THE LOUP HYDROELECTRIC PROJECT

UPDATED STUDY RESULTS MEETING

SEPTEMBER 8, 2011

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New World Inn

Columbus, Nebraska

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P A R T I C I P A N T S

MR. FRANK ALBRECHT, NEBRASKA GAME AND PARKS
MR. JOHN BENDER,
NEBRASKA DEPARTMENT OF ENVIRONMENTAL QUALITY
MS. MARY BOMBERGER BROWN,
TERN AND PLOVER CONSERVATION PARTNERSHIP
MR. ROBERT CLAUSEN, LOUP POWER DISTRICT
MR. TOM ECONOPOULY, US FISH AND WILDLIFE SERVICE
MR. PAT ENGELBERT, HDR ENGINEERING, INC.
MR. JIM FREAR, LOUP POWER DISTRICT
MR. DENNIS GRENNAN, HDR ENGINEER, INC.
MR. MICHAEL GUTZMER, NEW CENTURY ENVIRONMENTAL
MR. ROBERT HARMS, US FISH AND WILDLIFE SERVICE
MR. RICHARD HOLLAND,
NEBRASKA GAME AND PARKS COMMISSION
MR. GEORGE HUNT, HDR ENGINEERING, INC.
MR. JIM JENNIGES, NEBRASKA PUBLIC POWER DISTRICT
MR. JOEL JORGENSEN,
NEBRASKA GAME AND PARKS COMMISSION
MS. MICHELLE KOCH,
NEBRASKA GAME AND PARKS COMMISSION
MR. TOM KUMPF, LOUP POWER DISTRICT
MR. GARY LEWIS, HDR ENGINEERING, INC.
MS. THERESA PETR, COLUMBUS AREA RECREATIONAL TRAILS
MR. MATT PILLARD, HDR ENGINEERING, INC.
MS. LISA RICHARDSON, HDR ENGINEERING, INC.
MR. JEFF RUNGE, US FISH AND WILDLIFE SERVICE
MR. JOHN SHADLE, NEBRASKA PUBLIC POWER DISTRICT
MR. NEAL SUESS, LOUP POWER DISTRICT
MS. WENDY THOMPSON, HDR
MR. DAVE TUNINK, NEBRASKA GAME AND PARKS COMMISSION
MR. GEORGE WALDOW, HDR ENGINEERING, INC.
MS. STEPHANIE WHITE, HDR ENGINEERING, INC.
MR. SHUHAI ZHENG,
NEBRASKA DEPARTMENT OF NATURAL RESOURCES
MR. RON ZIOLA, LOUP POWER DISTRICT

VIA TELEPHONE:
MS. JANET HUTZEL, FERC
MR. PAUL MAKOWSKI, FERC
MS. ISIS JOHNSON, FERC
MR. MARCUS GRANT, HDR ENGINEERING, INC.

(Whereupon, the following proceedings were had, to-wit:)

NEAL SUESS: First of all, my name is Neal Suess, and I'm the president and COO of Loup Power District. I want to thank everybody for showing up today for our updated study report meeting. I think everybody got a copy or everybody should have a copy or was able to access the report that was put together by HDR. And, again, I want to thank you for the meeting today.

I think the agenda Lisa Richardson will go over and the rest of the HDR team as to what we are going to do today. Obviously like all of our other meetings, pretty free flowing and open so do not hesitate to ask questions as you need to from any of the entities that are here today.

What we will do is we will go through a set of introductions from everybody that is here today, and we will start with the folks on the phone.

So will those folks on the phone introduce themselves to everybody that is here.

STEPHANIE WHITE: So, Janet, do you want to start?

JANET HUTZEL: I'm Janet Hutzel with

the Federal Energy Regulatory Commission. I guess I'm filling in for --

COURT REPORTER: I'm sorry. I'm having a hard time hearing on the phone.

STEPHANIE WHITE: So that was Janet Hutzel from FERC. I'm going to introduce the phone participants. We also have Paul Makowski and Isis Johnson. Are all three of you on the phone?

PAUL MAKOWSKI: Paul Makowski, I am.

ISIS JOHNSON: And Isis Johnson is here as well.

STEPHANIE WHITE: Great. So we have three folks from FERC.

And then Marcus Grant, are you also on the phone?

MARCUS GRANT: I am on the phone. Good morning.

STEPHANIE WHITE: He's from HDR.

So for those of you on the phone, we are going to monkey around with the phone system a little bit while the rest of the folks introduce themselves.

NEAL SUESS: Lisa, do you want to start?

STEPHANIE WHITE: My name is

Stephanie White. I work for HDR, and I will facilitate this meeting today.

LISA RICHARDSON: I'm Lisa Richardson with HDR. I'm the project manager for the Nebraska Relicensing for the Loup.

GEORGE WALDOW: I'm George Waldow, HDR, relicensing consultant.

MICHELLE KOCH: Michelle Koch, Nebraska Game and Parks Commission.

BOB HARMS: I'm Bob Harms with the Fish and Wildlife Service.

JOEL JORGENSEN: Joel Jorgensen, Nebraska Game and Parks.

SHUHAI ZHENG: Shuhai Zheng, Nebraska Department of Natural Resources.

MARY BROWN BROWN: Mary Bomberger Brown from the Tern and Plover Conservation Partnership.

RICK HOLLAND: Rick Holland, Nebraska Game and Parks Commission.

DAVE TUNINK: Dave Tunink, Nebraska Game and Parks Commission.

FRANK ALBRECHT: Frank Albrecht, Game and Parks.

DENNIS GRENNAN: Dennis Grennan with

HDR, Regional Power Manager.

MATT PILLARD: I'm Matt Pillard. I'm with HDR.

JIM JENNIGES: Jim Jenniges with Nebraska Public Power District.

MIKE GUTZMER: Mike Gutzmer with New Century Environmental.

JOHN BENDER: John Bender with Nebraska Department of Environmental Quality.

JOHN SHADLE: John Shadle, Nebraska Public Power District.

TOM KUMPF: Tom Kumpf, Loup Power District.

BOB CLAUSEN: Bob Clausen, Director or Loup Power District.

GARY LEWIS: Gary Lewis, retired HDR. Pine Valley Hydraulic Engineering. I'm subcontracting with HDR as a specialist.

GEORGE HUNT: George Hunt, HDR.

PAT ENGELBERT: Pat Engelbert, HDR.

JEFF RUNGE: Jeff Runge, US Fish and Wildlife Service.

TOM ECONOPOULY: Tom Econopouly, Fish and Wildlife Service.

THERESA PETR: Theresa Petr, Loup

Power District.

RON ZIOLA: Ron Ziola with Loup Power District.

JIM FREAR: Jim Frear, Loup Power.

NEAL SUESS: All right. I want to thank everybody for being here today. With this, I'm going to turn it over to Stephanie and Lisa, and they are going to basically monitor and move the meeting forward today. And, again, feel free to ask questions as you need to. Stephanie and Lisa will set up the ground rules for today, and I will turn it over to them, so thanks everybody.

STEPHANIE WHITE: Okay. Those of you on the phone, could you hear Neal?

MARCUS GRANT: Yes.

STEPHANIE WHITE: Okay. So I think I will pass the microphone to those of you who want to speak. This one isn't working but the one that's working, I pass it around to you. If you cannot hear the conversation or the discussion, your part of the microphone is up near the front of the room, so if you will speak up, I will ask somebody to repeat their comments, or I will repeat it on their behalf.

Okay. Lisa, if you would like to get up

and walk through the purpose of the meeting today and the agenda.

We have an early dismissal. We are set to adjourn at 2:30 this afternoon. So this is the last stretch for this part of the relicensing process.

Lisa?

LISA RICHARDSON: All right. Again, thank you all for coming. On the phone, can you hear us?

ISIS JOHNSON: Yes.

LISA RICHARDSON: Excellent.

Okay. This is the agenda for today. You should have a copy in the handout that's on your table, and it was part of the packet that was on the Web site. Folks on the phone, were you able to download the handouts?

ISIS JOHNSON: Yes.

JANET HUTZEL: Yes.

LISA RICHARDSON: Okay. We are going to be moving very quickly into the integrated licensing process overview. That's going to be similar to what we've talked about every other meeting that we have had. And then around 9:00, a little after, we will be starting on the presentation of the updated study results from both the sedimentation and hydrocycling studies. Then we will break for a quick lunch break and have the species summary for the terns and plovers after lunch. And then we will go over some next steps. We are hoping to get out of here about 2:30. I think the original agenda had said 3:30, but we are thinking it will actually be around 2:30.

So here are some ground rules. Stephanie, I will let you cover the ground rules.

STEPHANIE WHITE: Sure. The first one deals with those folks on the phone as well as those here using the microphone. It's a little unusual to be using a microphone, and I realize that none of you, at least to my knowledge, are rock stars so you don't do it every day, but it's close up to your mouth and it's tilted a little bit.

For those of you on the phone, we ask that you please not put us on hold. What happens is we get to listen to your fine elevator music for as long as you put us on hold. So if you need to step away, I would just mute your phone and step away. We will try to be active in letting you know when our breaks are, but if you could please not put us on hold that would be great.

We do have an alternate phone number for all of the phone attendees today.

I would ask all of you to put your cell phones on silent, if you would, please. We will have plenty of breaks today, so there will be time enough for you to respond to phone calls as needed. But if you need to, feel free to step out.

And then lastly, as we have talked about already, those of you on the phone, if you have a hard time hearing, just speak up, and we will repeat or move the microphone a little bit closer.

LISA RICHARDSON: Thank you, Stephanie. And I will try to -- we will all try to remember what slide number we are on for the folks on the phone so that they can keep up with us. I'm on Slide 4 now with the goals of this meeting.

The first goal is to present the results of the updated studies that were part of the study determination and then to discuss if there are any additional proposals to modify studies or additional things that we need to discuss in light of the study results, that -- this is also an opportunity for that.

So going to the next slide, I think that everybody in this room has been to all of the meetings that I have up on the board there. We have had numerous meetings on this project over the last three years starting back in May of 2008 when we had kind of an introduction to the project and the process. The FERC relicensing process is a fairly long process and very involved with the agencies.

So we have had several discussions. The most recent ones back in August of 2010 -- actually, September, I should say. September of 2010 we presented the initial study results for the studies that were determined back in August of 2009. And then in February of 2011, we presented some -- a second initial study report. We had some studies that had data collection activities that went past the September time frame, so we did a second meeting and presented those results. And now here we are presenting updates to studies that were -- additional pieces were requested on.

So moving on, this is an overview of the integrated licensing process. You have all seen this many times from us now. We are still currently in that box with the red box around it. We are very much moving into the next box though, which is to apply for the new license, so this is the last discussion related to the studies and any issues that were brought up as far as that needed to be studied, so we will be putting together the license application later this year.

So back in August of 2009, the Federal Energy Regulatory Commission, FERC, had given a study determination on the proposed studies that the District had presented. In that determination, three studies were removed, three studies were approved without modification, and six studies were approved with modification. Those are the first studies that were presented back in September of last year, including sedimentation and water temperature, hydrocycling. Some of those were also presented in February.

Moving on to Slide No. 8. This is the full list of studies. Those were all presented at either the first or second initial study report in August/September last year or February of this year. And as far as additional work, there were two studies where additional work and analysis was identified, and those are the two shown in red, the sedimentation study and the hydrocycling study, so that's what this meeting is to present, the changes or additional analysis that has been completed based on the study determinations.

So just very briefly I want to kind of

walk through the basics of what was requested for these additional studies.

Study No. 1, which is sedimentation, the FERC study determination after the last meetings requested that we put some confidence limits on sediment discharge rating curves, do an aggradation/degradation analysis at North Bend, Duncan, Ashland, Louisville, and Genoa. Part of that was information that was included in the PAD. They asked that that be added to the sedimentation study and then perform a Kendall Tau test to assess those aggradation/degradation trends at those gages and then to do a supplemental spatial analysis of the channel geomorphologic characteristics, and then to do some additional statistical analysis related to tern and plover nesting.

That additional -- the original analysis was presented a year ago, and there's been some additional work done, and then there were a couple of reports done, the Chen, et al, and the Missouri River Basin Commission report, that FERC had asked that those be submitted, and those have been submitted to FERC and were made available on the e-Library.

So moving on to hydrocycling, the only

revision to the hydrocycling study was a request that the sediment transport analysis be conducted using the sediment transport module in the HEC-RAS software. That has been done. Pat will be presenting the results of that and also comparing it to the results of the calculations that we had performed for the original study.

And then finally there was a species summary for the interior least tern and piping plover was requested, something that kind of pulled the studies together that related all of the results in relation to the specific species habitat and environment, so we will be presenting that as well.

Next step from here, and I will go over these again at the end of the day, but today is September 8th, and in 15 days the District will provide a meeting summary of the ongoings at this meeting. That will be September 23rd, two weeks from tomorrow.

October 24th is when agencies will have an opportunity to provide comment on that meeting summary as well as to submit any requests for additional analysis or new studies. Those requests for additional analysis or new studies need to follow the FERC process as far as meeting the requirements of the seven criteria. As I think some of you have had discussions with FERC prior to this meeting, at this stage in the process any additional requests need to have some kind of extenuating circumstances as to why the request is being made, new information that's available, or something to that effect.

Then in November the District will provide responses to any requests or comments that were received.

And then in December FERC will be making a determination as to any additional analysis that should be completed.

And it's a little bit out of chronological order there -- that's the process related to the study meeting. And then also kind of stuck in there, November 18th, the District will be filing the draft license application. So we have a lot of stuff going this fall.

And, now, I think we will turn it over to Pat to talk about the sedimentation study, and we are on Slide No. 12.

PAT ENGELBERT: All right. Thanks, Lisa. Can everybody hear me okay?

Again, for those of you on the phone, we are on Slide 12, and we are going to go into the sedimentation component of the updated study report.

But before I get into that, I just wanted to review the goals and the objectives of the sedimentation study. I'm sure for most of you you have seen these before but I thought it might be helpful just to review them as we are in kind of the third study phase here.

The first goal was to determine the effect, if any, that project operations have on stream morphology and sedimentation transport in the Loup bypass reach and in the Platte River; in addition, to compare the availability of sandbar nesting habitat for interior least terns and piping plovers to their respective populations and to compare the general habitat characteristics of the pallid sturgeon in multiple locations.

Going on to the next slide which lists objectives, this is Slide 14. The first objective in order to meet those goals was to characterize sediment transport in the Loup River bypass reach and in the lower Platte River through effective discharge and other sediment transport calculations. Objective No. 2, to characterize stream morphology in the Loup River bypass reach and in the lower

Platte River by reviewing existing data and literature on channel aggradation/degradation and cross sectional changes over time.

Next slide, Slide 15. The third objective is to determine if a relationship can be detected between sediment transport parameters and interior least tern and piping plover nest counts as provided by the Game and Parks Commission and productivity measures.

Each one of those three objectives that I just spoke to we addressed in this updated sediment report per FERC's study plan determination letter. The fourth objective was not covered in the updated study report, and that is to determine if sediment transport is a limiting factor for pallid sturgeon habitat in the lower Platte River below Elkhorn.

Okay. Moving on to the next slide, we are on Slide 16, just wanted to give a little bit of background on each of the study reports -- I'm switching microphones.

A little bit of background on each of the study reports that we have done to date. For sedimentation, the initial study report covered all of the sediment transport calculations and supply and capacity calculations for the gaged locations on the river, okay, for the gaged locations.

Once we got the survey data in, we were able to perform the same set of calculations for the ungaged locations, and those results went into the second initial study report, so we kind of had two sedimentation study reports out there. The initial study report had the gaged locations on the Loup and the Platte River. The second initial study report had the ungaged locations or our study sites on both the Loup and the Platte River.

So per FERC's study plan determination letter, we updated the study report. The first thing that they asked us to do was to combine the initial study report and the second initial study report so it was in one location. In addition, they asked us to analyze some new things, first being provide confidence limits on the sediment discharge rating curves that were developed in the sedimentation study, to do a supplemental spatial analysis. The third thing was to do a specific gage analysis and Kendall Tau on the gage locations and then evaluate some bird nesting statistics.

On Slide 17, just a quick review of it. It's a little difficult to see, I understand, but the -- on the Loup River, here are the study sites we will be talking about. We have ungaged Site 1, which is upstream of the diversion weir, ungaged Site 2, which is just downstream of the diversion weir. Then we have the Loup River at Genoa gage, which is located downstream of Site 2. And then the last location on the Loup is the Columbus gage -- the Loup River at Columbus gage.

On the Platte River, the study sites that we evaluated were the Platte at Duncan, this is upstream of the confluence with the Loup. Study Site 3, which is located downstream of the Loup/Platte confluence but upstream on the tailrace return. Study Site 4 is located just downstream of the tailrace return. And then we have the Platte River at North Bend gage, which is located approximately 30 miles downstream of the confluence. And then we have a study site, Study Site 5, which is just downstream of the North Bend gage. And then the remaining sites are the Platte River at Leshara, Ashland, and Louisville, and those are all at gaged locations.

So quick refresher on kind of how we got here from that initial study report meeting.

With that I'm going to turn it over to George Hunt. He's going to walk you through the confidence limit development process.

GEORGE HUNT: Okay. I'm on Slide 18.

So FERC asked us to include confidence limits on the sediment discharge rating curve.

So first I will just walk through a quick history or a background of the sediment discharge rating curve and the Yang unit stream power equation we used to create that. I will talk about confidence limits we've put on some of the parameters that go into that equation, and then I will show you some of the results, the results of the sediment discharge rating curve with the limits and regression on the USGS data.

So a little background, right here -- I'm on Slide 19, and I'm pointing to the equation on the slide. That's Yang's unit stream power equation, and you can see it's -- you know, by varying flow and using several different parameters we get sediment discharge, and the graph shows an original sediment discharge rating curve from Yang at North Bend, and this is the sediment discharge rating curve we used in the initial study report.

So confidence limits are generally put on, you know, groups of data or blocks of data, and this is just the result of putting parameters on equations. So what we did was we expanded the request by putting confidence limits on the parameters that were used to create the equation, parameters that we had enough data to put confidence limits on.

And so we put confidence limits on three main parameters: The velocity discharge relationship, the depth discharge relationship, and the D50 values we have.

Right here I'm showing on Slide 20 the velocity discharge relationship. The black line is the original equation we used originally in the initial study report. The red and green lines are the upper and lower 90 percent confidence limits on that measure USGS data.

And just as an example, at around 6,000 the velocity ranges on the lower limit from about two feet per second to between three and three and a half feet per second, while the data can range anywhere from nearby from two feet per second to just over three feet per second.

Slide 21 we are showing the depth discharge relationship. Again, the black line is the line originally used in the initial study report. The red and green lines are the upper and lower confidence limits.

And, again, at 6,000, it can range from about one and a half feet to maybe close to two and a half feet while the data ranged from about that same amount.

