs that you're going to start seeing in terms of perhaps it's the total amount of effective spawning incubation habitat. That's one method. And maybe you break it down into different geomorphic regions. So there might be, you know, a spatial element to the

decision support. What are the, you know, the recreation pieces that might come into play? If they operate this fashion, how many boat days would you have under this particular operating scenario versus another? And in the end, there's going to be some discussion, and, you know, working out details and working out -- collaborating with AEA and the stakeholders and trying to craft what is a good operating scenario. There's going to be lots of constraints that will come into play because the AEA is going to be constrained by energy and all that weigh into this for sure, but that's my conceptual view of how the Decision Support System would play into this.

Wayne?

MR. DYOK: Dudley, I think that's right on the mark, and I would just add that certainly from an operational, you know, perspective, that's where I would see more of a iterative process to look at a particular operation that's going to be balancing the development and the non-development aspects. But I wouldn't rule out the potential for some, you know, design modifications to deal with issues, particularly those that might relate to things that we can actually effect by having a different

design. We have to obviously keep in mind the safety aspects; that's number one, and, you know, cost is up there as well. But if there's some factor that would suggest you put your cone bells at a certain elevation, absolutely, we could, you know, incorporate that kind of information.

Ultimately, that information is going to be incorporated in our draft license application and final license application in the Exhibit E, so we will have that. But I think Dudley is right. There's going to be a lot more opportunity for discussion on each of these alternatives as we move forward through the process.

Now, I don't want to be in front of people trying to, you know, get the food here, so maybe we ought to call it.

MR. PADULA: Everybody.....

MR. ROTHWELL: (Indiscernible - interference with speakerphone).

MR. REISER: Yeah (affirmative), and obviously we've got work to do to be able to answer that question. You've hit on a couple of good points though, and that is the need to make this transparent. The methods

that we're going to be looking at need to be understandable by the public, and so there's -- I mean, we could sit down and think of a few of those, but I think for the benefit of time, we recognize there is more work to do on this in 2015 as we're moving forward. So there will be details coming out on this, and I'll just let it go with that.

MR. PADULA: Chris is going to get the last word here.

MR. HOLMQUIST-JOHNSON: I just want to -- we talked about the DSS work that we presented back at the Riverine Modelers meetings, and I just wanted to bring it up that we do now have a manual for that program that is out. It just came out last month, and we will also have a special issue in Limnology coming out on the application of that on the Delaware River that will also be, you know, an application and reference that he can look at.

MR. PADULA: Thank you.

MS. BOLBERG (sp): I have a (indiscernible - interference with speakerphone). But recognizing that we won't have a lot of this information for about a year, speaking of Eric's (unintelligible) that's the

daily data and the sub-daily data (indiscernible - interference with speakerphone).

MR. REISER: Let me -- I think this is -- and I apologize. I don't recognize your voice. Somebody from (unintelligible).

UNIDENTIFIED SPEAKER: It's Tara Bolberg.

MS. BOLBERG: Yes, this is Tara.

MR. REISER: Yeah (affirmative), I think the question was whether or not the daily data, and this, Wayne, is a question for John Haapala. I'm not quite sure how to answer that question.

MS. BOLBERG: Just to followup quickly, it's published in the ISR (indiscernible - interference with speakerphone).

MR. HILGERT: Under Version 2 of the open water flow routing model we developed hourly hydrology under the OS-1B. We have that data available, but it's for a short period of record, a short -- for several months during specific years. If you're looking at running, say, an IHA analysis, you need an entire year of record, and you're looking at hourly flows. It requires a combination of both the open water flow routing

model and flow routing during the ice period.

And frankly, we're going to be doing that type of analysis under version three. The final version of the open water flow routing model will need to incorporate the hourly flow fluctuations from the tributaries. That's one of the things we're doing for that Version 3. So we really won't have that year-round hourly analysis available until we finish the Version 3 of the open water flow routing model.

MS. BOLBERG: Thank you. I guess specifically, the hourly data that is incorporated into a graph in the existing ISR [Study 8.5, IFS, Part A, Figure 5.4-1], that graph covers a full year. So [are those data available?]. This is 1984 to 1985.

MR. REISER: And did you have that figure number again to give us?

MS. BOLBERG: Yeah (affirmative), I believe it is (unintelligible).

MR. REISER: Yeah (affirmative), you're cutting out. Try again, please.

MS. BOLBERG: Yeah (affirmative), 5.4-1.

MR. REISER: Thank you.

MS. BOLBERG: Thank you.

MS. MCGREGOR: Hi. I just -- this is Betsy from AEA. The response that Phil just provided was provided to the Nature Conservancy in an email from AEA with respect to the data. We did provide the data that was available for the graph, what we thought was -- what was going to be asked for as Phil just responded.

MR. PADULA: Thanks. All right. Everybody has earned lunch. So we're going to keep it to an hour. So please be back at 1:15.

12:15:38

(Off record)

(On record)

1:18:23

MR. PADULA: Thank you. We're going to get started with our last afternoon session. The way the agenda was laid out initially was that Kevin doing his Riparian Instream Flow presentation and then to the discussion and then come back to Aaron Wells. And since -- and there's a

lot of interrelationship there. What we're going to do is have both of the presenters present, probably a total of 15-20 minutes, and then we can have a collective discussion around all that information. There's just a little bit of a slight modification. And with that, Kevin, you want to start? Kevin Fetherston.

STUDY OF RIPARIAN INSTREAM FLOW (STUDY 8.6)

STUDY OF RIPARIAN VEGETATION STUDY DOWNSTREAM OF THE PROPOSED SUSITNA-WATANA DAM (STUDY 11.6)

MR. FETHERSTON: Good afternoon. We'll spend the rest of the day going out of the channel on to the flood plain. I know it's been an in channel-oriented meeting so far.

And as Steve was saying, the riparian studies program is really integrated between the Riparian Instream Flow Study and the Riparian Vegetation Study. You can think about it as pattern and process. Riparian Vegetation Study is focused on mapping the patterns throughout the entire study area in terms of floristics and soil patterns. And the Instream Flow Study is focused on processes that generate and maintain those patterns.

So it was administratively split up into two separate studies, but it's really one integrated whole. And I work on Aaron's team, and Aaron works on my team in terms of the design and also the field work.

The goal of the Riparian IFS study is to provide a quantitative spatially explicit model to predict what potential effects will be downstream due to project operational changes to the natural Susitna flow sediment and ice process regimes, and that's the total goal of what we're doing; and everything -- all the studies are designed to support that.

Our work is supported intimately by the geomorphology and fluvial geomorphology programs and by ice process modeling as well as the hydrology groundwater surface water studies in terms of modeling and measurement of physical processes.

So I'm going to skip through the slides-- I'm not going to actually read that. This is taken directly out of the ISR.

We have six primary objectives in our study leading off with the Dam Effects technical memo. It's a critical literature review that we've written in partnership with Mike Harvey and the geomorphology team, and

that, as you mentioned yesterday, is going to be coming out by November 15th, I believe. We're essentially finished, and we're going through a final internal process with that.

Secondly, the series of studies we're doing in this program are focused on what happens-- if you change the flow sediment and ice process regimes, what kind of effects will it have on plant community establishment and maintenance. We consider that in terms of surface water and groundwater relationships, sediment dynamics. We know those are critical in terms of seedling establishment.

And then finally the whole issue-- which is very different up here in Northern (unintelligible) Susitna River is ice processes. We tend to call this an ice disturbance parameter in terms of its effect on vegetation patterns.

In doing so we have -- we're doing detailed seedling, seed dispersal and seedling establishment studies to characterize how things are occurring under current conditions, and then after developing a process understanding of that, we can then look at what could potentially change

when you change those driving -- those underlying driving physical processes.

We're working with ice process studies to characterize river ice, which is dramatic up here, and I'll get into that in a minute. And then working with the geomorphologists, we're looking at the role of sedimentation relative to the erosive and sediment depositional processes in the river, both in water -- I won't go into such detail on this, the geomorphology study. Then also the groundwater aspect of this.

The components, this is simply a laundry list straight out of the ISR in terms of the details of the study.

We have two variances. One, as I mentioned before, was the Dam Effects Literature Review was initially scheduled to be finished up, I believe, in Q4, 2013, and once we got into doing this, it became readily apparent that we really need to have an integrated document because geomorphology is so intricately linked with the pattern and process of vegetation.