And the D50 values, the USGS had suspended sediment discharge measurements -- I'm sorry, they had measured suspended and measured beds. We had combined them as described in the initial study report. That still left us a group of data to create confidence limits on at North Bend because that's the example I've been using. Originally we had used the median value of .23 millimeters. The upper and lower 90 percent confidence limits ranged from .2 to .26 millimeters in diameter.

Slide 23. So we have the Yang Unit Stream Power equation. We have three variables we varied, and each of the variables have three states they can be in: The lower state from the lower confidence interval, the origin value, and upper value. And so that gives us 27 combinations to create the 27 different Yang Unit Stream Power curves, the -- one of them being the original value that we had used.

So what we are showing here on Slide 23 are the uppermost and lowermost sediment discharge rating curves. Along with the blue solid line as the original and the black line is the linear regression of the measured USGS suspended sediment discharge. Those are the red dots.

And you can see that our original Yang Unit Stream Power equation follows the linear regression of the data well. And in our initial study report, that's what we used to say that our equation was well fitted and calibrated.

Slide 24, I'm showing upper and lower confidence limits on the measured USGS suspended sediment discharge data. Along with the blue lines is the original calibrated Yang Unit Stream Power discharge curve and the linear regression.

On Slide 25, we put them together to show them all at once. You can see that the 90 percent confidence limits on the data are on the upper and lower ends of that graph. In between are the upper and lowermost Yang Unit -- Yang derived Unit Stream Power sediment discharge curves and the linear regression and the calibrated value.

Any questions on that?

GARY LEWIS: I point out too those are -- I'm sorry, Gary Lewis -- log cycles on those, so -- at 1,000 CFS, there's quite a variation in the sediment discharge calculation, so we have been trying to point that out all along, that we think we have hit the data very well. We certainly have hit the regression through the data. And the confidence limits are pretty broad if you look at that chart. Just information that I think is important to all of this.

PAT ENGELBERT: Any other questions about the confidence limits that were developed for the sediment discharge rating curves? If not, we will move forward with the spatial analysis.

Is it okay if I just talk and not use the mike? I'm cutting in and out. Can everybody hear me okay? Can everybody on the phone, can you hear me okay if I don't use the mike?

JANET HUTZEL: I can hear you.

PAT ENGELBERT: Okay. Per FERC's study plan determination letter, they asked for an additional spatial analysis on some of the stream morphology, and these three bullets here on Slide 27 show the -- kind of the summary of what they had quoted in their letter.

The first thing that was asked of us is to relate the effective discharge at each of the locations to mean velocity, flow width, flow depth, and flow area. And they wanted us to do that in each of the gaged and ungaged locations and make longitudinal or spatial comparisons of all the sites on the Loup River and the lower Platte River starting at the upmost location and moving downstream.

So, for example, we performed a sequential comparison. We compared ungaged Site 1 on the Loup to ungaged Site 2 on the Loup. Then we compared ungaged Site 2 to the Loup to the Loup at Genoa gage and so on and so on.

So, again, just to reiterate, the channel geomorphologic characteristics that FERC asked us to evaluate, and this is on Slide 28, were mean velocity, flow width, flow depth, and flow area. They asked us to relate those characteristics to the effective discharge. We also compared them to the dominant discharge that was calculated.

This was done at the gaged locations. And if you recall from our initial and second initial study reports, at the gage locations we have long-term measurements from the USGS. We were able to obtain those electronically from 1985 through 2009, so we had approximately 25 years worth of measurements.

At the ungaged locations we developed those same relationships, the depth and the width and the area relationships versus discharge. At the ungaged locations, we had to do that based on HEC-RAS modeling, and the RAS models were developed from cross-sections obtained last year -- last summer, at three different points in time. I just wanted to point that out. That's kind of an important thing to note.

Here's an example on Slide 29. Here's an example of the graph that shows depth versus discharge at the gaged -- one of the gaged locations, and I chose North Bend for no other reason than it was closest on my computer and I could dump it in quickly. But this just shows the relationship between the measured data on depth versus discharge at the North Bend gage.

The next graphic on Slide 30, this shows a similar graphic, except I chose Site 4 here, of the results that were developed using the HEC-RAS one dimensional hydraulic model, so you get a similar relationship, but one is computer generated from a calibrated model, the other is based on 25 years worth of measured data from the USGS.

Moving on to Slide 31, this is a little

bit of our -- the methodology that was incorporated for this supplemental spatial analysis. We used the sediment discharge rating curves that were developed in the initial study report and the second initial study report. We developed the effective and dominant discharges based on those sediment discharge rating curves and the hydrology that we used. And from those, based on the effective discharge and the dominant discharge, we went to our depth discharge, width discharge, velocity discharge, and flow area discharge relationships and grabbed each of those for both of the effective and the dominant discharge. And we used those values to perform our spatial comparison.

The study period that we selected, at the gage locations we had sediment discharge rating curves developed based on data from 1985 to 2009. But in order to compare those to the gaged site -- I'm sorry, to compare those to the ungaged sites, we used data from 2003 to 2009. And reason we did that is at the ungaged location we chose 2003 to 2009 because that's the point in time in which the Eighth Street gage was put into place, which measures the return flows coming out of the power canal. So in order to compare the ungaged sediment discharge rating curve information to the gaged rating curve information, we used the hydrology from 2003 to 2009.

Okay. Moving on to Slide 33, this is the graphic that we present in the report. And it's very difficult to read looking at the whole system. We did color code it to help folks, and we do have handouts on the tables, but to make it a little easier to step through the process we have created another set of charts so we can walk through each parameter.

I'm moving on to Slide 34, and we are going to go through the Loup study site results first.

On the bypass reach, we are looking at ungaged Site 1, ungaged Site 2, the Loup at Genoa, and then the Loup at Columbus. And this graphic that's up on the screen right now on Slide 34 represents those.

Quickly to reiterate, on the -- the data limitations that we had in evaluating the Loup bypass reach, we had two gaged sites on the Loup bypass reach, one being at Genoa and one being at Columbus. The Genoa gage had measurements from inception which is approximately 1950 through 2010.

As we stated in the initial reports, we use the data from '85 to 2009 because we had that data electronically. However, at Columbus that gage was reinstalled -- it was taken out of service in 1978 and it was reinstalled in 2008, so we had very little measurements for the Loup at Columbus gage. The two ungaged sites, Site 1 and Site 2, we had the 2010 survey measurements.

What I want to point out here is out of the four locations we truly only have one location that had long-term measurements, and that was the Loup at Genoa. We had 25 years there. At the other sites, we had between one and two years. So I just wanted to point out a little bit of the data limitation that we have.

Moving on to Slide 36, this is kind of a bar graph representing the mean velocity on the Loup River study sites. The left side -- the Y axis, that's velocity, and then we showed the mean channel velocity for both the effective discharge and the dominant discharge at Site 1.

Comparing Site 1 to Site 2, we see very similar mean channel velocities between the two sites for both the effective and the dominant discharge.

Comparing Site 2 to Genoa, there's a slight increase in the velocity between the study Site 2 and the Loup at Genoa gage.

And then showing Genoa to Columbus, comparing those two now, you have essentially the same velocities between Genoa and Columbus.

All right. Moving on to the next set of slides, this is flow depth at each of the study sites on the Loup river. Study Site 1 compared to Study Site 2, you have very similar flow depths between the two study sites. Between Study Site 2 and Genoa, very similar flow depths between those two study sites. And comparing Genoa to Columbus, it looks like for effective discharge there's a slight increase in depth, but the dominant is pretty close there. They are really pretty close. So pretty consistent flow depths between the study sites on the Loup River bypass reach.

The next graphic that I would like to show, this is flow width versus the effective and dominant discharge for the Loup Rive -- the bypass sites. Loup Site 1 compared to Loup Site 2, we see a reduction in the flow width between Site 1 and Site 2. Comparing Site 2 to Site 3, we also see a reduction in the flow width.

Comparing Genoa to Columbus -- excuse me, I think I called Genoa Site 3. That was the Genoa gage. Comparing Genoa to Columbus, we have very similar flow widths comparing Genoa to Columbus.

One interesting thing to note is the effective discharge and dominant discharge at Site 1 when compared to Site 2. It's approximately a 25 percent reduction. What's interesting to note here is that the flow width comparing Site 1 to Site 2 is also approximately a 25 percent reduction in flow width. So there's kind of a correlation there between the effective discharge and the flow width.

Moving on to Slide 39, I'm going to talk about flow area now. Very similar relationship to flow area that we saw in flow width. Not really surprising in that for a wide shallow river the area is dominated by width so you would expect the width and area relationship to be similar. But we do, again, see a reduction in flow area between Site 1 and Site 2. We see another reduction in area between Site 2 and Genoa. And then comparing Genoa to Columbus, we have very similar flow areas.

So moving on to Slide 40, this is kind of a summary of the results of those bar charts. The flow depth and the mean velocity between sites was all relatively consistent, uniform and consistent. All four characteristics--velocity, depth, width, and area--were all very consistent between the Loup at Genoa and the Loup at Columbus.

Site 2 appears to be an intermediate and stable geometry between Site 1 and Genoa. It was that kind of intermediate between Study Site 1 and Genoa, there was a consistent trend down. And the percent reduction between the effective discharge for Sites 1 and 2 very closely matched the width and area reduction. Again, there's about a 25 percent reduction in effective discharge between Study Sites 1 and 2, and we saw a very similar reduction in flow width and flow area between those two locations.

When comparing those spatial results to the results that we presented in the second initial study report, the percent changes in flow width and flow area between 1 and 2 closely match the reduction in effective discharge, and what we reported earlier was we see consistent natural stream flow processes in the effective discharge changes as we worked our way downstream.

In addition, the data at Genoa and

Columbus, they are very consistent along all four parameters, which shows that they are in that state of dynamic equilibrium, which is very similar -- exactly the same results that we had presented in both the initial and second initial study report.

Before I go on to the Platte River sites, does anybody have any questions on the Loup sites?

Jeff?

JEFF RUNGE: Yeah, Jeff Runge, Fish and Wildlife Service.

I guess maybe the best reference is Table -- or Figure 513.

Looking at -- on gage Site 2 and comparing that to Genoa and Columbus, when looking at the effective and dominant discharges, there's really not much as far as differences in effective and dominant discharge. But then when you look at other variables like depth, velocity, and I think most noticeably width and area, that you see differences -- slight differences when comparing on gage Site 2 to those numbers on Genoa and Columbus. To me it doesn't explain -- or dominant or effective discharge doesn't explain these differences. I don't know if you had any insight as to what else may cause these differences.

PAT ENGELBERT: I have transitioned back to Slide 38 which shows the flow width for the study sites as an example. And what Jeff had asked is the Loup Site 2, the Genoa, and the Columbus sites all have very similar effective and dominant discharges. Is that right?

JEFF RUNGE: That's right.

PAT ENGELBERT: That's part of your question? And then the question was, Genoa and Columbus have very similar widths, but yet Site 2 has higher widths. And because we are relating dominant and effective discharge back to those widths, why -- is there a reason why the Loup -- Study Site 2 is so much different than Columbus and Genoa.

We looked at that as well, Jeff. One of the things is that the difference in data. At the Genoa site we had very long-term data. At the Loup site, we had just essentially the one surveyed cross-section. And it seems to be an intermediate site between the two.

We evaluated the variability between effective and dominant discharges when you are using a short window for the analysis. In this particular case we are looking at 2003 to 2009, which is a fairly short window. That may explain some of the variability that we are seeing at those sites.

Gary, is there anything that you would like to add on that particular point? You talked about it a little yesterday.

GARY LEWIS: Yeah, we expected this question because we puzzled over the same question. And I think Jeff has really raised a very important question here. Why -- with the same effective discharges at Site 2, Genoa, and Columbus -- they are between 100 CFS of each other. Effective discharge is that discharge that represents what flows transport the greatest amount of sediment, and what we are looking for and the reason that FERC asked for this graph is that there have been many research studies that show that there is a relationship between the effective discharge and the channel width. Area and depth are not reported as much in the literature -- or velocity and depth. And area, as Pat mentioned, is made up mostly of width. With a very wide width, you take that times the shallow depth, you don't see much difference in the graphs.

And I think Pat answered the question fairly well. Probably one thing I would add to that, at -- comparing now Site 2 with Genoa, so Jeff's question, if you didn't understand it, is why are the widths and areas -- and I believe velocities and depths -- different at Site 2 than they are at Genoa and Columbus if you have the same effective discharges.

So trying to rationalize that, one of the things that we came up with is the fact that for Loup Site 2 all we have is a single one set in time set of cross-sections. HEC-RAS requires that you model that cross-section at the -- assuming a fixed bed.

So in addition to what Pat said in terms of the limited data that we have compared to Genoa, Genoa may have many, many years of data that we used for this. When you use a rigid bedded model, for example, we surveyed that cross-section or those cross-sections, we averaged them for this model study. When you look at those surveyed cross sections and the flow rate that existed at the time, that flow rate was not equal to the effective discharge. That just defines the width of the water surface.

But probably part of the answer, Jeff, and I think what we are really saying here is I don't have an, and I don't think Pat has, a full explanation for what we are looking at here, and all we can allude to is the difference in the data sets and the assumption in HEC-RAS of rigid boundaries. So when -- effective discharge, for example, at about 1700 for Loup, Genoa, and Columbus, if the cross-section that we measured on the days that we did it was formed by flows that were leading up to those dates. They weren't formed by the flow that day, but if they were formed by the flows leading up to that day and if that flow was not something close to the effective discharge, you are going to get a weird reading because -- remember the cross-sections we took showed huge variation in the bed, where the deep channels were, a lot of variation over the two or three months that we took these measurements. So the bed changes constantly and the width adjusts itself with those changes.

So that's part of the answer, Jeff. We think that the rigid bed assumption in HEC-RAS. We developed, for example, the width versus discharge relationship. And if that -- at the effective discharge, if that width would have been quite different we wouldn't get a reading on that. We are only getting the width that existed on the days that we measured the cross-section.

So we have puzzled over the same thing. I don't believe we have a full answer to it. And what we concluded is that Site 2 is an intermediate morphology between Site 1 upstream of the diversion and between that of Genoa and Columbus, where Genoa and Columbus are so equal to each other, that there's an immediate -- I don't think it's transitional. I think it's just an intermediate morphology.

If there is a difference in morphology, more likely it was a difference in the data we had and the methods that we had to use to develop this relationship. If we had long-term data at Site 2, you might find something much more similar to Genoa and Columbus because they are all receiving about the same flow, they are receiving about the same sediment.

One other point I will make too, because we did use 2003 to 2009, if you look at older graphs in the initial study report where we plotted the effective discharge each year from -- at Genoa from 1985 clear up to 2009. If we look at that 2003 to 2009, you see the effective discharge varies between 1,500 CFS and 3,000 CFS during that seven-year period, so those would have an effect on the morphology. That effective discharge is what's changing the width and the depth and the area. That rate is an indicator of what's changing that.

We have very high fluctuations at that Genoa station over a very wide range, so when we went out there in 2010, who knows what you have. What you are measuring in 2010 may not be the equilibrium morphology. It's probably in transition from what it is that year to this long-term equilibrium that was established for the gage sites and we reported in the initial study report.

So, Jeff, that's about all we could come up with.

JEFF RUNGE: Just one follow-up question then.

Thank you for the explanation. With that, it seems as if your boundary conditions like channel width is not a static condition but pretty highly variable based on the flow events that pass through there.

PAT ENGELBERT: The width I think would be probably more consistent in that once you kind of get up close to those vertical banks, if you look at cross-sections, once you reach a certain discharge, it should maintain pretty well. Getting on the lower stages, that -- you see some variability of width due to the presence of sandbars and things. The depth and the area I would say are probably pretty similar in relationship as well.

JEFF RUNGE: Okay. So what you are talking about is the active channel width stays similar but the flow width may vary based on flow conditions.

PAT ENGELBERT: Yes.

JEFF RUNGE: Okay.

PAT ENGELBERT: Particularly at those lower flows when it's kind of going between sandbar formations.

GARY LEWIS: If you remember the cross-section from over those few months that we measured, the geometry, you saw huge changes in the width between -- across the surface among those three cross-sections. So we say the flow is 1700 and go to the graph and try to pick out what the width would be, it's kind of an estimate at best.

JEFF RUNGE: Okay.

PAT ENGELBERT: Any other questions on the Loup bypass reach, the supplemental spatial analysis?

If not, I will go ahead and move forward toward the Platte River results.

For those of you on the phone, I'm now on Slide 42.

And, again, this is just the graphic showing the location of both the gaged and the ungaged sites that we have evaluated on the Platte River starting at Duncan and working our way down to Louisville.

Again, just wanted to reiterate the difference in data that we had. The gage locations, again, we had longer term records, particularly at Duncan and North Bend and Louisville, we had the full 25 years. At Ashland and Leshara we had shorter periods there. I believe Ashland -- one of them started in '94 and the other one started in -- I'm sorry. Ashland began in 1989, and Leshara began in '95, so we did have slightly shorter periods for those two particular gages. And then at the ungaged locations, the surveyed information that we had in 2010.

Moving on to Slide 44, here's a relationship of the mean velocity for the Platte River sites. Starting at Duncan, we see a slight increasing trend between Duncan as compared to

Site 3, and then Site 3 as compared to Site 4. So there is a slight increasing trend when we compare those sites.

From Site 4 down to Leshara, we have very consistent mean velocity relationships there, between those sites. Then between Leshara and Ashland, we have a step up again, a slight increase in velocity, and then that is fairly consistent as we move down to Louisville.

Looking at flow depth at those sites, we see a very similar relationship with what we saw in the velocity. We saw an increase between Duncan and Site 3, and then again between Site 3 and Site 4. At Site 4 -- from Site 4 to Leshara again, we see consistent -- pretty consistent flow depths between each of those location. And then again we see a slight step up between Leshara and Ashland, and then a leveling off again between Ashland and Louisville.

Moving on to Slide 46, we evaluate the flow width of the study sites. And at this particular study site, we see fairly consistent widths between -- from Duncan all of the way down to Louisville in about that 1,000 foot range. A slight increase as we work our way downstream with the one anomaly being that Site 3 is a little bit lower than all of the other sites. It's a little bit lower.

Going on to flow area at each of those sites, and I am now on Slide 47, again we see a slight increase between Duncan and Site 3 and then comparing Site 3 to Site 4, a slight increase again. And then that -- kind of that leveling off between Site 4 and Leshara, and then a leveling off between Ashland and Louisville.

So moving on to Slide 48, kind of a summary of the results of those particular graphics of the channel geomorphologic characteristics we were asked to evaluate, for flow depth, mean velocity, and flow area. Duncan to Site 4 showed a gradual increase. From Site 4 to Leshara, there was essentially no change, maybe a slight increase. From Leshara to Ashland we had a step up. And then again from Ashland to Louisville there was no change.

These changes were consistent -- the increases were consistent with the increases that we see between Duncan, Site 3, and Site 4, the differences in effective discharges that we see there. From Site 4 down to Leshara, it has essentially the same effect of dominant discharges. And then we see a step up with additional tribs coming in for the effective and dominant discharge.

Now, in looking at the flow width, Gary had mentioned that some of the work -- prior work done by the USGS, Kircher in particular, noted a relationship on the river between the effective discharge and the flow width. I think we have seen that same -- we have confirmed that relationship that he wrote about in his paper. And, again, Duncan to Louisville, there was a -- just a very gradual increase in that width with the exception of Site 3.

Okay. So that's kind of a summary of the results of this spatial analysis. But we wanted to go one step further in evaluating that relationship between effective discharge and flow width and the effective discharge and flow area. And we thought we would represent it using a line chart, and this is on Slide 50, kind of showing that spatial longitudinal relationship.

We see that when we plot flow width versus discharge and that just gradual slight increase that we saw, the sites fall pretty much -- very close to the line, which tells us that there's a strong relationship between flow width and flow -- and the effective discharge.

Similarly the flow area even has a stronger relationship on the Platte. And recall that in a wide system the area is very much dominated by the flow width itself. So when we look at flow area versus effective discharge, we see a very good relationship between those two parameters at all of the gaged sites which tells us that as effective discharge increases your flow area will increase and then similarly your width.

In summary, there was a strong relationship between effective discharge and the width and a similarly strong relationship between effective discharge and the flow area. Again, the area in a braided river is predominantly governed by the width. It's very wide and shallow. The results indicate that a percent change in effective discharge was corresponding to a proportionate change in width and area, the one exception being Site 3.

So in summary, it's, again, consistent with the results that we showed in the prior spatial analysis that we see, an increase in the effective discharges as we move downstream. We are seeing, you know, similar changes in the four channel geomorphologic characteristics that we were evaluating. And, again, probably one of the biggest things that we found is that it really shows what Kircher had found, that there is a strong relationship between the effective discharge and flow width on the Platte River.

So that kind of concludes the supplemental spatial analysis that we did on the Platte as well as the Loup. I would now open it up for any questions that you guys may have on the relationships that we saw on the Platte River. And if you thought of something that you want to cover on the Loup, we can hit that one again.

PAUL MAKOWSKI: Pat, this is Paul Makowski from FERC.

PAT ENGELBERT: Yes, Paul.

PAUL MAKOWSKI: What you see on Slide 50 and 51, did you do that for the Loup on that?

PAT ENGELBERT: We plotted those for the Loup, Paul, but had very -- it didn't look good at all. The relationship just didn't -- it didn't look good.

PAUL MAKOWSKI: Okay.

PAT ENGELBERT: And I think we attributed that to the four areas that we were looking at, truly only one of them had long-term data. The others were very short and limited data sets on that.

Paul, Gary Lewis would like to respond as well.

Can you hear us okay?

GARY LEWIS: Very good question.

Recall on the Loup that three of the four locations all had the same effective discharge, and then Site 1 had a higher effective discharge, I think around 2300, so we only had a few data points. So if we plotted them, you would see the same relationship. We would see -- because the three data points for Sites 2, Genoa, and Columbus would all fall on the same discharge, that basically, essentially, is one data point cluster, and then the other data point would be at Site 1.

And as Pat pointed out, there is definitely a change in width area -- I'm sorry, at least in width and area with the effective discharge between Sites 1 and 2 and 1 and 3 -- or, I'm sorry, 1 and Genoa and 1 and Columbus. So it's essentially two data points, and two data points don't make a good graph.

PAUL MAKOWSKI: Okay.

PAT ENGELBERT: Thanks, Gary. That

sounded a lot better than it didn't look good.

JEFF RUNGE: But based on what was said earlier, you see a relationship, but that relationship can't be overlaid with the data from the Platte? I mean, are these relationships generalized to the point to where it doesn't matter which river you use, these relationships will have a similar -- similar linear form to them, or are they completely different? Since it's in a different system using different inputs, you can't overlay the Loup data with the Platte data.

PAT ENGELBERT: I think it goes to just the natural river processes as you work your way upstream to downstream.

And I see Gary grabbed a microphone.

GARY LEWIS: Yeah. Another very good question.

First of all, we saw a steeper slope on the graph between Site 1 and Site 2. If you look at this graph, it's not a 45 degree line. It's much flatter on the Platte.

In the professional paper 1277, USGS looked at three different ways of trying to match width with discharge, with effective width, some governing discharge. It wasn't always effective.

But they found in the upper part of the Platte that that relationship existed and they applied power equations and others some of you are familiar with.

The effective discharge/width relationship is a defining relationship in a truly unconstrained natural river. Do we have that in either of the Loup or the Platte? No. The Platte River, especially in the lower Platte, and that's reflected I think in the slope of this line that we have up here in Slide 50 is reflected somewhat in the lateral constraints. Yeah, that's flow width versus effective discharge. The surveys that have been done by the Corps of Engineers has looked at the effects on the environment of those I think is impacting that, we think.

Paul and Jeff, part of the explanation of Site 3 is that. If you look at the surveys that were done on Site 3, it shows lateral restraints on both sides of the river at Site 3. And if you look upstream and downstream on those same surveys, we see the lateral constraints on one or neither side. So that's one possible explanation for Site 3.

If the river was completely unconstrained, I would expect these data points to fall right on that line, Paul and Jeff, because that is the relationship between the flow that's shaping the river and the shape of the river. That's how we define effective discharge.

So any deviation from this graph -- and we were surprised. We hadn't seen this done. I would like to see someone do it for the Central Platte, plot these widths and depths and areas and so forth and have the effective discharge rates.

So part of the question I guess is can we apply what's happening on the Loup to this river, they are two different rivers, they are both braided. If you plotted the Loup data on this, the effective discharges were down around 1700. And we don't see the widths on the Loup that we had here. If you recall on the graphs that we showed for the Loup, the widths were quite a bit less.

So the answer is, no, we can't really translate from one river to another, but you can look -- we make that point in our write-up, that if we have enough gages on the same river, you can get a very morphology defining relationship by creating these graphs. So if for some reason at Leshara somebody wanted to change the effective discharge reducing it 40 percent for whatever reason, I think you can estimate what that width would be by just moving down this line. I think this line defines the morphology of the river based on the whole principle of effective discharge.

That's a long answer, but hopefully that adds something to it.

JEFF RUNGE: That's helpful. Thank you.

PAT ENGELBERT: Any other questions on the supplemental analysis either on the Loup or the Platte River?

If not, I'm going to go ahead and turn it back over to George Hunt who will talk on the specific gage analysis, moving on to Slide 54.

GEORGE HUNT: So we originally presented specific gage analysis in the PAD. FERC asked us to include that in this updated study report, and they also asked us to do a Kendall Tau analysis on that data -- sorry, they also asked us to include Genoa in that -- in the analysis.

Bringing the data and the graphs forward from the PAD to the updated study report, we added two more years of data since the PAD was written, 2009 and 2010.

Slide 55. So the specific gage analysis, this is the exact graph plus two years that was in the PAD, and what we are showing here is North Bend at several different flow rates -- 500, 1,000, 5,000, 10,000, 15,000, and 30,000 CFS.

Slide 56 is the Genoa, so this is new, and, again, 5,000 through 30,000 CFS.

And then just like in the PAD, on Slide 57, we put the -- we rearranged the data to show all of the sites that we are looking at on a single graph, and we have here -- we also included Grand Island, but we have Duncan, North Bend, Ashland, Louisville, and now Genoa. For -- and this is specifically the 1,000 CFS flow rate.

On Page 58 -- sorry, on Slide 58 we -- this is a summary of the Kendall Tau analysis. The Kendall Tau analysis showed no trend at Genoa, Duncan or Ashland. There was a trend for the 1,000 CFS flow rate at North Bend.

And I'm going to go back to Slide 55. That would be this kind of pink line, the 1,000 CFS line, showed a slight degradational trend.

And I'm back on Slide 58. There was a trend at the highest flow rate for Louisville, but overall no aggradational or degradational trend were found using this analysis, which, you know, meshes well with what we had said qualitatively in the PAD originally.

Any questions?

Hearing none, moving on.

LISA RICHARDSON: We are going to get done early if you guys don't start asking questions.

Okay. The next piece that we are going to talk about is this statistical analysis of the bird data that we did. Can you guys hear me on the phone without the microphone?

ISIS JOHNSON: Yes.

LISA RICHARDSON: Okay. Starting out I'm going to just indicate that we had done some statistical analysis in the initial study report. As part of the study determination, we were asked to do some additional analysis. And as part of that, we recruited one of the folks in our Denver office to do that statistical analysis. Marcus Grant is on the phone. I'm going to be presenting a lot of the data that's on the slides. Marcus did the analysis and can answer any questions. He will correct me if I say anything that is not accurate. So with that, Marcus, can you chime in just real quick?

MARCUS GRANT: Yeah. I would be glad to answer any questions anybody has, and I will just let you go ahead with it, and, if I need to chime in, I will.

Are you okay with that?

STEPHANIE WHITE: Marcus, are you on speakerphone, or are you talking directly into the receiver?

MARCUS GRANT: I'm on speakerphone. Is that a problem?

STEPHANIE WHITE: It would be -- I think we could hear you better if you pick up the receiver for this part.

MARCUS GRANT: Okay. Is this better?

STEPHANIE WHITE: Try it again and speak up.

MARCUS GRANT: I'm speaking directly into the phone.

MATT PILLARD: It's a little quiet.

STEPHANIE WHITE: If you can speak as loud as you can, even though it will feel strange to you. Your voice is projecting about 35 feet.

MARCUS GRANT: Okay.

STEPHANIE WHITE: Okay.

LISA RICHARDSON: Okay. We will get started then. And if we can't hear Marcus, we will try to repeat what he says. I can hear him down here.

As Pat mentioned, there were several objectives with the sedimentation study. The one that applies to this analysis is Objective No. 3, which was to determine if a relationship can be detected between sediment transport parameters and interior least tern and piping plover nest counts.

As I mentioned, we did some initial analysis. What I wanted to make note of here is that we did that initial analysis on nest count data that was available from Game and Parks. There was some portion of that objective that indicated trying to use productivity measures. There really wasn't enough fledge ratio information to be able to do that, so the best data that we had was the nest count data. There was quite of bit of adult count data, but there was some concern about the accuracy of that, which we see -- in a count on the river, would you see the same bird be counted two or three times as they flew up and down the river.

So we were using the nest count data. That initial analysis was conducted at really a very coarse geographic scale. We did the analysis from the tailrace all of the way down to Louisville by hydrologic river segment. So it was broken down basically by the gage locations, which put 30 or more miles in each segment.

And then we did some linear regression on 14 different hydrologic variables. That analysis showed that there was no evidence of a relationship. But we were asked to do some additional analysis, maybe look at fewer parameters, but do some additional statistical analysis.

So for the supplemental analysis, the first thing that we did is look at hydrologic data correlation and see out of those 14 variables that we looked at initially how much of those were collinear. We also did a normality assessment and a factor analysis kind of determining which were the variables that we should be continuing to look at that weren't related to each other.

So in this analysis, the variables that remained were river mile, year, adult counts, peak mean daily flow, wetted width, and the annual percent diverted flow. So we really ended up with three hydrologic variables and then the other variables, and all of that was being related to nest counts.

Back in March, we did have a meeting with Joel Jorgensen and Mary Brown from the Game and Parks and the Tern and Plover Conservation

Partnership to discuss the data, the types of analysis that they thought would be appropriate for the data that we had, and how we could continue to further the analysis.

One of the things that we talked about very much in depth was the bird data that -- that the data has been collected by the Game and Parks since about 1982, I believe, through 2010. Over that time period, there have been a lot of changes that's been made to the data collection methods. We all understand that the data was not collected based on a specific research design for this purpose, so there is some uncertainty about the data and its applicability for this use.

We agreed that there was much more interior least tern nesting data than there was piping plovers, so we only did the initial analysis on the tern data. There really wasn't enough plover data to make a useful analysis.

A couple of other things about the populations: One, that the birds themselves are very -- they cover a very large area. There may be nesting populations on the Missouri River, on the Niobrara River, on the Platte River, and there's interchange between those groups for various reason that are mostly unknown throughout time. Another factor in the analysis is that the interior least terns are colonial nesters. They don't necessarily all identify their own specific best place to nest. They like to kind of nest together. So once one of them decides to nest, you may see a group of them nesting in that same area.

And as I said, we all agreed that this was the best available data but that it wasn't gathered specifically for this purpose, and so there's uncertainty about how it's used.

Additionally at that meeting we talked about how were we going to do the analysis. And, first of all, we talked about a refined spatial scale. As I said before, it was a very coarse geographic scale by hydrologic river segment. We determined that we would go ahead and try to do this analysis by river mile so you are only looking at one mile of data at a time. And then we also limited the analysis to the area immediately downstream of the tailrace. That's the area basically between the tailrace and North Bend.

We could identify the hydrologic parameters that were going to continue to evaluate and then -- but we would not have as much influence from other outside flows. As you move downstream, you get a lot more inflows and a lot more changes that are not related to the project.

So as far as the types of statistical analysis that we agreed to do, one was to look at just a pretty basic presence/absence analysis. We looked at log transformed nest counts for normalization, and then did some logistic regression and ANOVA for the additional statistical analysis.

And feel free to ask a question in the middle here.

This is the study area that we did the analysis on. Basically from the tailrace canal right here, that is approximately River Mile 102, and then all of the way down to North Bend, which is approximately River Mile 72, so we looked at the analysis on data for about a 30-mile stretch. And a lot of the following slides talk about river mile, so 102 is at the tailrace, 72 is downstream at North Bend.

The first analysis that we did was to look at relationship of nest counts to the actual data collection visits. As I mentioned, the data was collected over a variety of years. The methods of collection maybe have changed a little bit. There have been cycles of volunteers doing the collection, Game and Parks employees doing the collection. There was a lot of differences in the data.

So we looked at all of the data that was in the database from the mouth of the Platte at the Missouri, which is River Mile 0, all of the way up to the confluence with the Loup, which is River Mile 106. We looked at only the on-river data and found that there was a very slight correlation between the number of times that nests were counted and the numbers of nests that were counted.

So basically what we were trying to determine is when there was a year that there were a lot of visits made, sometimes you would see folks would be out about once a month for three or four months versus a year when there was only one or maybe two visits made, was that affecting the number of nests that were counted. So basically that analysis showed that about 4 percent of that difference could be associated with the number of visits.

That was further reduced though when we looked at adding in adult nests -- or, excuse me, adult counts into the analysis. Then this is pretty obvious, the more birds you see, the more nests you tend to see. It was really determined that the number of data collection visits that occurred was really insignificant in the number of nests that were counted.

JOEL JORGENSEN: I have a question about that.

LISA RICHARDSON: Go ahead, Joel.

JOEL JORGENSEN: So you are telling me that increased effort does not significantly increase the number of nests detected. I guess I see -- when I see that you say that there's -- the relationship between the number of visits and the number of nests counted, I guess if there's a period of time that is between those visits you may have the same number of nests but they could be all different nests.

LISA RICHARDSON: And that's something that we -- you know, you can't tell exactly. Nowadays when you are counting the nests, you are getting the GPS coordinates.

JOEL JORGENSEN: That's right.

LISA RICHARDSON: So you can know which -- when you have the same numbers -- when you are counting the same nest.

JOEL JORGENSEN: Right.

LISA RICHARDSON: Historically in the data that wasn't available. So we had to make an assumption. You are right that you could go out two different times and come up with the same number of nests, none of which are the same or all of which are the same or some combination, somewhere in between. We didn't know what was what there, so we had to make an assumption.

JOEL JORGENSEN: So what did you use? I guess my question is, did you use the data from both visits, or should I wait until you sort of get down the line a little bit?

LISA RICHARDSON: And maybe Marcus will chime in, but when we were just looking at the number of data collection visits versus the number of nests counted, we looked at all of the data. Every time -- every piece of information that was in there.

JOEL JORGENSEN: So this wasn't used in the analysis?

LISA RICHARDSON: Right. What we did, in the analysis we looked at each year and each river mile and said, Okay, was there -- as an example, at River Mile 72.2, it was noted in the database that that location was counted four times in 1987.

JOEL JORGENSEN: So what you are presenting here is talking about what you did to sort of assess the data before it was applied to the analysis.

LISA RICHARDSON: Yes.

JOEL JORGENSEN: I guess bottom line this for me then. Did you adjust the data in any way to account for effort intensity, or is it just looking at data and we looked at it and now we are moving on, or did you actually make any changes as to how you applied the data?

LISA RICHARDSON: When we did the analysis -- the statistical analysis, we only looked at the highest nest count at a specific location.

JOEL JORGENSEN: During a year?

LISA RICHARDSON: During a specific year.

JOEL JORGENSEN: Okay.

LISA RICHARDSON: Now, there might have been -- as I mentioned, we are looking at this by river mile. So as an example, there would have been three counts at 72.2, one count at 70, and one count at 72.8. So we would have looked at what was the height at that specific location. We only took the maximum number.

So at 72.2 where there were three counts, we looked at which one of those counts had the highest number. That's the piece of information that went into the analysis.

JOEL JORGENSEN: Okay.

LISA RICHARDSON: In addition to the counts at 72.0 and 72.8, so -- because those were considered to be separate locations, not potentially the same nests, so when we looked at a river mile, there would have been three counts in that river mile.

JOEL JORGENSEN: Okay. Well -- and just to clarify again, I come back to my initial statement. If the nests were individually marked, I think you would find a much stronger relationship between the number of visits and the number of nests counting. It's counter-intuitive to say that the effort does not affect the number of nests present in the environment over the course of a year. I mean, I know that's not specifically what you are saying there, but it's sort of what's being implied.

LISA RICHARDSON: Right.

JOEL JORGENSEN: And that doesn't make any sense. So -- and I guess given the amount of variation in timing and effort on the surveys in any one year, the amount of variation may by that very fact lead to a nonsignificant relationship. If you had a controlled period where you were making weekly visits or something, if you were controlling for those things, a significant relationship may be much more obvious. I mean, it's not a surprise there's not a significant relationship.

LISA RICHARDSON: Right.

JEFF RUNGE: I guess since we are stopped here, just one quick question. The R squared values, does that, for example, for the number of visits and number of nests, is that .04R squared?

MARCUS GRANT: The R squared for the correlation for the number of visits and number of nests is 0.038.

JEFF RUNGE: Okay. .038.

MARCUS GRANT: So we made that an approximation on the slide.

And then when we included adult tern counts, the semi-partial R square for number of visits reduces to .02.

JEFF RUNGE: Okay.