And then the second variance is that in our seedling establishment

study, upon our initial reconnaissance efforts in 2013 when we began to do the studies, it became readily apparent that -- as you can see here on the slide. This is a stand of cottonwood that was leveled by an ice raft, and that what we see in the middle channel islands and the lateral margins of these floodplains are both sexual reproduction of plants and asexual or clonal reproduction. And that this clonal reproduction is something that was somewhat unforeseen for us who do much of our work in the lower 48, and it plays a major role in terms of the pattern vegetation that we see out there.

So what we've opted to do is go ahead and do our seedling transact establishment study, and in addition to that, we're going to be laying out transacts to characterize the clonal reproduction pattern that we're seeing out there because if we change the ice processes, that will change how the ice interacts with these floodplain forests.

The summary of the results, this is again just straight out of the ISR, and I'm going to go through this slide by slide here. The seed disbursal study is going well. We did that first in 2013. We have four

cottonwood groves ranging from Deshka Landing up Indian River along a temperature gradient. The results are coming back. We did one year of measurements, and we'll be doing a second year of measurements in 2015.

The seedling establishment and recruitment is detailed -- the results are detailed, preliminary results are in the ISR.

One thing I will point out is that we have two sets of measurements of the seedling establishment of transects in 2013. The reason for that is there are on average some peak flows which occur in August, and if you look at the record, you tend to have a variable distribution of flows. And indeed, what we see here is that we -- the blue lines are the proper seedlings established and orange is when -- we went back and did a mortality study, and there was significant loss of seedlings due to a 48,000 cfs or approximately a two-year event in August of 2013. So we were able to capture just what we set out to do.

Our ice interaction study is -- we're seeing that, number one, characterize the map for the extent ice effects, and it's very discrete on this river. There are areas where ice has dramatic effects on the Middle River,

and in the Lower River we're seeing very little in terms of dramatic ice vegetation interaction patterns. And we're doing that through mapping and also doing dendrochronology, which we can actually measure the year in which ice affects these forest stands.

Floodplain stratigraphy and development is key to, again, analyzing and understanding the pattern of vegetation, and we're using dendrochronology, which not only affords us to understand the age of the forest stand, but it gives the geomorphologist essentially dates in which these terrain surfaces have developed. And we have over 300 samples to date in that.

And finally, in floodplain stratigraphy in terms of doing our sediment, understanding Susitna which in the Athabaskan language means "river of sand." The sand is a huge deal in terms of the establishment of *Salicaceae* vegetation out there, and so we want to get a quantitative characteristic of the depositional rates of sand. And we've been using lead 210 isotopes and CZ 137, and we've had preliminary results from our 2013 work. And this laboratory analyses are going to work for us. So we will

continue to do that in 2015.

The groundwater/surface water hydroregime is focused on understanding relationships between where plants are getting their water, and again, the key to this is that you have -- when you change this river stage that would affect, say, groundwater levels that plants are dependent upon or not, and we're documenting that in a number of methods.

Finally, I think that's -- those are pretty much our results. Our modifications, are again, the literature review and seedling establishment approach.

And in total we're really on target to get our product in February of 2016. Our studies on time, and we've got very few modifications to them.

I won't go into the detail on this. It's all laid out in the ISR, and I think that's the big picture. And I'm going to hand this over to Aaron Wells. He'll go through a similar summary for the riparian vegetation, and then we'll open this up to discussion.

MR. WELLS: Good afternoon. I'm Aaron Wells with ABR, based in Anchorage. I'm going to talk to you about the Riparian Vegetation

Study, which is a component of the overall Riparian Instream Flow Study, as Kevin mentioned.

The objectives of the study are to, as Kevin mentioned, you know, he's more focused on the process, where I'm focused on the pattern in my study. So we're mapping and describing vegetation and describing successional sequences. And we're also interested in characterizing the role of sedimentation and erosion. As Kevin mentioned, there's a sediment dating study that we're working on in 210 1 through 7. And we're working closely with the other instream flow studies, including geomorphology, groundwater, and ice-processes.

So the components include developing mapping materials from existing data, including high resolution aerial imagery, field surveys, and utilizing an integrated terrain approach to classification and mapping of the riparian vegetation, which I'll talk about more as I go along.

Variances, there were just a few variances from what we originally proposed. First was the plot allocation in Focus Areas. And in response to AMC comments, we revised our approach, which originally only

accounted for the size of the Focus Areas. And we decided that there weren't enough plots being allocated based on the number of ecotypes that are in the Focus Areas. Ecotypes are local-scale ecosystems. In our revised approach we accounted for both the size and the number of ecotypes for Focus Areas to develop our target number of plots in each Focus Area. This resulted in an overall higher number of plots allocated to the Focus Areas, and we described this in a technical memorandum that was dated July 1st and filed with FERC.

The second variance was related to the spacing of points along our sampling lines and our intensive ecological land survey plots. We originally proposed 0.5 meter spacing, and because of the robustness of vegetation on the floodplain, we decided to change that to 1 meter spacing. You can imagine for a large plant like a Devil's Club, that if you spaced the points too close, you would be, you know, sampling the same plant. Whereas if you spaced the points further apart, you're sampling different plants and allocating the sampling along each line more effective. If you're looking at Alpine tundra or Arctic tundra, you can space them much close

because the plants are much smaller. The larger sampling area will require larger radius of our plots. So we had (indiscernible - distance from microphone) large spacing.

And then the last variance, at plots where we integrated the groundwater wells with our vegetation plots, we had originally proposed to put the ground water wells in the middle of the plots in what we're calling the trample zone. The trample zone is where our teams can go and set their gear, but where they would not disturb the adjacent sampling area. However, because of the size of the wells, we decided that it was better to place them just outside of the plot but in the same community and on the same fluvial surface.

And there were no additional variance or modifications.

To just briefly go through the work that has been done already, in 2012, we went out from June 24th to July 3rd and sampled 82 integrated terrain unit plots. These are for mapping verification and description of the vegetation. We collected vegetation data, including describing the vegetation and all species present, estimating percent foliar cover, and

describe the soil and environment.

In 2013, we went out over several sampling periods, and we started our soil trench stratigraphy descriptions in May. And then went out again June and August and sampled 214 additional ITU plots along 35 transects.

During the same period, we sampled 62 intensive ELS plots. These are designed as permanent plots, so there's a magnetic marker that's been buried in the soil so people can go back to that marker in 5, 10, 15, 20 years. It's set up that way, and sampling design is more intensive.

Here's a map that shows our sampling plot, both integrated terrain unit and intensive, and plots where sediment sample were collected in 2013in 2013. And at the Focus Areas specifically, the yellow points are those that we sampled in 2013. The blue points are those that we plan to sample in our next sampling period.

From this we can review the spatial distribution of our sample plots and quickly see where there are gaps that we need to go fill spatially, and along with this will come, this fall and early winter, a review of the existing data to look for gaps that need filled next summer, so two parts of

the data gap analysis.

To summarize our progress to date, at this stage we have been actively mapping. We have about 50 percent of the total riparian study area completed. People are actively mapping right now. We're going to work on preliminary analysis, as I mentioned this fall, early winter so we can use that information to guide our sampling next summer.

So the mapping, the integrated terrain unit mapping is a multi-parameter mapping approach, and at each polygon that we delineate, we assign several variables. So each polygon is unique in all those variables, and that includes geomorphology, vegetation, surface form, recent disturbance as observed on the aerial imagery, and poplar size class.

I'm just going to roll through. These are all presented in ISR. I'm just going to show you examples of the mapping, just in the Focus Areas, and of course, the mapping is broader than this. It extends across about half of the study area at this point. These are examples.

So the geomorphology, the different color coding is the different classes, here is the surface form, the vegetation, disturbance, poplar size

class, and then we integrate all these into what's called an ecotype map, ecotypes are local-scale ecosystems that integrate both vegetation and environment.

There's been no significant modifications to the mapping portion of this study.

The steps to complete, I won't go through all these, but I will mention that we just got back from Susitna floodplains, Kevin and I, in September. I still have Devil's Club in my hands from that.

We are set to finalize the ITU mapping as scheduled in 2015, and we'll be able to use the 2015 data to verify that mapping in areas where we don't have plots now. And we will be developing riparian wildlife habitat wetland types in coordination with the wildlife program and the wetlands program, and we'll be developing natural vegetation-succession pathway models based on all of our data and in combination with the process-driven data that Kevin studies are collecting. That will feed into our models of succession.

So as described in the ISR, no additional study modification

proposed, and we're anticipated to meet study objectives. And that's all. Thank you.

MR. PADULA: Great job, guys.

So we'll open to question for either Kevin or Aaron. You want to get it started, Greg?

MR. AUBLE: Yeah (affirmative). Hello. I'm Greg Auble. I'm a Riparian Ecologist with USGS working with the agencies. I got all kinds of comments, but I'll try real hard to focus on the most important ones and pretty much completely from the perspective of sort of the progress of these studies and how well they will inform and ability to evaluate project alternatives. I'll be watching for ways to comment on that. That's what I'm going to focus on.

And I guess as Kevin said, sort of the gold standard of evaluating changes in -- downstream changes in flow and sediment on varied vegetation, some sort of spatially explicit probability or cause output associated with each of these alternatives. Just exactly what the study is doing involves sampling vegetation along with the driving variable to

describe the current pattern and then be able to project that into the alternatives. The obvious drivers are inundation, depth of groundwater, disturbance, which in this case is ice, water (unintelligible), and changes in topography.

That seems to be going very, very well. I would say I've got concerns about the quality of limited steps that might feasibly be done better, and those are largely sampling. There's some variation in -- your scheduled has changed over time and the Focus Areas they haven't gotten done or didn't go on. I think it's really important to make sure that we get an adequate coverage in this ELS well where we have concomitant vegetation, inundation, depth to ground water, and disturbance. We want to make sure that at some point you give us an update or make sure that we really do have full coverage there by the time you're done.

The other area is depth to groundwater, and there's -- you know, there's been ambiguity there, both with respect to existing vegetation. What is the depth to groundwater of the existing vegetation, and then how well will you be able to predict depth to groundwater on the project

alternatives. And I know that a lot of work has been going on since the ISR on dealing with that, but that's an important area of concern it seems to me. It's one of the areas where as of between now and 2016 might really improve. If it doesn't get better, it's going to be really bad, and it could be -- it's a good place to allocate that.

Yeah (affirmative), those are the most important points I think.

I am personally -- I know Bob Henszey, Fish and Wildlife Service, is more interested in this than I am. I am personally really skeptical about the -- the value of detailed measurements of transpiration. I just don't think -- the work that's being done is being done very well. As plant ecologist, it's really interesting to me. I just don't see that variation across the vegetation cover types and transpiration rates is that important in this system. I know in arid systems, in like San Pedro, (unintelligible), Mojave, that's the main thing, but I just don't see it as being a real important element, especially in connection between project alternatives and changes in vegetation. I just don't that variation is -- I mean, I'm not arguing that it's not real, but I don't think it's that important, and especially

to the extent that, that whole effort was originally aimed at quantifying the riparian component of MODFLOW. And I just think that as the project has evolved, that's a less important thing to be doing.

The ice core mapping component and the stratigraphy, it's just been incredibly valuable, not only in terms of -- well, you've developed field data that is establishing the importance of ice in structuring the vegetation and in control and flow stratigraphy. So I think that is a (indiscernible - interference with microphone), even transcends the riparian vegetation. And I don't know whether you're communicating anything that (unintelligible) doesn't already know, but it is -- you've got developing real solid, real field observations that document that.

A couple more than I'll -- with respect to the seedling dispersal and establishment, that certainly would be a standard thing to look at. That (unintelligible) is proceeding very, very well with generating very clear results. It's going to nail down the potential disruption of seed reproduction of cottonwood and willow, especially as it might relate to changes in the basic hydrograph, where you're storing spring water and

releasing it in the winter.

My comment is, okay, if that isn't clearly disruptive, then what's going to happen, and what is the replacement vegetation likely to be? The other aspect of that is (indiscernible - interference with microphone). You've also got the problem of if we are dealing with substantial stage (indiscernible - interference with microphone), what that does to these freshly germinated seedlings. It's not the stuff (indiscernible - interference with microphone), but it could be very, very important.

Isotopic water sources. You've got a ton of samples. We just haven't seen. The numbers aren't in the ISR yet, so I'm looking forward to that. Okay. That's about it.

MR. FETHERSTON: Thanks, Greg.

MR. PADULA: Anyone else have any comments, questions? Anyone on the phone have any comments or questions?

MR. HENSZEY: (Indiscernible - interference with speakerphone).

MR. PADULA: Thank, Bob. Kevin has been taking notes, and we're going to ask him to see if he can restate your question, make sure we

got it right and then respond.

MR. HENSZEY: (Indiscernible - interference with speakerphone).

MR. AUBLE: This is Greg. I was actually trying to say the same thing that Bob was saying at the end. The immediate thing that could be done to address this (indiscernible - interference with microphone) a shared summary. Like how many plots are we really going to have where we know surface water inundation and groundwater and have got -- what's the coverage of those across different ecotypes? So Bob is raising the same basic question there. It's just hard to tell. Well, and I imagine the river study was hard to plan because things evolve and are changing.

You need to tally that in a check-in to make sure -- you talk about it in terms of data gaps, okay. We got that covered. Is that coverage going to be pretty good or not?

MR. FETHERSTON: We have -- in terms relative to groundwater, every well that we have in Focus Areas is going to have a vegetation soil plot associated with it. So they're all going to be covered.

In terms of a non-Focus Area sampling, currently we don't have

groundwater measurements. We have surface water inundation. We're doing essentially a HEC-GeoRAS exercise for the entire project area. So we have flooding inundation frequency for the entire -- basically all the floodplain surfaces throughout the study area, and we have very detailed levels of that with also the 2D model in Focus Areas. So that's the current design.

MR. AUBLE: Well, if Michael could come up -- (indiscernible - interference with microphone) come up with some figurative way to estimate what the groundwater was for those places where you didn't measure, and I could use those.

MR. FETHERSTON: Well, the groundwater issue relative to plant communities and the relationship between river stage and what we're calling floodplain water bodies. These are water bodies on the floodplains in terraces that are associated with abandoned sloughs. They're associated with seepage areas that beavers have dammed up along the lateral margins of the floodplain and the toe slope.

And what's become, as we've gotten into this work, after, you know,

a year and a half, it became apparent that in terms of conducting an effects analysis of project operations, that the key aspect of this is to be able to adequately delineate what I would call hydrologic domains in the valley bottom. You have riverine flow, which is, you know, linear flow coming in, transported by fluvial process. We have waters -- we have hill slope or upland hydrologic processes, which are coming off the lateral valley walls, and then there are seepage areas at the toe of the slope.

So there's quite a bit of water, and again, this is something that's emerged since we've gotten into this work, realizing just how much water is staged in water bodies at the top of the valley walls. It's like a whole series of water towers, so there's a significant hydrologic gradient from them coming downslope. When it hits the floodplains, it emerges, and then there's flowing water of many kinds. The beavers dam this up, and we see beaver -- open water beaver complexes throughout these types of areas.

And it's really this past winter that we've really understood, you know, that, in terms of the effects analysis, we need to be able to look at

the valley bottom and draw a line.

In fact, if you could put up the picture of FA-115. This is FA-115. We're looking up river. So we have the main channel or side channel right here. We have an island. We have what's effectively an abandoned slough. We have a number of beaver dams, which are causing these backwater pools. We have over here the valley wall, and a really old beaver complex here.

So these wet meadows here, which are dominated by sedges, and Calamagrostis, and typical wetland emergent plants, the key thing that's come out in this past winter and early summer is that what's going to change in terms of hydro regulation is the river stage. And so the critical factor relative to this entire floodplain terrace complex is, as the river goes up and down and the river changes, how hydrologically linked are these water bodies? And to be able to draw a line and say, for discussion purposes only, draw a line down this middle part and say this slough and the main channel is all driven by the riverine hydrology; that these lateral beaver complexes are driven by water coming off the hill slope, expressed,

and then dammed up over hundreds to thousands of years.

So we have riverine, upland hill slope hydrology, and then we have a transitional zone in between. And if we can clearly, you know, map this out and be able to take this from the Focus Areas and scale it up to the entire project area, then we could actually model what's going to happen in these spots and these surfaces. And we've done this initially at FA-138, and that's part of the -- that's in the ISR analysis. And we presented it at previous TWG meetings.

Immediately below the Gold Creek Bridge, we have a floodplain terrace area that is literally 10 to 12 feet off the active channel with beaver complexes, and we were looking for a way of analyzing the relationship between river stage and these floodplain water bodies without doing the same extensive 2D models, 3D model. So we went out and installed stage gauges in these water bodies and put another river gauge that was also linked up with the Gold Creek gauge, and we saw that with the August two-year 48,000 CFS flow, at Gold Creek at least, that these lateral water bodies associated with the hill slope hydrology didn't move at all when the

river stage went up three to four feet.