MARCUS GRANT: So that removing all

of the shared variance and looking at just the contribution of the number of nest counts to -- or, excuse me, number of data collection visits to number of nest counts.

LISA RICHARDSON: Mary, did you have a question?

MARY BROWN BROWN: I'm wondering what statistics we are actually looking at because correlation is R and R squared is regression. I'm wondering actually what test statistics we are seeing and are the actual test statistics values available, Marcus, that we can see? Or am I misunderstanding what I'm reading on the chart? Correlation is R and regression is R squared?

MARCUS GRANT: R squared is proportion of variance of the independent variable that's accounted for by knowledge of the -- I'm sorry. The dependent variable --

COURT REPORTER: I'm sorry. Can you speak --

MARCUS GRANT: It's called the coefficient of determination.

STEPHANIE WHITE: Marcus, can you speak up a little bit, please?

MARCUS GRANT: Okay. I'm trying to.

R squared is the coefficient of determination. It's the proportion of variance in the dependent variable that's accounted for by the -- by knowledge of the independent variable, in this case number of nest count visits or number of least tern adult counts.

JOEL JORGENSEN: So I guess the question is, did you conduct a correlation analysis or a regression analysis here?

MARCUS GRANT: This was a regression analysis. This was a multiple regression using the two independent variables.

LISA RICHARDSON: More questions on this slide. I thought this one would be the easy one.

Okay. We will move on to Slide 67 for those folks on the phone.

So now this is actually getting into the analysis that we did to try to look at project effects.

One of the analyses we did was to look at the relationship of nest counts to distance from the tailrace return. So basically were you seeing more nests further way, closer, or did it not seem to matter in relation to the tailrace. The data that was used was from 1987 to 2010. That was when we had the flow data and the nesting data. And, again, as I mentioned, we were analyzing River Miles 102 to 72.

And then one of the things -- one, we did not see a statistically significant relationship between distance from the tailrace and the number of nests that were counted.

We did identify a post-1995 and pre-1995 kind of dichotomy in the data, that the -- in this particular river segment, counts after 1995 were pretty steady but significantly lower than counts before 1995.

And then, Marcus, I will let you talk a little bit about the tests that you did on that, the T-test and then the Mann-Whitney U and the Kendall Tau.

MARCUS GRANT: Sure.

We basically visually saw that potential dichotomy between nest counts prior to 1995 and after 1995 on that portion of the river. And you can see it in that box plot in the slide of 69.

And we did the T-test of the difference in means all of the years prior to 1995 and all of the years after 1995 for that stretch of the river and got a significant result -- a significant difference. After discussing with one of our senior biometricians, he suggested, Well, why don't we do a non-parametric test on that because it's a more conservative test and it's going to cover your bases good. So we did a Mann-Whitney U test, which is a non-parametric version of T-test that looks at the rank compared observations, and we got a Mann-Whitney U T value of 0.71 -- .071, excuse me, so a trend towards significance there, but not hitting the .05 criterion with the non-parametric tests. But we get the .05 criterion with the T-test, and that is sort of typical of a lot of things that we see with the nest count data that we have. But there seems to be a dichotomy in the number of nest counts just in this portion of the river. It's not a linear progression or reduction in nest counts over time, but a step down event since approximately 1995.

LISA RICHARDSON: Go ahead, Joel.

JOEL JORGENSEN: Why did you select the -- limit the analysis to River Mile 72 to 102. I guess 72 just seems kind of an arbitrary number.

LISA RICHARDSON: That was where the flow data changes. North Bend -- I mean, the -- the

North Bend gage is the nearest gage to the tailrace. It's about 30 miles downstream. After that you start to see more inflows from other tributaries and things, so that was where we broke the analysis.

JOEL JORGENSEN: Why at 72? I don't get that. What changes in the river at 72 that makes it -- there's inflows throughout the entire system, I guess. Is there a mechanism to control -- I mean, that would be a no quantity to a certain degree, wouldn't it?

LISA RICHARDSON: We just show North Bend because that's where we had the hydrologic data. And I thought that was part of what we discussed at our meeting in March was to limit it to a smaller area. And so North Bend is where --

JOEL JORGENSEN: I can't remember that far back, so that's fine. Okay. I just wanted to know if there was something hard or firm there, why 72 was significant in the analysis.

LISA RICHARDSON: Matt, do you remember?

MATT PILLARD: Matt Pillard. I guess all I can say -- Lisa said that the North Bend gage was the last gage nearest the tailrace for which we had data, and the next gage down is Leshara. Is that right?

LISA RICHARDSON: Yes.

MATT PILLARD: So that would have been the next gap. And river miles between North Bend and Leshara, Pat, do you know offhand?

PAT ENGELBERT: Not off the top of my head.

MATT PILLARD: It's quite another distance down river. So in order to reduce the spatial scale, North Bend was the last spot that we had gage data other than moving another 30 miles downstream to Leshara.

JOEL JORGENSEN: I guess if you are interested -- if there were to be an effect, and not saying that this analysis would affect it for a number of reasons, the effect would be attenuated as you move downstream.

LISA RICHARDSON: Yes.

JOEL JORGENSEN: So I guess you are somewhat limiting the data, I guess, given the limited number of data points within a 30-mile stretch -- yeah, I guess I'm fine. I understand decisions have to be made, but, again, 72...

And I guess the other thing I would comment about is we know that there are a number of other variables in effect in the tern/plover numbers in the system, and I know you make some assertions here later on in the presentation about a constant and the changes here, so -- but there's definitely other variables at work in the system.

LISA RICHARDSON: Absolutely. And we don't know what happened in 1995 that caused it -- a decrease in the nest counts.

I'm going to back up one slide to 68. This -- I guess I got this a little bit out of order.

This slide, No. 68, shows the highest nest counts summed by river mile. So there you can see 102 at the left side of that screen and 72 at the right side, 102 being close to the tailrace, 72 being 30 miles downstream at -- approximately at North Bend. So those were the -- that's the data that was basically used to determine -- doesn't seem to be a relationship between distance from the tailrace and the number of nests that were counted.

And then we also, moving on to 69, broke it up by year, summed it over the River Mile 72 to 102 and saw that kind of stepped relationship.

So we also -- to see -- okay, there seems to be something going on in 102 to 72, what's going on in the rest of the river. And I think this is part of what your question was, Joel. We then did look at rest of the river and say, is there something happening in 1995 everywhere. And we also did look at some of the sandpit data that we had as well.

This is all river miles from the mouth of the Platte up to the confluence with the Loup and showing there doesn't seem to be anything happening at 1995. 1995 itself is a relatively low year, but the rest of it is pretty scattered. It seems to be fairly consistent. So when you look at all of the data together, you don't see that.

We also looked at it, okay, so is there something going on from 102 to 72, what does it look like from 71 down. And, again, this is River Mile 71 to 0. You don't really see anything there.

So I think we are kind of getting to your question a little bit. We did look at beyond just 72 when it seemed like there was something going on.

And this is also showing -- this is how the sandpit counts looked in River Mile 72 to 102 during that time period.

Mary has a question.

MARY BROWN: I'm wondering if Marcus

could send us the test statistics for this as we go along. The U values and the Ts and all that jazz. Is it reasonable to ask for that, Marcus?

MARCUS GRANT: We have the SPSS output for all of this.

MARY BROWN: Okay.

MARCUS GRANT: These were just descriptive statistics. This was not a hypothesis test.

MARY BROWN: That's fine. It might be a little easier to interpret some of this if we saw the values.

LISA RICHARDSON: Yes. And as Marcus said, we have the SPSS output for all of the analysis. That is part of the report. And I meant to start off with this piece of analysis was submitted late. We had some things that we needed to clarify with Marcus the last week or so. He was called out of the country on a family emergency, so we had to delay getting the statistical information into the report. But as was submitted on Tuesday to FERC, the write-up for the analysis as well as Attachment H, which includes all of the SPSS output files for all of the analyses that are were done.

MARY BROWN: Okay. That's fine.

It's just a little easier to interpret things like this if I do see the test statistics with is all.

LISA RICHARDSON: So here's kind of a summary of the analysis that we did for this -- this analysis per river mile. We looked at 102 to 72, 106 to 0, and 71 to 0, both on- and off-river data for parts of those segments and identified that there seems to be something going on pre- and post-1995 just in the 102 to 72 river mile segment.

But, as we have noted in the report, project operations were unchanged during that period, so we don't feel that there's something project related that happened in that 1995 time frame.

JOEL JORGENSEN: Well, that -- I guess I question that conclusion. I mean, you are sort of -- there's sort of a syllogism there that with you are making a conclusion. Because, I mean, potentially there could be far fewer least terns in the world during those different time periods that would be available to put down nests, so that would affect your nest numbers in the system.

LISA RICHARDSON: Yes.

JOEL JORGENSEN: And it's made later on too the sort of suggestion because you have a constant variable in project operations, and you have variation in the number of nests, that this constant variable isn't affecting the other, and I guess that's perpetually not an appropriate statement to make because given that you have noisy data, you have a number of variables at play that are affecting what you are looking at, and you are not controlling for any of those. It's -- there may be an effect, but you are not able to detect it. I think that's the important way to present that. We don't know. We are limited and hamstrung by the data, and we can't say either way. But, again, to stress that there is noisy data and other variables at play here.

LISA RICHARDSON: Okay.

JOEL JORGENSEN: Including that there just could be fewer terns in the world during the different time periods here.

LISA RICHARDSON: Right.

We also did some more analysis to try to determine is there a relationship from -- with distance from the tailrace to the number of nests that were counted. This is something that we specifically talked about with Joel and Mary about doing binary logistic regression, which basically reduced all the nest count data to a presence/absence variable. So if there were nests in the river mile, that was identified as one. If there were no nests identified in a river mile, that was identified as a zero.

Just a point of clarification, I didn't mention this earlier, but there were several times when visits were recorded that no nests were counted, but there was nothing -- there was nothing entered in the nest column of the database. Those were treated as null values and were not actually included in the analysis. So they weren't included as zero. They weren't included at all.

So, again, this simplified a very larger amount of data to a presence/absence variable. It eliminated any magnitude associated with the nest counts, you know, was it one nest, was it ten nests. It didn't matter. It was one or zero.

And, again, no relationship was detected between nest presence and distance from the tailrace.

Marcus, do you want to expand on this just a little bit?

MARCUS GRANT: Well, you covered it pretty well. The logistic regression analysis, of course, was a work around for the fact that the data were not normally distributed and there could be problems from using a correlation analysis, a parametric correlation analysis. And as Lisa pointed out, a certain amount on information, of course, is sacrificed when you go from count data to presence/absence data.

The results were very consistent in the binary logistic regression, and those results are available to you also in Appendix H, that all of the variables that we tested came out with -- excuse me, odds ratios very close to one, which would be the equivalent to getting an R of zero in parametric regression analysis. So we could not detect any effect of distance from the tailrace on the number of nest counts using that method of analysis.

LISA RICHARDSON: Yes, Jeff.

JEFF RUNGE: Yeah. Just one quick question here. What's the spatial bounds when you looked at the distance from the tailrace?

LISA RICHARDSON: Go ahead, Marcus.

MARCUS GRANT: No, go ahead.

LISA RICHARDSON: In this particular analysis, it was 102 to 72, the 30 miles immediately downstream of the tailrace.

JEFF RUNGE: Okay.

LISA RICHARDSON: Additional questions on this slide?

Okay. One more analysis related to distance from the tailrace, and I would say we didn't find anything, so we kept looking to see if we could find some other type of analysis, if there was some relationship. This was a multiple regression on the log transform nest counts as the dependent variable. The number of adult tern counts was also included in that regression as were the variables of peak mean daily flow, river mile, year, and percent diverted flow.

There was a high association with the number of adults counted. That's perfectly reasonable and not a surprise there. There was no association with the other variables of peak mean daily flow, year, and river mile. There appeared to be a slight association with the annual percent of diverted flow. And in that case, the more flow that was diverted, it was showing that you would expect to see more nests. There was no real logic. That didn't make any sense for that type of a conclusion to be drawn, so Marcus did some additional analysis and was -- determined that what was showing up initially was not really there.

Marcus, I will let you explain that a little bit better.

MARCUS GRANT: Sure. And we saw this in the -- to point out, we saw this in the logistic regression analysis flow, annual percent flow diverted was a very problematic variable. And the correlation matrix was very unstable. It's just the nature of the way that that data or those data were collected, I believe.

And when we looked at the multiple regression analysis of log transform, which was not normalized I should point out, but the regression residuals looked pretty good with the log transform scores, so I had some confidence in it.

What was going on there was that very weak association that appeared to be was annual percentage converted flow was actually a very strong correlation between annual residuary flow and peak mean daily flow. They were sort of catching themselves so to speak at the correlation variance matrix in the multiple correlation, and that's what we are seeing when you account -- again, when you account for that relationship, then the apparent relationship between annual percent diverted flow and nest count goes away, it becomes trivial.

LISA RICHARDSON: Any questions?

JEFF RUNGE: Since a lot of these other -- a lot of the other studies look at effective discharge as your measure of comparison across these segments, I guess I wonder why peak mean daily flow was selected as opposed to these other measures that were already in place?

LISA RICHARDSON: Marcus, I think that had to do with the factor analysis and the collinearity.

MARCUS GRANT: Right. That may have been a somewhat arbitrary decision, and I would have to go back and review those data, but a lot of those variables were collineary, and we were choosing the ones that we felt at the time were most representative.

LISA RICHARDSON: And, actually, Jeff, now I remember part of it. The effective discharge, dominant discharge, and peak mean daily flow loaded on the same factor in the factor analysis, so there was -- they were very similar. Peak mean daily flow was something that we had data for for every -- we could calculate for every river mile, whereas effective discharge and dominant discharge were not something that we had at every river mile, so that's -- we were doing the analysis by river mile, so we couldn't do it based on effective discharge or dominant discharge because we didn't have that data.

JEFF RUNGE: I guess that leads me to another question then. If peak mean daily flow and dominant discharge or effective discharge are very similar when looking at -- or are very similar factors, I guess if there's no relationship between peak mean daily flow and nest counts, I guess could it also be implied that this is not a very good measure to look at project effects because we do see significant effects when it comes to other parameters and effective and dominant discharge, but if this shows that there's no relationship, I guess does that mean that this analysis can't detect the effects of the project?

LISA RICHARDSON: From an effective and dominant discharge perspective, I guess we couldn't do that analysis, but the sediment transport, which is really what you are getting at through the effective or dominant discharge, the sediment analysis determined that the system is flow limited, not supply limited. So the amount of sediment -- and Pat can help me out here if I'm incorrectly stating something, but the amount of sediment that's being carried is all that can be carried by the flow that's there.

PAT ENGELBERT: I think in looking at the effective and the dominant, that's kind of the long-term analysis relative to the sediment transport, evaluating what is that discharge that conveys the most sediment over the long term. I think when they were applying the daily values they were seeing if there was a response maybe to that single discharge in time, so it's kind of looking at two different things, I guess.

JEFF RUNGE: But don't they aggregate the data to make a long-term analysis though --

PAT ENGELBERT: The sediment data, yes. I don't know about the bird data.

LISA RICHARDSON: I'm not sure what you mean, Jeff.

JEFF RUNGE: Well, you said that the effective and dominant discharges looks at long-term effects to channel geometry, but wasn't this data for the species also analyzed within the long-term?

LISA RICHARDSON: Yes. Yes, it was.

MARCUS GRANT: From 1987 to 2009.

JEFF RUNGE: Okay.

LISA RICHARDSON: So in that case, we had to take like the average of the flow -- of the peak mean daily flow for that 24-year period, and the total numbers of nests that were counted or -- I mean, it was done over the -- each piece of -- each year had several pieces of data in it, and then it was aggregated in various ways.

GEORGE HUNT: I think the dominant and effective discharges used in the factor analysis, the annual dominant and effective discharge, not the long-term.

JEFF RUNGE: Okay. So there wasn't an aggregate comparison that looks at changes in effective and dominant discharge on the longitudinal, and does that affect the aggregate nesting over the long-term as well? There hasn't been that comparison then?

LISA RICHARDSON: No, not specifically.

JEFF RUNGE: Okay.

LISA RICHARDSON: Any other questions on this slide?

Okay. And then we also did analysis of nest counts in relation to annual change in peak mean daily flow. So basically as the flow changed from year to year how did that affect nest counts. A one-way ANOVA analysis was conducted for River Miles 102 to 72. What that analysis, and Marcus is going to have to chime in here, what that analysis showed is that the change in flow between years was statistically significant but the change in flow from -- between river miles was not. Now, that was for the 72 to 102, so basically -- essentially showing that you are seeing relatively consistent flow over those river miles.

What we did see is what appears to be a relationship, that high flows followed by low flows produced more nests, which is kind of a theory that's talked about quite a bit. The data was actually somewhat inconsistent, but we did do some analysis trying to look at that relationship.

On this graphic, you can see that in 1993 -- this is a normal -- this is a standardized flow graphic, so basically the highest flow that was recorded during that '87 to 2010 period was the denominator to each of the highest flows in each of the years. So the highest flow over that period was in 1993, so that's a one value. And then in 1994 you had less than 20 percent of that same amount of flow the following -- in the following year. You saw that again in the '99 to 2000, and '99 is actually not shown on here because we didn't have any nest count data in '99. And then you saw it again in 2005 and 2006 where you had relatively high flows followed by fairly low flows.

So we looked at what does it look like when you compare the flows and the nest counts, the sums of those nest counts for those years. In 1993 you had an average of 2.76 nests counted, and then in 1994 that went up to 7.8, and that was determined to be a statistically significant difference between those years.

But when we did the same look at 1990 and 1991 when we had actual data, there's a less dramatic change in the flow, 1990 to 1991, but there wasn't any data available -- bird nesting data or enough between '99 and 2000 and 2005 and 2006, and we looked at '90 and '91, and you saw actually an inverse relationship.

Now, I know that there's some -- the Game and Parks reports have said that there was some -- the '91 data was collected maybe outside of the normal window so that could also be a factor in why this number is lower than this one instead of higher as we saw in the '93 to '94 data.

So any questions on the peak mean daily flow analysis related to nest counts?

Okay. Then I will move on to conclusions from kind of the summary of all of these slides. We found that nest counts were weakly associated with the number of data collection visits per year, that nest counts were strongly associated with number of adult terns, and there's no measurable relationship between nest counts and distance from the tailrace in that initial 30 miles of the river, there's no measurable relationship between the presence of nest counts and distance from the tailrace, year, peak mean daily flow, or percent diverted, and that there is a potential relationship between high flows -- low flows followed by high flows that produces more nests and that there's no significant difference in the changes in flow within those 30 river miles.

ISIS JOHNSON: This is Isis Johnson from FERC. Can you go over that -- what is that, the bullet that's the third from the bottom? Do you mean there's no measurable relationship between the presence of nests or between nest counts?