And so that's the type of analysis that's needed to be able to draw a line on a map and say if we change the flow of the river, this area will be effected. This area will be not, and it's the simplest way to do that. So that's something that's been under discussion to put in more stage gauges, reset the Focus Areas this summer, and do you want to speak about that, Michael?

MR. LILLY: Yeah. So, Greg, what we saw on FA-138 we see also here on FA-115. In reference to the TM that was put out in September where it showed the 2014, it was critical to see responses during that period of the actual flows that occurred.

So if we look at those, both of 138 and 115, what you're going to see is the most current conditions going up into September in those reports where that (indiscernible - interference with microphone) key events help show the lack of response. That lack of response is critical in understanding the areas where it's groundwater dominated or it's upland hydrology dominated.

So if you can define those features in a way that you can then look at those spatially, then you have your technique to expand out of the Focus Areas by looking at what we spatially observe in a landscape, and we can tie that in with other information such as mapping, EM information, et cetera to help look at where the areas we have shallow groundwater.

And some of the points that were mentioned in the prior presentations and discussion were features such as lack of snow at end of winter. Where we have shallow groundwater, we do not see snow accumulation in the areas because groundwater is a heat source. We also see open flowing springs and streams that never freeze up. That would only occur in areas where you have enough groundwater fluxes, always keeping it filled up.

So where we see these features, looking at specific times of the year, that helps understand shallow groundwater systems without the use of wells. So if you have a spring, instead of having a well, you would have a piece of rebar and just measure the water levels in the spring. It's a cheap well.

So those types of features allow us to understand and relate to the landscape features. Those important observations that can then help identify how do we transfer the understanding gained within the Focus Areas outside the Focus Areas to the river segment scale.

MR. AUBLE: Yeah (affirmative), I'm very much with you there. Doing that is just really important or really -- yeah (affirmative), potentially important because if you're driving probability of occurrence of different vegetation by surface water inundation, what the study is ending up with is a potential for doing that at multiple scales because with 1D hydraulic and DEMs, you can do that for the whole river, and you can also do it in great detail at the Focus Areas where you got 2Dhydraulics.

If your driving probability of occurrence by the combination of surface water inundation and depth to ground water, okay, I see (indiscernible - interference with microphone). Can you do it on anything by the whole river scale? That depends on being able to do exactly what you're saying, somehow separate it out into zones using indicators that you could do over big areas without actually putting wells in it.

So anyway, yeah (affirmative), it's real exciting, and I'm just suggesting that, that's a pretty important thing to work on.

MR. LILLY: In the groundwater presentation we mentioned the addition of new staff gauge sites, data collection, and a lot of those were outside of Focus Areas in places so that we could test the transferability and develop that method. So we needed some places, not only sections, where there was less data to help show how do we develop a method to then step out into areas with less information and then out to those areas where all we're going to have are those spatial detail that we have on the map or aerial.

MR. FETHERSTON: Operationally, that's a difficult thing to do is to look at groundwater over 150 miles of floodplain, you know. And how can you do that? It's a classic sampling problem, right. You know, how many plots do you need or how many gauges do you need to characterize, in a meaningful way, to be able to predict? Suggestions?

(Laughter)

MR. AUBLE: Well, I mean, you might be -- I mean, the simplest

way is if you could like eliminate half the areas as unaffected by river stage, you know, then you've done half of it. But it's being able to operate because it's not just a matter of being able to measure it. It's also a matter of being able to predict what it would be on the project return.

MR. FETHERSTON: Using a combination of Mike Harvey's geomorphology classification of terrain, combined that with a typology of floodplain water bodies based on elevation of channel, distance from lateral -- you know, is there obvious influence from, you know, the lateral valley walls? Is it directly associated with the river or the slough? And I think that, that type of classification simplified -- because there's only so many types that are out there. I mean, there's -- and that's the exercise we plan on getting there. And again, as you said, with the level of hydrologic modeling we have on this, we can draw a line right away in terms of open water inundation, and that's half the map, if you will.

And then with simple gauges we can associate different types of water bodies with river response or not response to river gauge, we have a way then of scaling up to those areas we don't have gauges in. And that's

what we've been coming to in terms of a method to do those.

MR. PADULA: Yes, in the back. Microphone, please.

MR. MCLEAN: This is Dave McLean (indiscernible - interference with microphone). Dave McLean (indiscernible - interference with microphone). My question, this example you gave about the slough was very helpful. Could you explain that maybe how (indiscernible - interference with microphone). I wonder if you could explain a little bit more on how the riparian assessment is kicking back into the geomorphology or vice versa in terms of changing -- predicting changes in terrain pattern or with changes. And how confident are you that you can rate these futures of riparian effects and the geomorphic effects together to meet those kind of predictions? (Indiscernible - interference with microphone) the effects of the damn and how the river changed on the (indiscernible - interference with microphone) system into a much less complex with width reduction. The effects were basically caused by riparian changes on the side channels, margins where the vegetation encroached into the side channels, removing sedimentation, and it then

promoted evidently denser vegetation, which then ended up changing the whole channel pattern. (Indiscernible - interference with microphone).

So as a predictive tool, what are the predictive tools for going through that sequence that I've described?

MR. FETHERSTON: Part of the seedling study design is to identify and characterize the different physical parameters that are driving where seedlings become established. So we have transects that are normal to the channel, going from say the waters' edge up into the canopy of the floodplain, and these are, you know, along different elevations, with variance in depth to groundwater, frequency of flooding, et cetera. And we have models which actually give us a map of shear stress at different discharges.

And so for example, what happens is, you know, the amount of shear stress in a channel then is directly related to the slope of the channel and the depth of the water. That's what drives the amount of force to mobilize gravel. Is that correct, Lyle?

MR. ZEVENBERGEN: Pretty close.

MR. FETHERSTON: Okay.

MR. PADULA: Close enough. Close enough for plants.

MR. FETHERSTON: I'm stopping then at the geomorphology. And -- but the key to that is that you have seedlings that become established in the sand and gravels, and you have shear stress that you, say, events. We see this all the time in patterns of vegetation establishment. If you have a low flow year, you have establishment of seedlings going lateral into the mid channel isles and the main channel.

Well, for example, in 2013, that's what we had, and in August of 2013, we had a "bankful" two-year event occur. And what it did was it mobilized the bed right along the edge where these lower seedling and lower level transects the seedlings had established, and they were all removed because all the sand and some of the gravels in that part of the transect had been mobilized by that flow. So it's a direct relationship between shear stress, bed mobilization, seedlings in the first couple of years are going to be basically scoured out.

So by doing our transect studies we're developing a relationship of

seedling establishment relative to these different physical parameters on the Susitna River, which goes directly to how you look at, say, vegetation encroachment along channel margins when you reduce the flow pattern of those rivers. When you take out, say, the peak mobilizing flows, the classic stuff in the literature shows that you have, vegetation encroachment in those areas that are no longer flooded as deeply, so there's not as much shear stress and plants grow. And that's the classic thing that we see downstream from dams that affect peak levels.

You guys have anything to say? I'm going to defer to the true geomorphologists.

MR. ZEVENBERGEN: Yeah (affirmative), I just want to add that we have all the building blocks for what you were talking about there. I don't think we're going to have the same results as that particular system, based on the types of flow changes that we have, the types of sediment transport or availability that we have, but we have all the building blocks, whether it be vegetation, sediment transport, the hydrologic regime; and so, you know, we'll be able to address all of the aspects that you were

talking about in that example.

MR. FETHERSTON: And then additionally, how does this feedback affect channel, you know, plan form morphology and plan form? I'll leave that to the geomorphologist, but that -- you know, vegetation becomes established, provides roughness resulting in more sedimentation. But then, again, unique within the Susitna is the dam is designed is effectively trap all the sand. So that's a wild card in there; that's different than some rivers.

And that's why we've been spending so much time focusing on sediment deposition and seedling establishment because that's effectively what we, you know, will change, and our job is to come up with a level of predicted model that's -- how is that going to affect the pattern of vegetation establishment.

UNIDENTIFIED SPEAKER (TARA): This is Tara on the line. Would this be an opening to ask (unintelligible).

MR. PADULA: This would be fine. Thanks.

UNIDENTIFIED SPEAKER (TARA): Is the assumption still that

the reservoir would have 100 percent capacity?

MR. FETHERSTON: I'm getting a nod here from the geomorphologists. Yes. So the answer would be yes, effectively.

MR. PADULA: Anything else, Tara?

UNIDENTIFIED SPEAKER (TARA): Yeah (affirmative), and the observation that you made as in looking at sediment deposition during an HM event, will that observation then be essentially influencing that? Will that fall into the geomorphology study, or will that fall into the riparian study?

MR. FETHERSTON: We're actually doing -- again, this is an emergent property, if you will, in terms of doing work out here on the Susitna River. As we got into it, witnessed, you know, the 2013 break-up and the ability to actually see these ice dams form from the air and witness, you know, significant backwater events where the surface water would raise, you know, three meters in an hour, and it would float rafts of ice up onto the floodplain.

We went back to these areas, you know, within two weeks, and we

were witnessing local effects where there's significant sediment, as Mike described the other day, Mike Harvey. There's localized effects of sediment deposition due to ice dam backwater flooding. We have the blocks of ice, which basically stir up the sediment, which is on the channel margins. It gets mobilized, backwater flooding causing this, and we're finding, you know, sediment deposition and actually cobbles scattered throughout certain areas of floodplains on the valley bottom.

And this is a process that's been anecdotally described in the literature in a number of places, but the role that ice dams play in floodplain aggradational processes on this river is significant and may be localized, where ice dams occur frequently, such as below FA-115; but this has dramatic effects on, we believe, right now with our preliminary data on the vegetation patterns.

For example, Aaron and I last week, part of the sedimentation study is that we're not only taking sediment cores in which we are coming up with geochronology of when this sediment was deposited in a sub-decadal level accuracy, but we also do a soil stratigraphic description along with

this. And what we see is we have stratified organics with pulses of sediment, organic layers with pulses of sediment. And what that tells us is that we have plant communities that have been buried by sand, new plant communities buried by sand, and it's a layered cake. And we're seeing this in areas that are not flooded by open water flooding, you know. There are high surfaces out there in which the aggradational processes occur, and it's not open water flooding.

And that's -- the question is how big is the extent of that? We know it's localized, but we're looking into it.

UNIDENTIFIED SPEAKER (TARA): Thank you. And then (indiscernible - interference with speakerphone) dendrochronology study?

MR. FETHERSTON: Sure. The -- well, the dendrochronology study is -- you know, gives us the approximate age when a tree is established, and to do that in sedimentary environments, every tree that we core, we excavate down to the root collar, which is the point which seed germination happens because the trees are buried out there on the floodplains with 20, 30, up to 50 centimeters of sediment in

(unintelligible) areas on floodplains. And so that -- we go out and take tree cores. We age the trees. We measure the height of sediment, which we can then use as approximation for looking at how many, say, additional years we would add to that tree, the actual tree core. And from this we end up with a map of the age of floodplain vegetation, and it's the effective age of the most recent deposit in which this vegetation can establish. So we have floodplain ages for the valley bottom.

So that's one thing, and then that combined with sediment deposition, we could use these two pieces of data to essentially cross-correlate to multiple lines of evidence which will illustrate whether or not this is due to open water processes or this is due to ice dam backwater depositional processes. And we're not in the preliminary data. We're pretty confident we're going to be able to really identify this process in a number of places because we're seeing cottonwood on high surfaces not flooded under open water conditions.--

For example, back in 2012 I was out on FA-115 with Bill Fullerton, and Bill looked up to his left; and there was a floodplain surface or terrace

surface that was 10 feet off the deck, and he goes, "What's up there?" And I looked up, and there was a stand where I could see cottonwood, and this was right after the 78,000 cfs, approximately 20-year event, which went up to basically below our knees. And the surface is way up in the air.

And I looked at Bill and I said, "How did that surface flood?" Because the only way that those cottonwoods become established is on freshly deposited sediment, and so that began the journey in terms of uncovering the relationship between ice, stand development and these higher surfaces.

MR. PADULA: Tara, you all set?

UNIDENTIFIED SPEAKER (TARA): One quick followup with the (indiscernible - interference with speakerphone).

MR. FETHERSTON: I'm not quite -- neither Aaron or I are quite sure what the question was. Could you try to rephrase that again?

UNIDENTIFIED SPEAKER (TARA): Hi. Can you hear me?

MR. FETHERSTON: Yes.

UNIDENTIFIED SPEAKER (TARA): (Indiscernible - interference

with speakerphone) to see if there's a growth impact on -- that if you can trace growth impact to hydrologic years?

MR. AUBLE: I think she's talking about whether or not you can correlate ring width to the flow (unintelligible).

MR. FETHERSTON: That can be done.

MR. PADULA: You want to restate it and make sure.....

MR. FETHERSTON: Yeah, yeah (affirmative), as Bryce had mentioned here. Can you correlate the tree ring width to essentially precipitation and flow of a river? So if you have a really dry river -- I mean, a dry year, you don't have -- excuse me. You don't have a lot of growth. You're going to have a narrow tree rings. The tree is going to put on less wood that year. Or if you had a full-on -- you know, precipitation was not limited, you would have wider tree rings. And that can be identified. You can do analyses, but that has been done a lot, again, in more arid environments. That's not part of our current methods, but it could be done. I guess the question -- if you're entertaining something like that, the question is how does that relate to the objectives of, you know,

what we're doing here because that would be a whole other step in terms of analysis.

MR. RYCHENER: This is Tyler Rychener with the Louis Berger Group. I wondered if you could comment a little more about what you see as the output of the final model runs after everything is tied together, you know. Back in spring you were talking something about whether this was going to be a patch level model. I'm trying to get a feel of how, when you say spatially explicit, if we're talking about your plain versus our plain or this specific patch.

MR. WELLS: So the output of the model is -- you know, we are mapping existing vegetation, and the output of the model would be a map of the vegetation under various scenarios in the future. And it won't be at the patch level. It will be at a landscape scale, and we'll develop these successional models, state and transition models that will allow us to understand if some process changes, a change to the geomorphology study, groundwater study that we can predict where that vegetation is going to shift, existing vegetation will shift to, given various operational scenarios

in the future.

MR. RYCHENER: I guess my followup question then is how does the specific locations of disturbance get inputted into that model?

MR. FETHERSTON: Yeah (affirmative), for example, we've come to calling areas of -- that are disturbance driven in the valley bottom as *Salicaceae* domain, and *Salicaceae* is the family that the willows and cottonwood are in. And this is the zone. If you've looked at the maps, you know, Aaron's maps of poplar stands, you can draw a line on the map where cottonwood and willows occur and where spruce, birch occur. And cottonwoods and willows only occur within those ice and open water disturbance zones.

So in terms of, as Aaron was saying, being able to produce a change or a state transition map, you would have, for example, the first cut would be if you're going to reduce the peak flows on the river. You're going to -- or change -- we have a measure of change in ice process. You're going to say, for example, if you had a quarter mile line valley bottom that is actively disturbed. You take off all flows greater than 20,000 cfs. You

immediately reduce the floodplains surface down to, say, 50 yards. So what happens is that those areas that are actively disturbed and have -- it's reflected in the vegetation that will change, and we'll be able to do a spatially explicit map of that because we have such detailed hydrologic and ice process models.

MR. RYCHENER: Thanks.

MR. KONIGSBERG: Jan Konigsberg.

MR. PADULA: Yes, Jan. Go ahead.

MR. KONIGSBERG: My followup on that and a question I had earlier, yesterday, how would you be able to get changes (indiscernible - interference with speakerphone) in the Lower River now and post-project?

MR. FETHERSTON: Part of our last trip was to look at the Lower River relative to ice floodplain interaction. And Mike Harvey spent a couple weeks down doing investigations in the Lower River, and he witnessed very little ice floodplain surface interactions, except for perhaps in the braided region immediately below Three Rivers confluence. There's quite a bit of sediment disturbance right in the area near Talkeetna, in what

we call the braid plain area. There's a lot of depositional processes such as ice moving through it.

But the type of ice effects that we're seeing on the Middle River in what is effectively a confined narrow channel, which you need to have, to have these ice dams occur. In the Lower River you have -- where in the Middle River you might have a quarter mile wide or less active valley, down in the Lower River, it's three miles wide, you know. And so when you get into these broad expansive valleys, you don't have the constrained channel, which is what you need to have ice dams occur because the ice is simply spread out. It doesn't jam up causing these backwater effects that you get in the narrowly confined regions of the Middle River.