MARCUS GRANT: Presence/absence.

ISIS JOHNSON: Okay. Presence and

absence of nests, correct?

MARCUS GRANT: Correct.

LISA RICHARDSON: Yes.

ISIS JOHNSON: Okay.

LISA RICHARDSON: Any other questions?

All right. Stephanie, do you want to take a quick break before we go into hydrocycling?

STEPHANIE WHITE: Yes. Do you have one more slide?

LISA RICHARDSON: I have a questions slide.

STEPHANIE WHITE: Let's take a break. Let's reconvene in 15 minutes, which would be close to ten minutes of. Is that about right? Let's reconvene at ten minutes to the hour, so we will have a break.

(10:34 a.m. - Recess taken.)

(At 10:50 a.m., the following proceedings were had, to-wit:)

STEPHANIE WHITE: All right. When you are ready, Pat.

PAT ENGELBERT: For those of you that are on the phone, we are up to Slide 83. We are going to talk about the analysis that was performed for the hydrocycling study for this updated study report.

Moving on to Slide 84, just as we had done with the sedimentation study, I will review the goals -- the goal for this study as well as the objective that we are covering for this updated study.

To review the goal of the hydrocycling was to determine if project hydrocycling operations benefit or adversely affect the habitat used by interior least terns, piping plovers, and pallid sturgeon in the lower Platte River.

The first two objectives associated with this do not relate to what we did as part of this updated study report. But Objective 3 did, and that objective is to assess the effects, if any, that hydrocycling, the current operations, have on sediment transport parameters.

So a quick review. We are now on Slide 87. This is the study area for the hydrocycling report -- the hydrocycling study. It goes from just upstream of the tailrace, that being Site 3, down to Louisville. We have a slightly smaller area that we will be evaluating for this updated study report, but I wanted to refresh your memory on the study area for the hydrocycling study itself.

Moving on to Slide 88, the previous analysis that was conducted for the hydrocycling study included developing the sediment transport indicators for current operations as well as run-of-river condition, and those three sediment transport indicators are the total sediment transported, the effective discharge, and the dominant discharge. We have talked both about effective and dominant during the sedimentation discussion. The total sediment transport, that's just the amount of sediment that's transported for whichever study period you are evaluating.

This is a slide -- moving on to the next slide, Slide 89. Based on the previous sediment transport calculations that we performed, I just wanted to refresh everyone's memory. We looked at a typical wet year, a typical dry, year, and a typical normal year based on the hydrologic classifications by the Service, and we compared the total sediment that was transported for the current operations as well as the run-of-river, and we did that at Site 3, which is upstream of the tailrace return, Site 4, which is downstream from the tailrace return, and then down at the North Bend gage, as well as Site 5, which is near the North Bend gage.

And what we showed was, for example, at Site 3, the total sediment transported for current ops is the same as run-of-river as it should be, that is upstream of the tailrace return. However, at Site 4 we saw a slight decrease in the total sediment that was transported under the run-of-river condition as opposed to the current operations, run-of-river, in that they are not storing any water and whatever they divert runs right through the system, so there's no hydrocycling under the run-of-river condition.

Moving downstream, we saw a very close -- very close to same amount of sediment that was being transported. Actually, a slight increase under the run-of-river condition down at North Bend, a very, very slight increase. And that was for a normal year.

For a wet year, which was 2008, at Site 4, again, we had a slight decrease in the amount of sediment that was transported when the project was operating under run-of-river conditions as opposed to current operations.

So in a wet year at Site 4, slight decrease to the total sediment transported if they go a run-of-river condition.

That is consistent with what we saw at the USGS gage site, a slight decrease. However, at North Bend we saw essentially the same amount of sediment transported under those two conditions.

Moving on to the dry year, a typical dry year, again, at Site 4 we saw a slight decrease in the amount of sediment transported under a run-of-river condition as compared to a current operations condition; a slight decrease at the North Bend gage, but, again, just a very slight increase at the North Bend site, that being Site 5.

So I just wanted to refresh your memories that based on our previous analysis we saw a slight -- at Site 4 we saw a slight decrease in the total sediment being transported when the project was operated under a run-of-river condition as opposed to a current condition scenario.

Moving on to Slide 92, I'm just going to summarize FERC's request in the last study plan determination letter that we are evaluating this updated study report. HEC-RAS predicts -- this is per FERC's letter. HEC-RAS predicts whether there would be aggradation or degradation for various project operations, will allow FERC to evaluate relative effects of project -- that project operations have on sediment transport, channel geometry, and water service. Therefore, they directed Loup Power District to evaluate the sediment transport using the sediment transport module within HEC-RAS.

Moving on to Slide 93, in evaluating the capability of what HEC-RAS can do from a sediment transport perspective, this is right out of the Hydraulic Reference Manual. It's the very first thing you read, and it states that the data utilized to predict bed change is fundamentally uncertain and the theory employed is empirical and highly sensitive to a wide array of physical variables. However, you can utilize a calibrated sediment transport model to predict -- and this is the important part -- regional long-term trends that can inform planning decisions and can be used to evaluate project alternatives.

So I would like you to keep that in mind that we are not overstating the ability of this model, that we are -- it truly was developed to evaluate regional, long-term trends.

JEFF RUNGE: Do they describe at all as to what they mean by long-term?

PAT ENGELBERT: They didn't give a range of dates. I think in other studies that have been performed you would typically be looking at that ten-year -- probably eight- to ten-year would probably be a minimum. I would think based on what we have seen, but certainly in that eight- to ten- to twenty-year time frame.

And hopefully that will become evident when I go through the model development process as to the very nature of the complexity of the model and why that is so.

Yes, Lisa.

LISA RICHARDSON: Pat, are we still planning something next week?

As much as Pat is going to talk today, he can talk even more --

PAT ENGELBERT: You might find it

hard to believe, but I'm going to be summarizing the model develop and the model results today. For those that are interested in really getting down in the weeds of the model development, we have set a date of Wednesday, September 14th. We are going to hold kind of a live meeting with anyone who is interested to get into much more detail on the model inputs, simulation parameters, and those types of things from 12:30 Central to 3:30 Central. So right now I know Paul Makowski from FERC would like to participate in that, and we would welcome anyone else that would like to participate. Please send me an e-mail if you are interested, and we will make sure that we send you the link in order to access kind of a similar presentation, but, again, getting quite a bit more down into the weeds.

Today due to lack of time and probably interest from a lot of folks, I'm going to state at a pretty high level, just summarizing model inputs and results. That's next Wednesday, September 14th, 12:30 Central to 3:30 Central. If you are interested, send me an e-mail, and we will send you the link to participate.

So in developing the model, we looked at a series of sources, the Loup River -- a model had been developed of the Loup River as part of the ice study as part of this relicensing process. The Corps of Engineers developed or updated the study for the Platte River, so we used that. And that's more of a regional model, pretty coarse spacing. And then we supplemented those two models with the HEC-RAS models that we developed for the study sites as part of this relicensing process.

Some -- moving on to Slide 95, some of the model considerations or constraints when evaluating sediment transport is they suggest a fairly coarse cross sectional spacing because at every time step it's balancing sediment in and sediment out. The narrower you have the cross-sections, you introduce quite a bit of model instability, so they strongly recommend fairly coarse spacing or spacing close enough that it doesn't incur model instability.

Also simulation, they -- all of the manuals and literature suggests a pretty significant warm-up time, maybe a six month or a year warm-up time, which allows the model to become computationally stable. And I will explain how we did that in a minute.

And, again, they also suggest long-term simulations. What that does allow us to do is calibrate to long-term trends that we saw at the gaged sites.

Because of the time step and the simulation length associated with these models, we actually broke it into two models. One model included Sites 3 and 4, and then a model included Site 5. And the biggest reason we had to do this was just to evaluate about two miles around North Bend required -- in evaluating the daily flows as well as the realtime flows, each simulation took approximately 8 to 12 hours just for it to grind through the length of simulation that was required.

If we were to connect Sites 3 and 4 all of the way down to North Platte, so two miles to 8 to 12 hours, have a 35-mile long river segment, to evaluate sediment transport would have taken 15 times that.

TOM ECONOPOULY: Was this on your laptop or --

PAT ENGELBERT: We actually -- we got quite a souped-up computer that we have. It's very high processing speed in our -- and the guys that were running it always refer to that computer as Canseco because it was all juiced up. So for those baseball fans. If you are an A's fan, I apologize.

But anyway.

But I will talk, Tom, a little bit later, some of the discrepancies that we found in modifying input files and other things on various computers and having it run. Good question. I will get into that. But it was a pretty souped-up computer.

Moving on to Slide 96. So the hydrology that we incorporated into the models, we looked at a three-year warm-up period, and we ran just a base steady flow during that three-year warm-up period, and we used the effective discharge for that.

The next term -- the next part of the hydrology that we evaluated was a long-term hydrologic simulation, and we chose from 1990 to 2005 for a couple of reasons. One was there was good distribution between wet years and dry years and normal years between 1990 and 2005. We had approximately six wet years, five normal years, and six dry years -- no, six wet, five dry, and six normal years, I believe, but we had good representation in evaluating that long-term trend using that length of time.

Plus in order -- and then at the end of those year, we would tack on either a wet year or a dry year or a normal year using the realtime data, and that started in 2006, so we thought that provided us a good transition into those wet years, dry year, and normal years.

Relative to boundary conditions, for the -- the model had included Sites 3 and 4, we incorporated the Loup and the Platte as upstream boundary conditions for that model which allowed us to evaluate the sediment contribution from the Loup and the Platte as it comes into Sites 3, and then -- as well as to Site 4.

The other thing that we evaluated was the tailrace return contribution. And in looking at the Missouri River Basin Commission Study, they state that there is a sediment concentration in the tailrace returns that were approximately 350,000 tons per year. However, to evaluate the worst case scenario related to sediment transport, we assumed no sediment concentration coming in from the tailrace return. That would paint the worst case scenario from a sediment transport perspective at Site 4, so I just wanted to make that clear.

So down at North Bend, we just used -- for boundary conditions, we wanted to make sure we incorporated the North Bend gage because we used that for calibration, so the North Bend gage kind of serves as a -- upstream of the North Bend gage kind of serves as our boundary conditions there.

Real quickly I just want to show the graphics looking at Slide 97. These are the modeled cross-sections that we used. We were looking at model stability. We have cross-section spacings typically of about 1500 feet. It still allowed us to have either four or five cross sections in Study Site 3, Study Site 4, and Study Site 5. But this is just a graphical representation of the model limits. We have got a couple miles up the Loup, a couple miles on the Platte, and then we see Site 3 and Site 4, and then we extended it down a couple of miles.

It was important to have our boundary conditions sufficient enough distance upstream that boundary conditions weren't controlling our study areas, that being Sites 3, 4, and 5, so you want to create that buffer in the models.

Here we are in Site 5, and what I wanted to note there is we did go upstream of the North Bend gage about a mile and a half. We did use the North Bend gage for our calibration process, and I will go into that in just a moment.

So moving on to Slide 99, how the model

calculates sediment transport. It looks at the bed gradation, the available material that can be stirred up and transported, and it asks you to select a sediment transport method, so based on our initial study report and second initial study report, we again chose Yang's Unit Stream Power equation because that has been successfully applied to the Platte River. So it takes the bed gradation, that relationship, and then the computed hydraulics at every time step, and then it calculates what the sediment transport is at that particular time step.

Moving on to Slide 100, the only place that we had data for which to calibrate the models was at the North Bend gage, and we had bed gradation measurements that were taken, we had suspended sediment measurements that were taken, plus we had the long-term gage reading at the North Bend gage, so we used the model that included Site 5 as our calibration model.

One thing that I would like to note in -- and I'm on to Slide 101. When evaluating the sediment transport results, recall that we are looking at long-term trends, we are not necessarily looking at absolute values. And one of the by-products of getting the model warmed up is that the first initial time steps you will see a quick drop, a very quick degradational trend that's occurring. That's just the model's response to picking up the material to get to equilibrium when it starts its sediment transport run. So on some of the graphics, you will see us evaluating a trend line that's slightly lower than the measure data. That doesn't necessarily mean the model is not predicting it correctly, it's just recognizing that there's an initial adjustment period.

Okay. So moving on to the North Bend gage, one of the first calibration metrics that we had was is the model trending similar to what the long-term gage data was showing. So here we are at the North Bend gage location, and we looked at the cross-sections in the model just downstream of the bridge, at the bridge, which is where the gage site is located, and then just upstream of the bridge, and we saw that the long-term trend are represented in the blue diamonds -- this is on Slide 102 -- versus the solid purple line which shows the mean channel invert elevation in the model. Those are the average of the points that are used to define the river channel in the model. So you have the banks on either end and whatever points were used to describe the channel, it averages those, and that's what this line represents.

What we see is just a very, very slight long-term degradational trend. Just very slight, half a foot over the 15 or 16 years. And we see also a very similar long-term trend at the North Bend gage. That gave us -- that told us that the model was trending very similar to what the long-term gage had shown.

Secondly is we evaluated the -- what the model computed, the bed gradation that it took from the bed, did that represent what has been measured out in the field.

Here are a couple of lines on this graphic -- I'm on Slide 103. The green line is what the model stated it was pulling from its source for bed material. The other lines on there are measurements, either long-term gage measurements that were taken or recent measurements that were taken in 2010 by the USGS. What this tells us is that the model is accurately representing the material that's available for it to pick up and transport as part of the sediment transport calculation.

Jeff?

JEFF RUNGE: Yes. Before you move on here, the USGS 2010 document doesn't describe the results. It describes the methods, but there wasn't any published sediment data that came out of the report.

PAT ENGELBERT: The report that we had had gradations and tables I believe in the back. George, do you recall where we pulled those from?

GEORGE HUNT: Yeah, it had PDF tables of the data.

PAT ENGELBERT: Quite a large number of them.

JEFF RUNGE: That's odd because they collected the data and they were to send it to the Corps, and the Corps would process -- would sort the data -- they would hire a contractor to sort the data. And I even gave them a call too, the authors, and I guess I wasn't quite sure. I even looked up the report, and I didn't see the sediment gradations in the report.

PAT ENGELBERT: When we get back to the office, I will look it up, and I'm quite confident that we have that material. Would that be okay if we looked it up for you?

JEFF RUNGE: And please point out the

sections to me or provide me a copy, please, because that would be appreciated.

PAT ENGELBERT: Okay.

JEFF RUNGE: The other question too is when you looked at the model cross-sections, you look at average, is that an average over time or is that the average at the beginning or the end of the run?

PAT ENGELBERT: In -- as far as this gradation curve?

JEFF RUNGE: Yeah, the green line.

PAT ENGELBERT: That was at the end of the simulation.

JEFF RUNGE: Okay.

PAT ENGELBERT: We didn't do it finish each time step.

And just for -- to throw out numbers, each year -- when we looked at long-term simulation, we used daily data. And that calculated -- we provided a one flow per day, so we had -- for that year there were 365 flow points.

JEFF RUNGE: Oh, sure.

PAT ENGELBERT: We then broke that down -- I believe it was on the -- George, correct me if I'm wrong, a 15-minute or a 6-minute time step, we had it calculate a sediment transport.

JEFF RUNGE: Okay.

PAT ENGELBERT: So that's broken down again.

JEFF RUNGE: Okay.

PAT ENGELBERT: When you get into the realtime data, 30-minute data, you have to provide over 17,000 coordinates to describe every 30 minutes. So if we were to plot every single day, I think the output is 14 gig.

GEORGE HUNT: Each set of model results, the output was about 16 gig.

PAT ENGELBERT: About 14 gig worth of data. So to get through that -- that's why we showed just the end simulation.

JEFF RUNGE: Oh, no, this is helpful. The average -- it's helpful to know that that's an average of the output at the very end.

PAT ENGELBERT: At end of the simulation.

JEFF RUNGE: But as far as what you initially started with, is that on there, or is that --

PAT ENGELBERT: Yeah, we initially started with --

JEFF RUNGE: -- or did you use like --

PAT ENGELBERT: Something very similar to the purple curve, which is the combined gradation that we used in the initial study report.

JEFF RUNGE: Okay.

PAT ENGELBERT: We did have to take out some of the finds because we had dramatic model instability when we did that. It was picking up everything and dropping off of the bottom.

JEFF RUNGE: Okay.

PAT ENGELBERT: Again, another one of the modeling limitations. But the results, you know, indicate to us that its source is very nearly what's been measured in the bed, which gives us a good feel that it's accurately describing what's going on --

JEFF RUNGE: Uh-huh.

PAT ENGELBERT: -- out in the river.

Any other questions on either the model development or some of the calibration that we discussed at this point?

If not I will go on to the next slide. Again, this is at the North Bend gage itself, and this is a plot of the -- the orange squares on

Slide 104. The orange squares are the measured suspended sediment data taken by the USGS. The dark line is the sediment discharge rating curve that we developed for the initial study report and the second initial study report. The green circles, and they are all pretty well clustered around the sediment discharge rating curve line, but the green circles are what the model calculates is the cross-section's capacity to convey sediment. So based on the hydraulics and the bed gradation, here's how much that particular location can convey. The purple dots represent the rate at which the model is transporting sediment, so if the rate is higher than the calculated capacity, it will drop its sediment load. If the rate is less than the calculated capacity, it will pick up sediment to get to that equilibrium point.

What this shows is we had very, very nearly -- the sediment was being transported at its capacity for the majority of the time. There were instances where it wasn't, but by and large the very tight clustering that we see tells us that the river is transporting its sediment at its capacity.

JEFF RUNGE: I guess I missed the earlier explanation there. I guess I should have been paying closer attention, but maybe by providing us an example here where the transport rate is greater than the capacity, is that possible, or is that just a consequence of the modeling, or --

PAT ENGELBERT: It -- between cross-sections, the capacity changes. And at every time step that capacity changes. So when the Cross-Section 1 hands off its sediment transport load to Cross-Section 2, Cross-Section 2 may not -- the calculated hydraulics may not have the capacity to convey what the section upstream is giving it. So it will drop or pick up. So it calculates the rate and the capacity at each cross-section for every single time step.

JEFF RUNGE: Okay.

PAT ENGELBERT: So it's basically making a hand off as you work your way from upstream to downstream.

JEFF RUNGE: So in this case when you've got your transport rate is higher than any capacities, I guess what's the explanation for that?

PAT ENGELBERT: Well, what that's telling us is that that particular cross-section at that point in time, its capacity wasn't high enough to carry the sediment load that was being brought into its -- what do they call it, control section.

JEFF RUNGE: Okay.

PAT ENGELBERT: And, again, this is at every single cross-section for every single time step, so it's -- it chugs through quite a lot.

JEFF RUNGE: Okay.

GEORGE HUNT: So when that happens, it's just handed off its load from upstream, it will have to deposit that.

JEFF RUNGE: Okay.