And in this last trip, I specifically went down, and we cruised over 45 miles of the Lower River with binoculars looking for tree ice scars along the floodplains, which is -- I didn't see any. I mean, basically the first tree ice scar I saw on the river was just up river from Talkeetna when you head northeast up into the Middle River. That's where the ice scars began. That's where the ice jams begin.

And so the ice processes on the Lower River, there may be some issues happening in some of the more lateral narrow channels, but we didn't see anything along 45 miles of main river channel.

Did that answer your question?

MR. KONIGSBERG: Yeah (affirmative). (Indiscernible - interference with speakerphone).

MR. PADULA: Thank you, Jan.

UNIDENTIFIED SPEAKER: This is.....

MR. PADULA: Hold on just a second, please. We have one question in the room first.

UNIDENTIFIED SPEAKER: Okay.

MS. LONG: This is really interesting stuff, and I know I should know the answers to this. But how is this going to be tied into how operation effects well impact those habitat? Because we know that, you know, willows on the river bottoms, that's very important, moose habitat in the winter, and in other times. I'm not an expert, but this is going to be very important information to know regarding, you know, moose habitat

and what's that going to do.

MR. WELLS: Yeah (affirmative), thank you for that question. I alluded to the wildlife habitat mapping that will occur that will utilize our vegetation mapping.

And the process that will occur is that the wildlife biologist at ABR will use the vegetation map to develop a wildlife habitat map. And so they'll take the vegetation classes that I've mapped and say, for instance, the moose habitat would be these willow stands. And they'll assign those to a wildlife habitat class, and typically it's an aggregation of several vegetation types that are used by the wildlife, certain types of wildlife, and will target certain types of wildlife like moose, or raptors, or what have you and develop different maps for those different species. And then they'll assign to those wildlife habitat classes a preference for each of those classes, and so for moose it would be a high preference for those willow stands.

And then from there we can then say, well, vegetation -- our predicted map of vegetation, if it's going to change from willow to

cottonwood or then to spruce, then effectively in that map polygon it's moved from a preferred type to a lower preference type for moose. And that's the process which will develop the predicted model for wildlife habitat.

MS. LONG: Thank you.

MR. PADULA: We'll to go that question on the phone now.

MR. HENSZEY: This is Bob. (Indiscernible - interference with speakerphone).

MR. PADULA: We're going to try to restate that to make sure we got it right.

MR. WELLS: Yes.

MR. HENSZEY: (Indiscernible - interference with speakerphone)

MR. WELLS: The question was related to the Lower River and how we're addressing groundwater and vegetation sampling and mapping down there. And the approach that we're taking is that there are four groundwater well transects, and along those transects we have started to sample -- and we will continue to sample in the future the vegetation plots

along those transects. And then as far as the mapping goes, we have several hundred plots down there for verification of vegetation map, and we have, as I pointed out in my presentation, there's some gaps down there spatially that we're going to fill this coming year. So we'll have verification data at those as well. Those are ITU plots, and they describe vegetation and soils at those areas.

MR. FETHERSTON: And in terms of process, we'll be using the HEC-GeoRAS model do map surface water inundation for the entire project area from PRM-29, and this will give us a flood inundation map; and we'll be able to statistically relate plant communities relative to the flood regime. We installed at our transects both groundwater wells and stage recorders, and similarly we've done this at Focus Areas where we're looking at the relationship between plant community composition and groundwater to surface water inundation. The whole groundwater/surface relationship will have that -- we have that at these four transects, and we will look at the results of that data and compare it to what we see on the Middle River, which I expect to be very similar.

So it's a less intensive approach to looking at the Lower River. By design we selected Focus Areas. But I would put forth right now that I think, in terms of vegetation establishment and the water relations between the plant communities we're seeing from the Lower River to the Middle River, that they're similar, and that this will get at that. And then when we look at that data, if it's radically different than what we think, we'll reevaluate, but I think that we're going to see very similar relationships between groundwater depth, surface water, and the different types of plant communities that we see out there.

MR. PADULA: Does that answer your question, Bob?

MR. HENSZEY: (Indiscernible - interference with speakerphone).

MR. FETHERSTON: So, Bob, were you saying that the disturbance or physical process vegetation relationships in the Middle River would potentially be different than the Lower River, and that we have the Middle River vegetation, you know, clearly documented and characterized but less so in the Lower River; and that there may be different relations? That's the question, right?

MR. PADULA: Bob, did you hear Kevin's question back to you?

MR. HENSZEY: (Indiscernible - interference with speakerphone).

MR. FETHERSTON: Bob, we did the same hydrologic type community statistical analysis that we're doing at the Focus Areas at these transects in the well locations.

MR. HENSZEY: Okay. I think I understood that.

MR. LACROIX: This is Matt LaCroix with EPA. I've got just a couple questions, and we've already hit a little bit on this topic, so just a little bit of clarification. My understanding is we're going to have, at the end of the day, a map of the riparian surfaces, and we'll be able to identify the discrete areas where ice disturbance, whether backwater flooding or physical disturbance from the ice pieces themselves, or from velocity scum are the main source of disturbance; and then we'll have other areas where we know that, as you say, open water processes or overbank flooding is the main driver in terms of disturbance? That's correct, so for the whole area?

MR. FETHERSTON: Yes.

MR. LACROIX: And there will be some extrapolation to the Lower

River as well?

MR. FETHERSTON: The Lower River will have models in terms of flooding. We have a hydrologic model, flow routing model that will use what's called HEC-GeoRAS, and what that essentially does is it's an interface with ARC map with GIS where you have a series of transects, and you can map out with a DEM, digital elevation map, the flooding inundation areas for the entire, you know, area of model.

So we will have a flood frequency map, number one, and again, number two on the Lower River, we're not seeing significant ice interactions, at least on the main channel today. We'll do further ice investigations in some of the side slough complexes, but we really did not see anything over a 40-mile segment of the river.

MR. LACROIX: Yeah (affirmative), right, I heard that. So I guess I just wanted to hear you confirm that we are going to have, you know, a map identifying where overbank flows is the dominant source of disturbance as opposed to ice. I mean, ice clearly is important. It's important in discrete areas in the Middle River.....

MR. FETHERSTON: Right.

MR. LACROIX: .....not for the entire river. There's multiple sources of disturbance, where bank flooding would be one, which also could potentially be altered by the project.

MR. FETHERSTON: Yes.

MR. LACROIX: Okay.

MR. FETHERSTON: The hydrologic model is every square meter of the Lower River will be mapped out.

MR. LACROIX: And are there any areas where it appears that lateral channel migration might be the dominant disturbance factor?

MR. FETHERSTON: I'll leave this up Mike and Lyle.

MR. HARVEY: Thanks. The turnover analysis that's been done to date, 1950s photography, 1980s, and then the recent project would, on the whole, suggest that rates of lateral migration or turnover are pretty low throughout.

MR. PADULA: Mike, a little louder, please.

MR. HARVEY: I'm sorry. The rates of turnover or change in

spatial position of channels and other features are pretty low. They're very low in the Middle River, and they are pretty low in the Lower River too. So that's under existing conditions.

MR. LACROIX: So there's some areas where they may be (indiscernible - distance from microphone).

MR. HARVEY: There was a lateral relation going on in places, but the rates are very low. They're surprisingly low, you know. So we're having to recalibrate, you know, some personal meters about what to expect and whether this is reasonable or not, and it's -- everything you see is the system hasn't changed very much, and it's very slow.

MR. LACROIX: Thanks for that clarification. I just --

MR. PADULA: Could you restate your question that Mike just responded to?

MR. LACROIX: And was this related to whether or not there would be areas in the river where lateral channel migration is at least a factor in the disturbance regime, even if it's not a dominant factor. And I guess the reason that I raise that question is because, you know, if the dam is built,

there would be changes in flow, summer and winter. And we heard yesterday and I think also again this morning that the Lower River is considered to be substantially more dynamic than the Middle River, which is a challenge to go out sample the model at. So if it's normal under current conditions, there's a potential it would be more normal under, you know, project operations.

MR. PADULA: Did you want to move on to another question, Matt?

MR. LACROIX: Actually, yeah (affirmative), thanks, Steve. I guess one other point. It relates to Kevin's discussion about whether or not floodplain water volumes are directly connected to the river hydrology versus the hill slope hydrology. And I'm curious if you're making that distinction based on an immediate response to change in river stage, or whether you're looking for a delayed response? Because it would seem to me that areas that are at the toe slope that may be receiving water from groundwater inputs are not receiving river water, would still potentially deliver water to the river as the river stages decrease. So you wouldn't get

immediate response, but there would be potentially delayed response as you change those hydrologic grades.