PAT ENGELBERT: And that kind of explains the need for fairly coarse cross-section spacing so it can distribute that over a greater distance than if they are very close. That's where we saw some -- on some of the earlier runs that we made, we used all of the cross-sections within the study sites, the nine that we surveyed, and we just had dramatic model instability because of that change between capacity is what we were seeing.

JEFF RUNGE: With that, you know, just looking at the opposite one, and I'm not sure if you've got those graphics here, but Site 3, Genoa, and Duncan, the capacity is higher than the transport.

PAT ENGELBERT: Yeah, we will get to

those in a little bit.

JEFF RUNGE: Okay. I will just wait until those come up then.

PAT ENGELBERT: But I think, Jeff, what you will see in general is there's a pretty tight clustering around the capacity and the rate.

JEFF RUNGE: Yeah.

PAT ENGELBERT: But we will get into that in just a little bit.

JEFF RUNGE: Okay.

PAT ENGELBERT: Okay.

So we did not have data at either Sites 3 or 4 or Site 5 itself, so we did -- you know, kind of very loosely using the term validation, but we did more of a qualitative analysis in looking at model performance. We needed to have a good comfort that the model was responding as you would expect.

So a couple of things that we evaluated, for example, in the Sites 3 and 4 model, we looked at the trend in the Loup -- in the 2-mile stretch of the Loup and the 2-mile stretch of the Platte, we looked at its trend, its model trend, and we compared to the gages on the Platte at Duncan, which is seven or eight miles upstream, as well as the Loup at Genoa, which is 39 miles upstream, but we wanted to get a sense of was our 2-mile reach of both the Loup and the Platte trending similarly to what the gages farther upstream were trending, again, to give us some comfort that the model was responding according.

Similarly, we did the same thing with the bed gradations within the model for those two small reaches. And then we looked at the transport versus measured rate, again, similar to the graphic that I just showed.

Next we looked at Sites 3 and 4, and at Site 5. We looked at the long-term trend of the study sites to see if the model was responding to higher flow rates. As you would expect, when you see a higher flow occurring, typically see a dip in the long-term trend in response to higher flows coming in and drumming up the sediment. So we compared those.

We also compared for the -- in 2010 we ran a 2010 at the end of the long-term simulation to see if the model was responding similarly to what had been surveyed in 2010, so I will go through those results.

And finally we did look at the model versus the measured gradation within those study sites because we have that data. So, again, although it's not hard validation, it gave us some level of reasonableness evaluating the model performance qualitatively.

Now, I will begin a series of graphs, kind of death by graphics, but I am going to go through a lot of them, and I am open to questions at any point. I will probably run through them fairly quickly. They are all in the report, but feel free to ask questions at any point.

So looking at the Site 3 and 4 model, the first thing that we compared -- the first thing that we evaluated qualitatively was is the Loup reach that's coming in trending similar to how the Genoa gage had trended. What we see again are the blue diamonds showing the long-term Loup measurements, the gage measurements, versus the solid purple line -- again, we are on Slide 106 -- showing the model results. We had a stable trend for the measured gage data, and we had a stable trend for the model results for that stretch of the Loup River that was coming in.

Similarly at the Platte, the Platte at Duncan showed a fairly neutral trend, a stable trend. Our model results showed a slight decrease within the first three years of our long-term trend. And then it seemed to level off with possibly a slight degradational trend. So although we didn't have a perfect match, it was a reasonable match that we felt comfortable moving forward on.

Okay. You can see as I go through these, not in every instance did we hit each of validation metrics that we were using or the qualitative analysis metrics we were using, but in Genoa they all seemed to correlate.

Here's a graphic showing the Genoa bend sediment gradation versus some of the measurements that were taken. Although we were slightly -- what the model resulted was slightly coarser, it was still within the same log scale of the measurements that had been taken.

The Duncan gage as compared to the Duncan reach in the model, it fell right in the middle of the measurements that were taken as well as the long-term USGS measurements.

I'm moving on now to Slide 110. This is a graphic representing the Genoa gage, the suspended measurements that had been taken by the USGS versus the capacity and rate measurements that were simulated. And we are slightly below the long-term trend that we had used for our initial results, but, again, the model is showing that the transport rate and the transport capacity are very nearly clustered, which is consistent with some of the previous findings that we had.

So this is the Genoa gage itself, 30 miles upstream, comparing it to what the model simulated on the Loup reach.

JEFF RUNGE: This would be a good stopping point here. I mean, this is an example. Since we are looking at a log scale, these are pretty big differences, in my opinion, as to you've got a capacity but then your ability to transport is less than that. And, you know, across -- you know, across quite a range of discharges, there's certain instances where your transport falls below capacity.

PAT ENGELBERT: Yes, that is true. And then we have -- there are instances where the transport falls above itself capacity.

So one of the -- one of the slides I will show later is how at certain points in time we see aggradation and at certain points in time we see degradation. And remember these are points at every single time step along the way, so even within a given day you will see some balancing up and down.

JEFF RUNGE: But based on the previous assumption though when looking at the sediment yield, there's a multiple of sediments applied compared to what can be transported based on the Missouri River Basin Commission results. And with that, I mean, would that ever be a case that since there's a conclusion made that it was not supply limited that there would never be a case that your transport would be less than capacity?

PAT ENGELBERT: I certainly think there are instances of that, and you will see when we show the slide. There are periods of aggradation, but there are periods of degradation. Again, I think it's important to evaluate the long-term trend, what does the long-term trend show us.

JEFF RUNGE: Okay.

PAT ENGELBERT: Clearly there are days when it's degraded, which would suggest that the rate is higher -- I'm sorry, lower than the capacity. And clearly there are days where it's aggrading, which would suggest that the rate is -- well, the opposite of what I said before. But the long-term trend is what we are -- again, what we are evaluating.

JEFF RUNGE: Okay.

GEORGE WALDOW: George Waldow, HDR. Is not that totally consistent with the dynamic equilibrium concept that we have carried forward through all of these discussions? Is that a way to summarize it?

PAT ENGELBERT: Yeah, good point, George. In a braided integrated system, as we have said repeatedly, you will see periods of aggradation and periods of degradation over this long-term -- over the long-term.

JEFF RUNGE: Okay. But I guess in conclusion though, even in a system that is not supply limited, you would still have difference in transport capacities and actual sediment transport, you will have fluctuations from degradation to aggradation.

PAT ENGELBERT: Yes. Looking at each separate time step.

Any questions on that? Paul, do you have anything, or anybody?

PAUL MAKOWSKI: I'm good. Thank you.

PAT ENGELBERT: Okay. Moving on to Slide 111. This is a similar graphic showing this is the Duncan gage compared to the Platte River reach that's coming into Site 3. Again, a consistent trend showing a clustering around the rates and the capacities and similar to the suspended measurements that had been taken at the USGS gage.

So we felt we had reasonable agreement with the trends that had been evaluated, the rates and capacities that had been evaluated, and the gradations that had been evaluated on the incoming sediment coming into Site 3, so we moved into -- now we are down into the Site 3 location. This is Study Site 3, and we are down on Slide 112. Again, we didn't have any hard data here, so this is, again, where we get into more of the qualitative analysis.

The first thing that we looked at is in evaluating the long-term trend, we put this -- the vertical light blue line represents the date in which the peak discharge occurred in that given year because we wanted to see if the model was responding accordingly. For example, if you look at 1991 during a high flow event, you saw a dip -- you saw some channel response at a higher flow event and then a recovery. We see very similar situations occurring as you look down the system. It wasn't perfect. It didn't happen every time. But in quite a few of the instances, we saw that channel response, which again told us qualitatively that the model is responding accordingly.

What we see here again is a slight degradational trend occurring between 1990 and 1994, and then kind of a stabilizing or a leveling off of the system from '93/'94 out through 2005.

Okay. Here is a snapshot in time, Jeff, a little bit of what I was describing. We are now on Slide 113. This top line is -- we just chose a date in August of 1993. So for a date in August of 1993, that is the mean -- effective mean invert elevation within Site 3, so between 1993 and 1998, the red line, it had aggraded from what it had been in 1993. Now, that doesn't mean that it was a gradual aggradation. It might have bounced up and down a couple of times, but for that date in August and between 1993 and 1998 we saw it aggrade.

The next line -- the next date that we evaluated was 2003, and we saw that it degraded. So it aggraded and then it degraded. And then between 2003 and 2010, it was fairly stable, kind of slightly aggradational on the downstream end of the study site and sightly degradational at the upstream end of the study site.

All we wanted to represent here was just the variability of what's occurring within the study site, that there are periods of aggradation and periods of degradation, but when evaluating a long-term trend, we were seeing periods of long-term stability.

The next qualitative metric that we used was to look at the mean channel invert elevation, the change between the survey dates that were done in 2010, how did the model predict that.

Each of these lines represent the date in which the survey was obtained in 2010, and the purple line is the mean channel invert elevation of Site 3.

And if you recall from the second initial study report, we saw slight decreases in the flow area between each successive survey date, which would suggest that there was some aggradation occurring, but it was very minor, 2 to 3 percent change in flow area, which would suggest a minor aggradational trend within that time period.

The model within Site 3, and it's very difficult to see with the naked eye, but there is a very slight aggradational trend that occurred between May 1st and I believe the middle of August at Site 3, and, again, a very slight aggradational trend that occurred between the second survey and the third survey. Again, from a qualitative perspective, it appears that the model is responding accordingly.

Here again is the bed sediment gradations that have occurred, what was measured versus what was modeled. And we have a slightly coarser gradation in the model by a couple of tenths of a foot. You know, if you were to pick it up in your hands, I don't know that you could visually tell the difference in the gradations, but we felt that was a good accurate representation of what was occurring.

Here we are at ungaged Site 3. This is the modeled sediment transport rate as well as capacity. Again, we see really consistent clustering that is occurring. Although you do see some -- as you would expect, some variability. At 1,000 CFS, it ranges from 500 or 600 tons per day up to 5,000 or 6,000 tons per day. Again, it's iterating depending on the hydraulics -- the hydraulics and the bed gradations at that point in the model.

Moving on to Slide 117, kind of a summary of what we saw within Site 3 based on the model results is that the long-term trend within Site 3 seemed consistent with the channel's responses to high flows. The model versus the survey trend was consistent. The model versus the 2010 measured gradations were consistent. And the model versus the computed sediment transport capacity was transporting its capacity -- or transporting at its capacity.

Okay. So we have kind of looked at the boundary conditions, what was in the Loup and the Platte, and that seemed reasonable. We have now looked at Site 3, and those trends seem reasonable, so -- but before I go on to Site 4, are there any questions in some of the qualitative assessments that we have made in this model so far?

Any questions?

Moving into Site 4, Slide 118, we again evaluated kind of the mean peak annual flow and did we see any channel response on the long-term trend, and we did see some minor responses, not as significant as what we had seen in Site 3. We did have a slight aggradational trend from 1990 to '98, although we are talking a couple tenths of a foot, and then kind of a leveling off or even slightly degradational from that point. But over the long-term, it seemed to bounce between three-tenths of a foot or so over the 15-year simulation.

Looking at Site 4 between the measure dates, on to Slide 119, what had been measured in the field again at Site 4 was a slight aggradational trend. There was a minor difference in the flow areas that were computed, 3 and 4 percent. What the model predicted was a slight degradational occurrence, so we weren't dead on on that particular metric. However, the difference being within a tenth of a foot, again, we didn't hit it perfectly but there was a relatively small aggradational trend that was measured, we showed a pretty small degradational trend that was measured. Not perfect, but sure seemed reasonable given just the nature of the model itself.

Looking at the bed --

COURT REPORTER: Go ahead.

PAT ENGELBERT: The reporter was shaking her hand out. I was giving her a break. Imagine how my jaw feels.

But the measure -- again, the measure in the model seemed fairly close at Site 4, and that is Figure 534 in the report. That was a reminder for me to put that figure in there. I probably should have taken that out.

Here we are at the capacity versus rate that the model had. In comparing it to the sediment discharge rate curve that we developed for the initial studies, again we see good clustering between rate and capacity, which, again, suggests that the river is transporting sediment at its capacity, and it is clustered around the sediment discharge rating curve that we had developed for the initial part of the study, the ISR and the SISR.

So in summary on Site 4, the long-term trend and channel response to high flow seemed reasonable. The model versus survey trend wasn't perfect, although we didn't see, you know, relatively major swings either way. Had reasonable approximation of what was modeled versus the measured bed material gradations. And then the model versus computer sediment transport capacity, it seems to be conveying it at its capacity.

The next thing we evaluated was having a pretty good feel that the model is reasonable, it's stable, we evaluated the current operations versus the run-of-river for a wet year, a dry year, and a normal year using the model. You recall in our hand calculations we showed that we were transporting less sediment under the run-of-river scenario than we were under the current operations for all conditions. At Site 4, the model was showing slightly less sediment being transported for the run-of-river operation for about a six-month period, but then the curves reverse little bit. The lighter shade on Slide 123 is run-of-river, and the darker shade is current operations. It seemed to switch. There was less sediment being transported under run-of-river for a time and then there was more sediment transported under a normal hydrologic classification later in the simulation. So kind of different than the results than we had seen during the computations that were performed in the second initial study report.

However, looking at a dry year, we saw a similar relationship between run-of-river and current ops that we saw on the second initial study result -- study report results in that we were transporting less sediment under run-of-river operations than we were under current ops on Site 4.

However that relationship reverses again when we are evaluating a wet year. The model results show that under current operations we are transporting less sediment under current operations than we would be under a run-of-river scenario. So kind of a mixed bag when comparing the model results to what we had computed in the second initial study report.

Any questions on any of that before we move forward? Jeff?

JEFF RUNGE: For all of these sites, does that look at the elevations or like the aggregate average elevation of all of the cross-sections?

PAT ENGELBERT: It looks at the average elevation of the cross sections within the study site.

JEFF RUNGE: Within the study site. Okay.

PAT ENGELBERT: For example, I believe at Sites 3 and 4 we have four of the original surveyed cross-sections within the study site, again, due to the spacing limitations and things like that. So we averaged all four of those.

JEFF RUNGE: Okay.

PAT ENGELBERT: So kind of in summary, when we are looking at current ops and the run-of-river trend as well, the transport rate was, you know, very near capacity at all cases within

Site 4. Within a normal year, we saw no change in the sediment transport. It was slightly higher and then slightly lower as we move through the year.

A dry year we had a decrease in transport for the run-of-river condition as compared to the current operations. However, that relationship flipped when we looked at the wet year. And just recall, again, that the second initial study report results showed that we were transporting less sediment under all cases under the run-of-river scenario. So when comparing the results, it's a little bit of a mixed bag.

I'm going to go ahead and move on to Site 5 where we performed a similar qualitative analysis. Here we are at ungaged Site 5. Again, we wanted to evaluate how the channel was responding to those higher flows. Again, during those -- just looking at the peak annual discharges, we didn't look at all of the big events, but there seemed to be a little bit of a dip during those higher flows, which would suggest that the model is performing reasonably.

However, we do see kind of a slightly degradational trend within the first six or seven years and then a slightly aggradational trend near the end. So probably in general we were showing a slightly degradational trend, which is consistent with what we saw at the North Bend gage itself, a slightly degradational trend.

Here again is another graphic showing the variability at certain point in time how we see the model aggrade or degrade. The red line is 1998, and the dark blue line is 1993. So between -- for this date in 2003 we selected, we saw kind of a degradational trend between '98 and '93.

And I apologize. This is on Slide 128. So comparing '93 to '98, we saw a degradational trend, between '98 and 2003 a slight aggradation trend, but between 2003 and 2010, an aggradation trend, just showing the variability of the model through the simulation.

Here we look at the survey dates as compared to the model results, and I'm on Slide 129. The survey showed that there was, again, a very slight aggradation trend, 2 or 3 percent in the flow area. Here the model results depicts something very similar, a slight aggradational trend.

Finally we are looking at the bed gradations of Model Site 5 versus what was measured, and we have very consistent gradation, so the model seemed to be performing reasonably.

Finally the sediment being transported, the rate versus the capacity, it's all very clustered around the Yang's Unit Stream Power curve that we had developed for the initial and second initial study reports.

So in summary at Site 5 the long-term trend and the channel response to high flows was reasonable. The model versus the survey trend is very similar to what was surveyed. The gradations appear reasonable. And then the model versus computed sediment transport capacity were all very clustered around each other. So for the long-term, we saw it was transporting at its capacity.

Here we are at Site 5 evaluating the current operations versus the run-of-river scenario for a wet year, a dry year, and a normal year. This graphic on Slide 133 shows that we did have a slightly less sediment being transported under the run-of-river scenario than we did for current operations, and this is for a normal year.

Similarly for a dry year we saw slightly less sediment being transported under a run-of-river condition than under current operations.

And finally for a wet year, again, we saw slightly less sediment being transported under the run-of-river condition than we did under the current operations, which is consistent with our results from the second initial study report.

So in this instance, the model seemed to replicate the results that we showed from the computations in the second initial study report.

So in summary of Site 5 when comparing run-of-river versus current ops, the transport rate, the river is transporting at capacity in all cases, wet, dry, and normal. The normal dry and wet year, there's a decrease in transport during a run-of-river condition than under the current operational condition, and that compares favorably with the analysis that we did during the second initial study report.

So what conclusions could we draw from the model results. In all cases the reaches appear to be stable, which is consistent with the prior findings, that it's in a state of dynamic equilibrium, we showed trends of degradation, we showed trends of aggradation, but over the long term it's stable, consistent with what you could see in a braided system.

The model sediment transport rate matched the previous sediment transport line, calculated for the second initial study report.

And then the transport, it is conveying at capacity in all cases, so, again, consistent with the previous findings, we find it to be a not supply limited system, which is consistent with the regime analysis performed showing it's a braided system, it's a fundamental characteristic of a braided system.

Moving on to Slide 138, to give you an appreciation for the difficulty of performing sediment transport calculations using RAS, there was a lot of dark days, a lot of periods of instability. At times, weren't sure if we were going to get the model to stabilize. Some of the things that we found in running the model that we would like to caution anybody who is going to pick up the model and make different operating scenarios is that you have to take great care when you are making these simulations. You need to be very consistent as to what computer you are modifying the flow input files, the start and stop dates.

What was very, very interesting, if we made a simulation using a 32 -- a computer that had a 32 bit processor versus a computer that had a

64 bit processor, we would get different results. Not sure why, but we would get different results. Also, when you modified a plan, a plan file within HEC-RAS, which that tells the model which geometry should I use, which flow file should I use, which sediment file should I use, when you make modifications using different computers, even though when you look at the input files and they are exactly the same you would get different results.

Lastly, if you -- and as we were trying to evaluate why this is occurring, we would run a model that had the same start date, but we would modify the end date -- 20 years later we would modify the end date. Early on in the simulation in Year 1 we would get different results. We would modify it by one day. And this is just ending the simulation.