MR. FETHERSTON: Michael, you want to address that?

MR. LILLY: So we are looking at that, and I think the TM that came out in September, if you look at the FA-115 data and you look at the FA-138 data that we have in there where we have those time series, we're going through the whole hydrologic cycle, then you can see clear relationships between the upland dominated versus riverine dominated and the transitional zones in between.

Part of the cross-sectional study concept, when we look at that for both riparian aquatic -- because, again, we're looking at the influence between (unintelligible) conditions and hydrologic pulses that are between that, and then how do we use that to understand those dependencies.

So the data that's in those TMs gives some really good clear examples for where we see this variability in dependency between upland's hydrology, the riverine dominated, and what does it look like transitionally.

And as Kevin mentioned earlier, FA-138 has been brought up in some of the prior TWG meetings where you have an abandoned surface that's not an active surface up there. We had old abandoned sloughs, and what we're really looking for is the lack of response, which is what we wound up seeing, and we see that in other places.

For comparison, if you look in that same TM and look at the FA-128 where it's the upper right period transect, that's a clear example of where it's riverine dominated and across the whole, really what you could consider an island at certain flow levels, it's all riverine dominated. So there's a direct response to that.

So those tell some of the stories by looking at those various Focus Area differences. That also illustrates why the Focus Areas were chosen, why the sections within the Focus Areas were chosen to help illustrate differences in hydrologic environments.

If you look at the very last figure of that TM -- can you show that? So in this last figure, what we do is take FA-115 and not just show the water levels, but what are the hydrologic processes and dependencies. So

this is more of a process -- more of a process figure. Where when we look at the cross-sectional area at 115, what is riverine dominated, we have side channels; we have hydrologic features in here. When we look down from a describing boundary conditions and describing more of a hydrologic feature, where do we have areas where it's not changing at all? When we look at the seasonal high crest, we see no variation with river processes. Down here, of course, we see a lot of variation. We're right next to the river.

So at what point do we transition from riverine-dominated to upland-dominated, which in this particular figure we're calling a hinge point? That hinge point, if we can understand that, relate that to surface features that we can see in aerial images and other processes, may allow us then a method to transfer this to the river segment scale and go from a hinge point to a hinge line, and say within this line, we have varying degrees of dependency on river stage, groundwater interactions to those that are upland-dominated.

MR. LACROIX: Thanks for that verification. So thanks for that. It

sounds like you're going to be able to distinguish the variance of dependency or relationship to the (indiscernible - interference with microphone), which I think is good. I just didn't want folks to interpret what, you know, Kevin had said to indicate that most of the locations were completely isolated from the river. But it sounds like, based on some of your Focus Area data, that what's controlling the hydrology of those toe slopes is the influx of groundwater and transitivity of the slopes. So they really are kind of effectively isolated from the river, but that wouldn't be the case necessarily for all of those locations.

MR. LILLY: (Indiscernible - interference with microphone) and this to emphasize as to why are we using groundwater models. It's to help understand the process interactions so that we can really understand how those also take place, and that helps give us also some tools within those sections to look at predictive understanding. But when we use that in combination with all the empirical data and other observations, we develop the right process understanding that is then transferable to the river segment scale where we didn't have to deal with less data. Because as was

mentioned, we don't have wells everywhere, and that would make sense to do that. So we need to develop the level of understandings to allow us to predict those groundwater/surface water interactions without that information at the river segment scale.

MR. PADULA: Any other questions? Anything else from anyone on the phone?

MR. HENSZEY: Yeah (affirmative), this is Bob Henszey.

MR. PADULA: Okay, Bob.

MR. HENSZEY: (Indiscernible - interference with speakerphone).

MR. FETHERSTON: Yeah (affirmative), and (unintelligible) from Wayne here. We'll have a working group that will focus on this with you.

MR. HENSZEY: (Indiscernible - interference with speakerphone).

MR. FETHERSTON: You bet.

MR. PADULA: Thanks, Bob.

Anything else from anyone on the phone?

MR. HENSZEY: (Indiscernible - interference with speakerphone).

MR. FETHERSTON: I'll talk to this first, and then if our

geomorphologists want to answer the question. I'll paraphrase you, Bob, and you tell me if I got this correct. Is that given the geomorphic analyses such as in channel change aerial photographic analysis where we've seen changes, for example, I believe it's between the 80s and 2012 there was encroachment on the level of -- I want to say like 40 feet channel encroachment along the Middle River. But the question is (indiscernible - interference with microphone) with the current geomorphic analyses, the relationship between encroachment and flow regime during that period and the geomorphic processes?

I'm getting a shake of the head, which says no.

MR. HENSZEY: (Indiscernible - interference with speakerphone).

MR. HARVEY: I think the problem here is the scale of resolution. We have photography that's 30 years apart roughly on each period, 50s to 80s, 80s to current. And that's pretty coarse, and trying to tease out what's happening with individual flow years or high-flow/low-flow is pretty much impossible. All we can say is that -- probably is that from the 50s to the present as being net increase in the amount of vegetation on the valley

bottoms, pretty much throughout the Lower River and the river bed, which would suggest somehow or another that there may have been some form of disturbance in the past that we don't have a record of and systems recovered from that, or we really don't understand what really controls the vegetation. And maybe it's something in between.

MR. PADULA: Thanks, Mike.

Anything else on these two studies?

MR. DYOK: Tyler, did you have something?

MR. PADULA: Okay. I think we're going to bring in the technical part of the discussion today until we close, and as part of the Next Steps on the EPA earlier today to clarify the types of information that they will be shooting for November.

You want to take a break? Okay. Twenty-minute break, and then we'll come back. Okay. So it's 5 of. So let's say 3:15.

2:56:12

(Off record)

(On record)

3:17:40

MR. PADULA: Okay. We're going to move on to our last agenda item, which is Next Steps.

MS. MCGREGOR: This is Betsy with AEA. First, I'd like to thank everybody for participating. I think people were pretty prepared for these meetings, and it was very helpful information that we received from the various contractors.

Right now we're in the process of scheduling the January 2015 meetings. The target as of this time is January 6th, 7th, and 8th. We already filed that schedule with FERC and posted it to the Susitna-Watana Project website as well.

The January meetings will be limited in scope to the tech memos that were filed and posted on September 17th, 26th, and 30th of covering 14 studies.

On January 22nd, AEA will file the ISR meeting summary with FERC. This will include the meeting summary for these October meetings as well as the January meetings.

Up on the screen we provide a list of the additional info. This is at least what I compiled from my notes in presenting corrections to provide them. This is what AEA is committed to providing no later than November 15th. The transcripts of the ISR meetings we'll provide as soon as they're available but no later than November 15.

For Study 5.5, Baseline Water Quality Study, we'll provide 2013 QA/QC water quality data (indiscernible - interference with microphone).

For Study 7.7, Glacier and Runoff Changes, we'll provide that (unintelligible) of the analysis of potential changes to Susitna River from the (unintelligible) watershed into the reservoir from (unintelligible) service.

For Study 6.5 and 8.6, the Riparian Instream Flow and Geomorphology Studies, we'll provide the tech memo that was prepared for the effects of downstream channel and floodplain geomorphology and riparian plant communities and ecosystems.

For Study 9.9, Characterization of Mapping of the Aquatic Habitats, we'll provide an (unintelligible) to the ISR Study 9.9, Appendix A. The

map should be updated to include the side sloughs that we inadvertently left off.

We'll also provide a gap map book of all the (indiscernible - interference with microphone) from remote mapping.

(Indiscernible - interference with microphone) because they could be captured in a remote effort for various reasons. These were picked up in field surveys, and that will be provided in (unintelligible).

For Study 9.12, the Study of Fish Passage Barriers in the Middle and Upper Susitna River and Susitna tributaries, we'll provide a list of target species to be considered and passage criteria by species and life stage. This will include the information that's currently on our website for the March 19th meeting between meeting notes and the presentations. That information will be recorded and updated with recent information gathered on lamprey and whitefish.

One of the things that became evident from these meetings and the feedback that we perceived from various licensing participants is the need for targeted meetings on specific topics. The goal is to try to schedule

these before the January meetings. We have very limited time. It's limited to November and December. We're going to have to work together on trying to prioritize what we want to talk about during that time frame and schedule. With the holidays in there, it's going to be tough to fit all of this in.