So we would start it in 1987 and we would change the end simulation date to 2006, we would get different results back in 1987. We just modified the end date. Not quite sure why that occurred. So we were very, very careful to make sure we did all of our modifications on Canseco to make sure that we had consistent results through the process.

We are in the process of developing a -- kind of a memo that we are going to send to the folks at HEC. They don't typically provide technical support. It is public domain software, but we just want to see if anyone else has encountered these problems in running the sediment transport models.

So a little bit of sympathy along the way. But just to caution folks, when you are running these, be very, very careful when you are making adjustments within the input files.

That's all I had on the sediment transport model, the development, the results, comparisons to the prior studies. If anybody has any questions, I would be happy to field those now. And also remember Wednesday, the 14th, we are going to probably -- we are going to dig into a little more detail if you are interested.

JEFF RUNGE: I'm trying to integrate all of the different aspects of the study here. Based on the -- just using North Bend as an example here, North Bend based on the Missouri River Basin Commission study identified that there would be like 5,770,000 tons of sediment that would be transported from these different tributaries like the North Loup, the South Loup at North Bend. But when looking at sediment transport at Site 4, there's only, on average annual basis, 2,970,000 tons of sediment that's transported by the flow to North Bend from Site 4 on an average annual basis.

Is there an extension to this modeling, to the HEC-RAS model, or any other models in place that would explain the difference that would explain for these other mechanisms that would allow for the sediment to come from these different subbasins to North Bend, to explain that difference on an average annual basis?

PAT ENGELBERT: So you are talking the supply that comes off of the basin in the form of erosion and those types of things?

JEFF RUNGE: Exactly.

PAT ENGELBERT: I am not aware of a model that would evaluate rainfall runoff concentrations coming off the basin and then performing sediment transport within the system. Gary, I don't know. George? I'm not aware of any model.

GARY LEWIS: If you write it, I would like to have it. Yeah, I've not encountered that.

PAT ENGELBERT: I'm not aware.

JEFF RUNGE: Well, the Missouri River Basin Commission is not a model but an assessment that can come up with that number, can develop that number, but the mechanisms aren't really explained as to how that gets transported to or from outside.

PAT ENGELBERT: My understanding of the commission report is they evaluate it based on ground cover and average annual rainfall. This is the amount on average, the average annual supply of sediment. And then what we were able to evaluate is what is the capacity of the system to convoy that sediment.

Any other questions?

I think we might be just in time for lunch.

STEPHANIE WHITE: We are ten minutes early. So lunch will be delivered at 12:00. You will have a few minutes to yourself. Lunch will be served, and we will reconvene at 1:00.

(11:51 a.m. - Recess taken.)

(At 1:00 p.m., the following proceedings were had, to-wit:)

STEPHANIE WHITE: Okay. We have Isis Johnson and Janet Hutzel from FERC. Those are our only phone participants. So far we expect Paul in a little bit, and Marcus won't be with us this afternoon. So, Matt, I'm going to turn it over to you.

MATT PILLARD: Okay. I'm going to try to do this without the microphone. Can everyone hear me okay?

This afternoon we are going to start the last part of our discussion here today on a species summary of the interior least tern and piping plovers.

At our last meeting, the second initial study results meeting, there was a discussion kind of near the end of that meeting talking about how can we pull kind of the information from all of the studies together, look at that in a way that focuses then on the impact to the species or focusing on issues that might deal with the species, and so what we tried to do then is to take the results from the sedimentation study, the results from the hydrocycling study, the results from the flow depletion to flow diversion studies, those separate studies, and then look at them and then how combined, you know, how do these affect habitat and how do these affect species and what can we learn by looking at kind of all of these things in culmination.

The other thing that we did in the species summary was some pretty simply I'll call it re-discussion I guess of areas of interest or statistics relative to the species themselves. So I will kind of go through these. It's not going to be new information. It's just getting our mind frame set again to the species that we were focusing on.

You know, obviously the interior least terns was one of the species we wanted to look at the culmination of the studies on. They winter in South America. They arrive in Nebraska in early May to mid June. They spend about four to five months here. Their breeding range extends from Montana to Texas and from Southern Indiana to New Mexico.

Lott did a census back in 2006 that looked at what are the distribution of those least terns. You can kind of see there they range -- they are pretty heavy there, over half on the lower Missouri River system. The Arkansas River system carries about 11 and a half percent. The Red River, 10.4 percent. Missouri River system around 7 percent, and the Platte River system about 4.5 percent. Again, that was in 2006.

Just a little background information then on the piping plover. They winter in the southern Atlantic coast in the U.S. They also winter in the Gulf of Mexico coast, in the Unites States and Mexico, and the Caribbean islands. Again, similar to the least tern, they arrive in late April and early May, and they spend about three to four months here in Nebraska at the breeding sites.

Their breeding range includes northern Great Plains from Alberta to Manitoba and south here to Nebraska, the Great Lakes beach areas, the Atlantic coastal beaches from Newfoundland to North Carolina.

The most recent information we have on the general population for the piping plovers came from the breeding census of 2006, and over half of these were found in the United States and northern Canada -- and Canada Northern Great Plains regions and the Prairie Canadian regions.

Kind of focusing on the habitat here in Nebraska then, because that's really what we are interested in from the project perspective, you know, what do the least terns, piping plovers, what do they use for habitat here in Nebraska.

They nest on barren sandbar and gravel shores and islands of rivers and lakes. The size and the heights of sandbars, there's probably a lot of discussion on these. I pulled a few -- some of the information from the species summary as well as the PAD on these species. Size of islands for terns, it can vary, but 3.58 acres was what was found by the Kirsch study in 1996 as a general size and about 3 feet above the water is what they were finding on average, I believe, for those. And I'm sure, Mary and Joel, you probably know these backwards and forwards. I'm simplifying some things here, so if I misstate an average versus an actual number, let me know, but it kind of gives us an idea of the size of habitat that we are talking about that they found them on.

And then here, obviously, Brown and Jorgensen, their 2008 study, a little bit larger size on average they found in that particular year, and the height they were finding was about 2.29 feet above the water level. I don't know if we can trust that data or not.

But the piping plover information, we were finding, you know, 3.89 acres in size for our first sandbar and about .6 feet above water level. I think the Ziewitz study found that through the different studies that -- information that he was using that a good size for piping plovers would be about 3.58 acres size and about 1.48 feet above water level.

So you can kind of see that the two species vary a little bit on size and height above water level.

I don't know -- you know, I suppose this number is currently being worked on as we learn more about the birds. This isn't an end-all-be-all for what they like, but the most recent information that we have and what's been studied.

We also know that at least here in Nebraska sandpits are highly used habitat. We know that those are areas they've been using, including the District's North Sand Management Area. They have been monitoring that more regularly now since 2009, I believe, to monitor those birds on that particular parcel.

Kind of summarizing some of the threats that exist here in Nebraska as well as, you know, nationally, I guess, to tern and plovers. This is back from a five-year review information that was issued on least terns from the Service. This first one is little dated, but I think that the threats are still prevalent.

Habitat alteration and destruction was listed as a main threat. Human disturbance was listed as another threat to the species' existence, specifically due to recreational and commercial development activity in their habitat areas.

Piping plover, information again from the five-year review. This is from 2009. Destruction of the wintering habitat due to human development. Reservoirs, channelization, and flow modifications were a concern, predation, human disturbance again, and vegetation encroachment, you know, losing those sandbars and those areas to vegetation versus the barren nature that the birds like.

Kind of to summarize, review of agency concerns as we began the scoping process for this project and developing the studies way back a couple years ago when we started the process, kind of summarize a few of the issues here relative to terns and plovers.

You know, habitat may decrease in

suitability due to material changes in the Loup and the lower Platte River sediment transport regime. That was one of the issues that was brought up early on in the study as a concern. Habitat diversity, connectivity, and suitability may diminish in the lower Platte River due to erosion of sandbars by project hydrocycling operations. Project hydrocycling operations may cause an inundation of interior least tern and piping plover nests on the lower Platte River. And the last one, habitat connectivity and suitability may be diminished in the Loup River bypass reach due to the diversion of flows.

I believe these agency concerns also grouped in pallid sturgeon as well, but the last one probably being more specific to the pallid sturgeon than the interior least tern or piping plover.

So that was kind of a quick summary of some of the concerns. I'm going to, again, kind of summarize the study results here and then pull that together on how to -- how we group that with the species themselves. So this is just a little summary of each of the studies.

The sedimentation study, one of the results was that the Loup River bypass reach and the lower Platte River are not supply limited. That we are in a state of -- well seated in a state of dynamic equilibrium. These systems aren't aggrading or degrading on a long-term trend basis. That these rivers exhibit a braided morphology and they are well within that regime of a braided river system. And based on the statistics work that we did, the first -- you know, for both studies, the updated study plan as well as the initial, that we couldn't find a statistical relationship between the nest count variability and river mile location. And, again, that was on the statistics that we had just performed.

From a hydrocycling perspective, from that study, the summary of those result were that project hydrocycling operations result in higher flows and stage on a daily basis than a run-of-river scenario. We found that natural seasonal variability is equal to or greater than those hydrocycling effects. That was that benchmark kind of studies that we were looking at before that we went over last February.

The differences in flow and stage between current operations and run-of-river operations diminished with increased flow. The existence of the benchmark flows are a result of natural high flow events, those big events during whatever time of year that would cause those, normally spring and late summer. All benchmark exceedances under current operations were due to high flow events that also caused benchmark exceedance on run-of-river scenarios.

Hydrocycling operations results in slightly more sediment transport than run-of-river operations. However, as we kind of discussed and revalidated, that the system is transporting at capacity, and degradation on a long-term basis is not occurring.

The flow depletion and flow diversion study. This looked at flow depletions on the Platte River as well as potential flow depletions on the Loup River.

From the Platte River perspective, we identified that based on project operations there are no depletions occurring on the Platte River. On the Loup River, in comparing those two systems -- I'm sorry, the Loup River, comparing the differences between above the diversion and below the diversion that there is a difference in the physical characteristics of the channel above and below the Diversion Weir.

And in trying to analyze the bird information, the nest counts or other, above and below the Diversion Weir, there wasn't enough bird data to really ascertain the differences in these physical -- in the differences of physical characteristics and the impact by the use of the terns or the plovers.

So that was kind of a brief summary of the studies and a little bit of a summary on the species themselves. So kind of the collective analysis then. As we look at, you know, how do these different studies affect the elements of the species. We broke that down into how does this maybe affect sandbar formation. We know the birds use the sandbars in the river. How do these studies affect sandbar formation and kind of reiterating that we -- you know, we have identified through our studies that the system is not supply limited and that sediment removal from the canal would not limit then the supply for potential sandbar creation, and that sediment removal from the system would not create a sediment deficit that would potentially erode those sandbars at a faster rate. Again, this is over the long-term.

And then we know that the system is in a state of dynamic equilibrium indicating the channel morphology, that we are in a braided channel, that exist under the current operations and has shown to provide tern and plover habitat. The birds are using the system as it is today.

And as a result of not being a supply-limited system and if the system is seated in a braided river system, the effects of hydrocycling was not shown to affect sediment supply available for sandbar creation.

We also then kind of looked at how this might affect suitable habitat availability. We know that nest distribution -- in looking at the statistical analysis that we did, that the nest distribution variability was not related to the proximity to the tailrace return or by river mile, that that variability and nest distribution was not related by location, so it would appear that the tailrace itself or the proximity to the tailrace was not a factor for nest site selection.

We looked at -- one of the statistical things that we also looked at identified that that period of relatively high counts, from '87 to '95, was followed by a drop, but a static count again from '95 to 2008, between those 30 river miles that we looked at. I think we had a little bit of discussion before. Project operations have remained during that time period. There was a factor or a series of factors that might have caused that drop, but the operations of the project were consistent during that time period.

Kind of more from a hydrocycling perspective, kind of looking at that study and what it means. We do know that daily fluctuations in stage due to hydrocycling affect that wetted fringe of a sandbar that serves as habitat. This effect is greatest when upstream Platte River flows are the lowest. This effect also is expected to diminish as you move downstream. However, kind of stating back again, we didn't find that correlation between location of the tailrace to nest count variability.

We know that there are many factors that probably account for a bird determining suitable habitat on a year-to-year basis, like flows, predation, that wetted fringe difference is probably a factor in that as well, nesting disturbance due to recreation or other means. Many factors, you know, go into determining suitable habitat.

Kind of when analyzing the Loup River physical characteristics, there are differences in channel widths above and below the Diversion Weir. It was wider channel above, narrower channel below. That project operational changes are limited with respect to altering those physical parameters.

You know, a change in operations may or may not affect how that river channel looks below the weir.

There hasn't been any morphological changes in the Loup River system over the last 25 years. And based on the existing conditions that are there, no change in morphology is expected if conditions remain the same.

That's how we summarized, I guess, looking at all of the different studies combined. I'm sure there's some questions that we have on how we did that or questions on how we came to some of those conclusions.

JOEL JORGENSEN: I guess I have some questions or comments regarding, particularly -- Joel Jorgensen, by the way -- Slide 153, sort of when you are concluding things here.

You are discussing suitable habitat availability is the top point there, and you are using the analysis using the tern and plover data, the nest count information, which was -- I mean, that analysis was an exploratory analysis, and you didn't find any significant relationships, which is not a surprise given all of the variability and all of the issues and that noise that goes along with that data. So I guess, you know, there wasn't any significant relationship that was detected, I guess, and that's sort of where that should have been left.

MATT PILLARD: Okay.

JOEL JORGENSEN: Because that doesn't that -- I think there's just a very high probability for an error with that analysis, and then trying to make the next step and make a definitive conclusion that proximity to the tailrace is not a factor I think is over- -- overemphasizing the results from that analysis.

MATT PILLARD: Okay.

JOEL JORGENSEN: And then also too, I guess with that statement the way it's written on there, you have nest site selection specifically mentioned, and when you are talking about nest site selection, that -- I mean, from an ecological definition and from a methodological standpoint, if you are talking about site selection, you are talking -- I mean, that implies that there was some assessment of the habitat availability in the system at the time when you were assessing how birds were selecting a site. And from this analysis, there was no consideration of habitat during those specific times when birds were making selections about where they were going to put down nests.

MATT PILLARD: This was just count data.

JOEL JORGENSEN: Right. And, again, there's -- you are making a leap there.

MATT PILLARD: Okay.

JOEL JORGENSEN: And since habitat wasn't part of the equation and was not considered, again, I think it's a tenuous statement to say that definitively.

And, again, with the second point here, I pointed this out earlier.

MATT PILLARD: Yeah.

JOEL JORGENSEN: The -- having these two sentences or statements right next to each other sort of implies that because you have a constant -- because operations were constant, I don't know what -- I mean, is that implying something there about -- you know, that project operations aren't having an effect? It's sort of implied, I guess, the way it's presented here, but it's really probably not an appropriate relationship to state because, again, it could -- that relationship there -- I mean, that statement could have been strengthened if you would have shown from a different stretch of the river nest counts remained relatively constant, if there was some sort of a control to compare that to.

MATT PILLARD: Okay.

JOEL JORGENSEN: Again, I'm concerned how that is presented in that slide.

So that will conclude my remarks. Thank you, Matt.

MATT PILLARD: Thanks, Joel.

ISIS JOHNSON: I have a couple of questions, Matt.

MATT PILLARD: Go ahead.

ISIS JOHNSON: Okay. I guess my first question was looking at Slide 151, you know, when we are talking about removal of sediment from the canal and that it doesn't create a supply limited system. I guess one of my questions would be whether there was any discussion in any of your results and your conclusions about how -- even though you have shown throughout your studies that we are at a state of equilibrium, if you discussed at all how that equilibrium might be different if the sediments hadn't been removed, for example.

MATT PILLARD: Let me try to restate the question. How might the equilibrium be different if the sediment weren't removed?

ISIS JOHNSON: Right. I think -- or at least some of my thinking is that, you know, I don't think anyone is contesting that it's a state of equilibrium, but it may be at a different state than it would be without the hydrocycling and without removal of sediment. So I guess from my perspective and in looking at project effects, we would want to look at how current operations have essentially changed the system now but also how they are going to potentially change in the future.

MATT PILLARD: Okay. I think the best way to address that might lean on Gary or Pat. I think some of the analysis that we looked at relative to how it's seated in the braided river system might be the best way to answer that. Pat or Gary, I might defer to you to expand on that.

PAT ENGELBERT: Isis, it sounded like there were two questions in there. Can you separate those for me?

ISIS JOHNSON: I can do my best.

Essentially I guess the first question that sort of popped into my mind is that we keep talking about the fact that, you know, the river is behaving like a braided system and it's in a state of equilibrium. I guess my question is -- I guess maybe I will start here. If the sediment, for example, wasn't being removed -- I mean, I think it's obvious. You can look at any Google Earth map and sort of see that conditions in the way that the sandbars are being developed and being formed is different, you know, above, you know, the project diversion and below and that even though the system within -- I guess that's being affected primarily by project operation is in a state of equilibrium, it looks considerably different from the system both above and below the project location.

So I guess my question is that in your conclusion or in your discussion if there's any -- if there's any discussion of how that state of equilibrium may be different from what's happening both above and below it and whether that's either beneficial to, detrimental to, or has no effect on the presence of piping plovers or least terns. Does that make sense?

PAT ENGELBERT: I can address the first part relating to the removal of sediment from the system, how would that have impact or effect on the dynamic equilibrium.

The capacity of the system downstream of the weir is based on the current condition of the channel. And we have shown that after the sediment is removed, the channel and its capacity is -- has a value of X, and that does exceed the supply when taking into consideration that that supply has been removed.

We made a statement at the previous -- the second initial study report that the channel downstream of the weir would look very similar to the channel upstream of the weir, you know, given the fact that they -- if they were to divert for some significant period of time. So I think our statement was that it has reached a state of equilibrium based on the current operations of the system.

LISA RICHARDSON: I have a question I want to clarify because I heard a little different question than you answered, Pat.

Pat, I think you were referring to the Loup River, right?

PAT ENGELBERT: The bypass, yes.

LISA RICHARDSON: Yes, the bypass region. Isis, I thought you were asking about the Platte River.

ISIS JOHNSON: Right.

LISA RICHARDSON: And you are suggesting that there's differences in the Platte River upstream of the return weir?

ISIS JOHNSON: Right.

PAT ENGELBERT: Okay. I misunderstood. Again, what our analysis has shown, and if you look at the survey data as well as the modeling results, the hydraulics associated with Site 3 do differ from the hydraulics associated with Site 4, and it appears that the channel has adjusted itself to the point of its carrying capacity downstream of the weir matches the amount of sediment that's coming in. The survey results that we showed didn't show any degradational trends, the modeling that we did didn't show any degradational trend -- long-term degradational trend. So in our view it appears to have adjusted.