I'd like to point out that these meetings are outside the TWG meetings, which means we will not be following the protocol of posting materials two weeks in advance. The time frame just doesn't allow that.

After these meetings -- or I should say after our meetings next week, AEA will regroup with our contractors to go over what we think are some targeted topics that would warrant further discussion in November and December in order to either clarify what we're doing or resolve any disputes prior to the FERC study plan determination.

We would appreciate feedback from the agencies and other licensing participants on what they feel are priority topics to cover during that time period.

We would be happy to put out additional data. There were several

things identified during these meetings. Study 5.5, the Baseline Water Quality, the 2014 QA/QC water quality data and the DVRs per (unintelligible) was requested. We could provide those in early 2015.

For Study 5.6, the Water Quality Modeling Study, it was pointed out that model calibration report is due. We could provide that as well in early 2015.

For the Glacier and Runoff Changes Study, the draft report of DGGS' study that's being conducted outside of the ILP will be available by the end of 2015. Again, that's a draft report.

For Study 9.9, Characterization and Mapping of Aquatic Habitats, we could provide the final QA/QC map book on water macro and mesohabitats as determined from the remote mapping and ground-truthing in both 2013 and 2014. Again, that could be provided in early 2015.

These are just examples of some of the information we could provide. What's really important for AEA is to get the recognition from the licensing participants that we'd be happy to provide data as it becomes available, but that we don't want that to then infringe upon or cause a delay

in the FERC ILP process that's scheduled. So that's something that we would like to work together with the licensing participants and have that buy-in. That if we provide information that's not required in the FERC milestone, that doesn't cause delays in the process moving forward.

Oh, I'm sorry, in February -- end of February 2015 for the glacial study.

MR. PADULA: Go to a microphone, please.

MS. WALKER: Could you please state the question?

MS. MCGREGOR: There's quite a bit of information that's gathered in QA/QC in interim reports as our contractors implement the study plans. They're not necessarily required to be provided to licensing participants, but we are trying to have an open and transparent process and provide as much information to people, as it becomes available.

What has occurred when we provide additional information at times, then it is cause for an extension in one of the FERC ILP scheduling milestones, and that's what we're trying to avoid. I don't think per the process we're obligated to provide this information. We would like to. We

would like to be working together and have people have as much available information as we do to facilitate the process moving forward.

MS. WALKER: I'm not entirely sure what you mean by when additional information has been provided that it's delayed the ILP process. There does need to be sufficient time to review additional materials. There does need to be timely provision of these materials. We would do nothing to delay the process, but we would need to allow sufficient time for that review.

I think you're talking about the September 2014 reports. If you're not, then I'm misunderstanding.

MR. DYOK: So, Sue, this is Wayne Dyok. I want to sort of echo what Betsy is saying. What we're coming from is through this process we want to be able to provide information to you as it becomes available. We have goals to do the 2015, you know, studies. We want to make sure that the April 22nd date doesn't change with FERC. Okay. That's first and foremost as we go through, and I think that's the general concept of what we're trying to establish here is that the major milestone dates, you know,

don't change.

MS. WALKER: Certainly we can agree with that, and we're discussing internally what we can get to you before that February 23rd date so that things can proceed per that April 22nd date. That's a very good date to work with. We understand that very well, but what I disagree with is that past provision of additional materials is causing delay in the ILP. And I don't know that we can commit entirely to never having a slug of information slowing down the ILP. We'll do everything we possibly can. We will strive to meet the dates.

MR. CUTLIP: I think to put it slightly differently. After this April 22nd milestone is met, from then forward the question is do you want to see information as it comes in late 2015, or do you want to wait until the USR? Because that's really kind of the alternative. If you just stick to the process, you're not going to see it until the USR.

MS. WALKER: Looking at the schedule as it is now, we've got 15 days to review the ISR before -- USR before the USR meeting. That's practically absurd. That's the kind of thing that we've asked FERC to look

at right from the beginning when the use of the ILP was decided upon. We need a realistic amount of time. Fifteen days to review a 10,000-page document, provide comments, we know right now that, that's probably going to need to be rescheduled. Why don't we admit that and make a schedule that works? I can't commit that we're going to be reviewing the USR in 15 days. In fact, I can tell you that we won't.

MS. MCGREGOR: That's understandable. I was specifically referring to the information that we would provide in early 2015.

MS. WALKER: Absolutely we'll do that, and having these technical worker meetings that we're talking about will be very helpful. This meeting itself, being a discussion format, is extremely helpful I think for everyone from the services, other licensing participants, AEA, and AES consultants. This is the kind of thing that we would like to see in the future going forward.

A lot of misunderstandings occur when we're reading things, and we can't talk things out. We resolved a lot of issues just by meeting face-to-face and letting scientists talk to each other. We'd like to see that process

continue. That's been very successful this week.

MR. STEELE: This is Marie Steele from DNR, and I was just wondering if it's possible, since AEA, of course, has the best information about when information is going to be available for others to review, is it possible for you to create a draft schedule throughout 2015, after the April 22nd deadline, you know, what the director's determination is going to be, where you might be able to estimate when information could be released? And then we could get an agreement with the stakeholders that need to review that that they will; that we can get a commitment from them that they will review in a timely manner and get comments back to you so that we can keep to the ILP schedule as much as possible.

MS. MCGREGOR: AEA can provide that for 2015. We'd have to wait until after the FERC study plan determination and the legislative sessions ends so we know how much funding we have for fiscal year 2016.

MS. STEELE: And would that work for you guys to be able to have a schedule for a year that you can commit to, and you'll know in advance that this is the day this information is coming?

MS. WALKER: I don't want to speak for both services, but for NMFS, certainly that will help. It would be best if we could work on developing that schedule mutually, and I think ideally we could agree with any study modifications or new studies from everyone to FERC. If it's something that's agreed upon, I think FERC would probably welcome that.

MR. DYOK: I guess at this point, you know, Betsy, you want to speak for the services, kind of where you're coming from?

MS. MCGREGOR: Yeah, yeah (affirmative), I agree with that. I think it would be great if we could work together on a schedule and get some kind of idea of what's going to work for everybody. I know that we're planning to, you know, leave immediately and regroup and try to prioritize what information and feedback to provide to AEA sooner than later before the April 22nd deadline. So I think that's another thing that we can do to make it -- help it work.

MR. DYOK: Great. Thank you. Betsy and I concur that we'll put out, once we get the legislative session over with, see the first determination, is first cut, and then we'll just, you know, work on that, you

know, collaboratively. But just one thing that we want to make clear though, we're going to do the best we can, but there's always those things that happen. So we need to be able to be somewhat flexible, right. We're always talking about flexibility. So that's -- put a dose of flexibility in here as well.

Sorry, sometimes I should just give the phone to Matt here -- or the speaker rather.

So, yeah (affirmative), as we go forward, there are a number of other items that we identified here that are, you know, going to be happening like an updated version of the [QAPP] (unintelligible), et cetera, those things. So, yeah (affirmative), we'll try to do our best to get that out and schedule that as well -- work with you on that.

MS. STEELE: This is Marie Steele again from DNR, and I just -- what I'm looking for is a commitment from both sides and, of course, flexibility on both sides. But if we could have a draft schedule in concurrence from the reviewers that this will work, then there's a commitment, to the extent practical, from AEA, that the information will

come at that time. And then there's the commitment from the reviewers, to the extent practical, that they will provide feedback in a timely manner that you can use it. So just both ways.

MR. PADULA: Any other comments or perspectives on what's been shared by the folks in this recent discussion of the plan?

Becky, do you have a microphone?

MS. LONG: This is not a big deal. I just didn't hear really closely -- did you say February of 2015 for the draft (indiscernible - distance from microphone)?

MS. MCGREGOR: Yes.

MS. LONG: Got you. I just didn't hear it.

MR. PADULA: Any other comments?

Wayne's got closing remarks then.

MR. DYOK: Yeah (affirmative), and this goes along with what Betsy was saying with the big, you know, thank you to everyone. I must say that I truly appreciated the input of agencies, you know, consultants, you know, NGOs, Alaska Native Corporation representatives here. I do

think -- and I agree with the statements that this was a very productive meeting, and I look forward to, you know, continuing this next week. We've got three more days of this.

Maybe we won't see all of you, but I'm sure we'll see some of you next week. So thanks for participating, and let's look forward to another three good days, you know, next week. Thank you.

MR. PADULA: Meeting adjourned.

3:35:48

(Off record) SESSION RECESSED