Now, how it would respond without the elimination of that -- of that sediment, we didn't evaluate that per se, but I would -- I would estimate the fact that the supply -- and, again, it's two different analyses of how the supply is calculated versus the capacity. The supply still far exceeds its capacity to convey even with the dredged amount being pulled out of the system.

Now, how does that affect birds and habitat, I don't have an answer to that question.

ISIS JOHNSON: Okay. I guess from my standpoint, again, I mean, I guess I was just sort of wondering whether this -- if this was something that you guys had considered in your -- not necessarily when collecting data but in terms how you get to your conclusions or how -- you know, the way that you sort of worked your way through your discussion of the results of these studies because what I'm going to have to do is look at different scenarios to see what type of effects are happening to the bird habitat and also how those impacts can potentially be mitigated.

So I guess for me -- it would be helpful if there was some discussion of -- you know, even though the Platte above the diversion return is -- or before the tailrace return, I'm sorry, is in a state of equilibrium and isn't supply limited that there are definite differences between that part of the river and what's happening below. And so, I mean, there's a lot -- I know that there's a lot of factors involved in that, but in sort of making definitive conclusions, you sort of need to have discussions of all of these sort of potentially different alternatives because that's what we are going to be basing our analysis on. Does that make sense?

MATT PILLARD: George?

GEORGE WALDOW: George Waldow.

I'm not sure what you mean by all of these alternatives, and I'm also hearing the term equilibrium used without dynamic. I think that needs to be clarified. It's in general equilibrium. It doesn't mean that it doesn't vary.

ISIS JOHNSON: Sure.

MATT PILLARD: I guess from the alternatives perspective, I think what you are asking, Isis, is part of the conclusions of these -- in using these studies, can we use these to look at alternatives such as -- I will just say a no bypass scenario where none of the water is in the canal and it's all going down the river and how might that change the bypass reach, the portion of the Platte River that's between the Loup confluence and the tailrace return, and below the tailrace return, how might that change or affect habitat, and is that better or worse for the species from a habitat perspective? Is that kind of what you are thinking?

ISIS JOHNSON: Right. That's part of it. I guess what I'm saying is that in making conclusions and sort of saying that there is an effect or there is not an effect, you kind of have to qualify it and say, Well, under these conditions, you know, we don't think that there's an effect. Or the effect, you know, based on run-of-river operations, which we have talked a lot about today, is different from impacts based on hydrocycling. And so I just want to make sure that there is some discussion of that when we get to the end of all of this because that's the information that I'm going to need to use when doing my analysis. Does that clarify?

MATT PILLARD: Yes.

GEORGE WALDOW: We have a very pregnant silence going on here. I will speak up, but it's still unclear to me, Isis. And maybe it's the way it's written or presented that we are not being -- communicating, but my interpretation here is that the -- given the information on sediment transport and on hydrocycling that we have discussed earlier in the meeting, these conclusions that Matt presented and summarized here, granted it's not in maybe the detail that you need for your analysis, but my interpretation of it is that we have done this -- done the studies, evaluated the study results with respect to the birds and their habitat and their utilization or nonutilization.

I don't see that we are able to present conclusions other than what we have said. I don't see that there's -- there's more factual -- more scenarios that we can factually bring out from the study results.

And I'm hoping if someone wants to say that maybe we are -- is there some door that we haven't opened here that we have the information to do so with with respect to the birds and their utilization?

ISIS JOHNSON: I think what I'm saying is that you are making conclusions and that you are even stating that based on the results of these studies that these are the impacts, and I guess what my question is is that seems like there's a -- and maybe there's nothing to be done about this but that there is sort of a bit of a gap between where the results end and your conclusions begin, that there could be -- I mean, again, maybe it's just the way that they are presented thus far and maybe it's just based on the information that I have read in the -- in this last report that's been filed, but it seems as though they are sort of this is the data that we have and so things are in equilibrium and so there is no effect. And I guess what I'm looking for is a little bit more detailed description of what you mean by that, that there's no impacts at all and this is why, or there are more impacts on this scenario and not on the other.

Again, if what you are saying is that we have presented all that we have and there's no -- and there's nothing else that, you know, that you have to sort of qualify your conclusionary statements, then that's what I will have to make -- do my analysis based on.

I was just sort of asking if there was more discussion on, you know, even though -- the fact that even though the system is in a state of dynamic equilibrium, if there's been any thought to the fact that it could be in a different state of dynamic equilibrium than it would be if certain things were or were not occurring.

MATT PILLARD: Rick Holland had a comment.

RICK HOLLAND: This is Rick Holland from the Game and Parks Commission.

It seems to me that from the questions you've been asking that you're looking at a different question than what the HDR analysis was aimed at. They were looking at the scenario that compare run-of-river as the base scenario given the project as a given, that its presence would be here, and then comparing it to hydrocycling and what impact that would have. Their conclusion is derived from that analysis. The question of whether or not there has been an impact by the project itself is a different question, and we were informed that that was not something FERC was considering as part of this, that the project was given; is that correct?

ISIS JOHNSON: Right. And that's not the question that I'm asking.

RICK HOLLAND: It kind of sounded like it was when you were talking about putting a scenario with no sediment restrictions on there, so I think what you've characterized sounded to me like a nonproject scenario, which we would consider, of course, but I think FERC is --

MATT PILLARD: Just a second, Isis. Can you start this last comment over? Just start now, I guess.

ISIS JOHNSON: Okay. I guess my question is that whether or not -- I mean, we keep using this term that the river system is in a state of dynamic equilibrium. I'm not talking about going back to pre-project. What I'm saying is if -- if the water is still being diverted and we are just letting the water run through there's going to be certain things that are happening, if we are hydrocycling there's going to be certain things that are happening, and if we are removing sediment there's certain things that may or may not be happening.

And so I guess my question was, which is what my original question was, is that with removal of the sediment, even though it's not creating a supply-limited system, I was wondering whether there was any discussion of what might be different if the sediment wasn't being removed. I'm not talking about taking out the project and taking out the canal and having a no diversion scenario. What I said originally was that if there was any discussion of whether or not the amount of -- I mean, I know that we are talking about, you know, the fact that there's no aggradation or degradation over the long-term, but I'm wondering if there was any discussion of how the river might be -- how the bypass reach might be different if -- or the river bed might be different if the sediment was not being removed, or less -- or, I'm sorry, a lesser amount of sediment were being removed. Even though it's not creating an aggradation or degradation, whether that was something that was discussed. That was my question.

I didn't articulate that clearly initially, but that was what I was trying to get at.

LISA RICHARDSON: Okay. I think that part of our confusion on it is that really it's not possible to operate the project without removing sediment, and you really can't remove less sediment.

NEAL SUESS: The sediment basin -- Isis, this is Neal Suess with Loup Power District. The sediment basin would fill up and you could not divert any water if you did not dredge the -- did not remove the sediment from the sediment basin. Therefore, I mean, if you didn't remove sediment, within a year or two, you would not have a project anymore. The canal -- you couldn't get water into the canal, and therefore you would be back to pre-project operation.

ISIS JOHNSON: Thank you for clarifying that because that wasn't -- that wasn't part of my understanding.

NEAL SUESS: Okay.

JEFF RUNGE: One point though I think, maybe to add on top of what Isis has said, and maybe -- maybe she wasn't implying this, but for me this is my perspective, there's a lot of discrete studies that are evaluated discretely and reported discretely, and there's no integration -- or there is some integration, but there needs to be that integration from geomorphic effects to how does that affect habitat to how does that affect the species, and then that will help to make the -- likely to adversely affect or not likely to adversely affect determination.

One example that I pointed out this morning is that one metric that was being used was effective or dominant discharge and sediment transported, but a lot of the -- and the purpose of effective and dominant discharge was to look at long-term -- a long-term effective or dominant discharge and how that affects channel morphology over the long-term, but in the -- I forgot the ordination or principal component analysis, but this was evaluated on an annual basis. And there was no comparison about, Okay, this stretch has this effective or dominant discharge, this stretch had this effective or dominant discharge, and there wasn't a comparison of species use to your metric that you use for geomorphology and that integration, that step from geomorphic to habitat to species use wasn't made. So I guess that's what I would recommend is to encourage that the integration of your studies to come up with that final determination.

MATT PILLARD: Okay. We did try to look at how river mile -- you know, we look at nest counts by river mile. Is there anything that can be explained in those nest counts variation by river mile, so that part we have tried to look at. Maybe we can build on that for what you are saying, Jeff. I'm not saying that's the end of it, but...

JEFF RUNGE: To integrate the results with the metrics that you have already developed.

RICK HOLLAND: The problem is a question of scale. We are talking about reaches that have certain length of river, which has been described hydrologically through sediment transport. It may be too large of a stretch for us to define the impact that the project is having in terms of degradation versus aggradation. It may be too short of a stretch of river that is being impacted compared to the overall equilibrium of the 10-mile or 20-mile or 30-mile stretch of river. If someone wants to pay for that kind of detailed hydrologic analysis, we can probably get there. Do you have another 5 million?

JEFF RUNGE: Well, and we recognize too that there's a lot of effects that -- that the effect determination doesn't necessarily have to be solely contained within the study analyses.

One example is the sand management pile, the north sand management area, to where we have worked with the contractors there that removed that sediment and we worked with the Loup to develop a berm so that you don't wash out nest. Well, that is a direct effect to a species that is due to -- a potential effect that is due to District operations, and that -- there's no need for an analysis, but that is a potential may-effect situation that needs to be considered.

And so look at your entire effects and

make sure that they aren't necessarily contained within -- you know, to also consider the effects not necessarily contained within the studies.

Another one you mentioned, the wetted sand area and how that changes longitudinally, there wasn't a study, but there could be potential effects from that. It's just that there's no way within a two-year study that you could quantify those effects.

JOEL JORGENSEN: Sort of echoing some the same things I said earlier. There are just some very severe limitations that we know about with the data. We can't retroactively go back over the past 25 years and look at what was in the system. But, again, with that said, I think it just needs to be -- we need to be very cautious about making conclusions because -- based on some metric such as nest counts, which if we are thinking about habitat suitability, I mean, some definitions of suitability explicitly incorporate within it, you know, a level of reproduction -- successful reproduction. And I know that would be desirable.

If there's problems with what's available, and I don't think it's faulting anybody, what they are trying to do, it's just sort of the way it was.

But I don't -- I think there's still -- just the -- the data that's available, the analysis has such limitations that I think concluding that there's no effect, I mean, is probably a precarious conclusion to make given the limitation of the science that's available, so...

MATT PILLARD: I think some of the things Jeff was talking about he started using the language that would be discussed as part of the biological assessment. That is kind of a next step that is going to be developed -- and I don't want to skip ahead to the next steps because I don't want to end this discussion yet, but Lisa will handle kind of the next steps after this and developing that preliminary license proposal is part of that next step as is developing that biological assessment that ultimately then looks at these different factors and will ultimately be a decisionmaking process of an effect determination through that biological assessment process.

JEFF RUNGE: The other thing too is -- I forgot the title. There's a title about sediment and the sturgeon. Let me find that. But when you don a biological assessment, a single effect to a single individual, so if there's a potential to wash out a single egg, if there's a potential to affect a single pallid sturgeon, that constitutes a may effect under The Endangered Species Act, and so that's the job of the biological assessment is to identify those effects to individuals and to try -- attempt to quantify what that effect is.

Now, the significance of the effect, whether or not that effect is important or not important to the species, that role is done by the Fish and Wildlife Service under a biological opinion, and there's a lot of information. You have to look at how the species is doing, you have to look at the recovery objectives of the species and whether or not this local area or regional area is supporting those objectives, you have to look at the threats to the species, and the accumulative effects to the species. And so there's really a large amount of information that we are required to evaluate when looking at the importance of those effects to the species.

So I guess, again, to keep your focus on those effects to individuals versus whether or not it's important to the species as a whole.

MATT PILLARD: Okay.

LISA RICHARDSON: I guess I would give the folks on the phone one more chance. I'm not certain if we answered all of your questions or not.

ISIS JOHNSON: I have one more question. On Slide 155 there's a statement that says, Project operational changes are limited with respect to altering physical parameters. Can you clarify what that means exactly?

MATT PILLARD: Yes, Isis.

The question is can we clarify the second bullet, Project operational changes are limited with respect to altering physical parameters. All that is simply saying is that based on the existing project operations there's little that can be done project operation-wise that could alter the physical parameters below the Diversion Weir.

ISIS JOHNSON: Okay. Thank you.

MATT PILLARD: It goes back to your sediment removal discussion. You can't decide to remove less sediment or more sediment or introduce more or less. The system operates the way the system operates.

ISIS JOHNSON: Okay. That's helpful. Thank you.

STEPHANIE WHITE: Any other questions from those of you participating on the phone today?

JANET HUTZEL: No.

STEPHANIE WHITE: We are going to move to Slide 157, which takes us to the last part of our agenda, which is next steps.

Lisa?

LISA RICHARDSON: Okay. This is really just a rehash of the next steps slide that I showed at the beginning of the presentation.

With respect to the studies, those first four bullets are really with respect to the studies. As I mentioned earlier, on September 23rd, the District will file a summary of this meeting, and then that kind of sets the time frame for agencies to provide comments both on the summary and on the studies themselves, and so those comments from agencies will be due October 24th. And that is also the time that -- the deadline for any requests for additional analysis or new studies, anything like that, that any of these requests must follow the FERC process and identify the rationale for why a study is requested and why it's requested now, is there new information available, or something to that effect.

So then on November 23rd, the District will file responses to all of the comments and questions that have been provided by agencies.

And then December 23rd, FERC will make a determination as to whether there's anything else that needs to be done study-wise or not.

In the middle of that, November 18th is when the District will be submitting a draft license application. And then April 16th of next year is when the official license application will be filed. And there is a comment period in there between the draft license application and the final application. I believe -- I may have that on my next slide.

So, yes, February 16th is when the comments would be due on the draft license application and a draft biological assessment if that is filed with the draft application. Then about the middle of February is when comments would be due, and then the District would review those and make any changes that they would see necessary for the actual license application for April 16th.

So that -- that kind of starts the Section 7 process officially when the draft EA is submitted. Our intent is to submit a draft EA with a draft license application so that the comments would be reviewed -- received by mid February and then hopefully incorporated.

I think I have one more slide.

And then beyond that, there's more steps into the process, and these kind of get into the post-filing steps. Around July 1st is when we would expect that the application would be accepted and ready for additional analysis. That's kind of -- ready for environmental analysis. That's based on an idea that the application as submitted in April will be determined to be adequate by FERC, that they don't have additional information requests that they need. It's possible that there will be something that they need and it won't be quite ready for environmental analysis, but that's kind of an approximate time frame.

Sixty days after that is when comments are due again from agencies regarding recommendations and preliminary terms and conditions or fishway prescriptions.

And then right around May of 2013 is when FERC is anticipating that they would issue their environmental assessment related to the relicensing, so taking the information that's provided in the studies and the application and developing an environmental assessment related to the relicensing of the project.

And then the official biological opinion is due 135 days after the EA is issued.

And I know that, Bob, you and some folks from the Game and Parks talked with FERC three or four weeks ago about kind of that last process and time frames of when things would be due.

Isis or Janet, anyone from FERC, do you have any comment on what I have laid out as the next steps?

JANET HUTZEL: Janet. I don't.

ISIS JOHNSON: I don't either.

LISA RICHARDSON: Any questions about next steps or comments?

RICK HOLLAND: What do you mean by the preliminary fishway prescriptions?

LISA RICHARDSON: That's a specific terminology from The Power Act, the preliminary fishway prescriptions.

RICK HOLLAND: Okay. What does it mean?

JANET HUTZEL: Do you want me to explain it?

LISA RICHARDSON: That would be good.

JANET HUTZEL: Preliminary fishway prescriptions, that is the Fish and Wildlife Service Section 18 authority to prescribe fishways. Everything is in the ILP, you have a preliminary, and then you have after the EA is filed modified conditions. So they give you preliminary one for the EA. I believe that's the fine print. After the EA is -- or EIS -- I think we are doing EA is issued, they can modify them depending on information received, but preliminary fishway prescriptions is basically Fish and Wildlife Services' ability to require fishways or structures of that nature or decide to not require them or to assert their authority to require them at a later date.

LISA RICHARDSON: Any other questions?

PAUL MAKOWSKI: This is Paul Makowski from FERC. Can I remind the -- with the draft license application that we do recommend that if there are any proposed measures that they be included in the draft license application?

LISA RICHARDSON: Right. Yes, we are aware of that.

PAUL MAKOWSKI: And throughout the

day I heard that, you know, certain people were requiring references. It would be really helpful if the references were actually submitted to the secretary so that they -- so they can be entered into the public records, so that everybody has that information available to them.

PAT ENGELBERT: The USGS measurement is --

LISA RICHARDSON: Okay. You are talking about the USGS measurements?

PAUL MAKOWSKI: Well, any information that was actually being requested. Rather than send it to one entity, to make sure that -- it could be on your project -- on the project Web site, but, you know, just so that it's available to most everyone, that would be really helpful.

LISA RICHARDSON: Okay. I understand.

PAUL MAKOWSKI: I may not even know to ask for something and then go to the project Web site and it's there.

LISA RICHARDSON: So you are not specifically asking that all of the references that are used in the studies be submitted, right?

PAUL MAKOWSKI: No, no, no, no. I'm

just saying if someone is asking for a specific reference to be available that it be, you know, put into a public record, either on the project Web site or filed with us.

LISA RICHARDSON: Okay. I think specifically Pat is going to track down that USGS reference. I think the only other thing that we talked about today is getting the statistical outputs to Mary. Those were filed with the statistical analysis information on Tuesday, so that is available. It's not on our Web site because normally the attachments are quite large, so I will e-mail those to Mary and to Joel. But FERC, you guys already have those.

PAUL MAKOWSKI: Uh-huh.

LISA RICHARDSON: Okay. If there are no more questions, I guess we will adjourn a little bit early today.

Thank you all for coming.

(1:57 p.m. - Adjournment.)

** ** ** **

C E R T I F I C A T E

STATE OF NEBRASKA)
) ss.
COUNTY OF DOUGLAS)

I, Kara D. Holland, CSR (IA), Court Reporter and General Notary Public within and for the State of Nebraska, do hereby certify that the foregoing was taken by me in shorthand and thereafter reduced to typewriting by use of Computer-Aided Transcription, and the foregoing one hundred seventy-seven (177) pages contain a full, true and correct transcription to the best of my ability;

That I am not a kin or in any way associated with any of the parties to said cause of action, or their counsel, and that I am not interested in the event thereof.

IN WITNESS WHEREOF, I hereunto affix my signature and seal this 16th day of September, 2011.

____
KARA D. HOLLAND, CSR (IA)
GENERAL NOTARY PUBLIC

My Commission Expires:

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