

Saco River Erosion Informational Meeting
Minutes
December 6, 2023

The Saco River Erosion informational meeting convened at 7:00PM in the meeting room at the North Conway Water Precinct, 104 Sawmill Lane North Conway, NH.

The following were present:

Commissioner Suzanne Nelson (Phone)	Deborah Loiselle (DES)
Commissioner James Umberger	Tom Eastman
Superintendent Jason Gagnon	Mark Hounsell
Alexis Wagoner	Andrew Smith
Bill Hounsell	Steve Angler
Karen Umberger	Nat Lucy
Nick Nelson (Inter-Fluve)	Karen Junge-Dennison
Cameron Twombly (Inter-Fluve)	Mark Dindorf
Keith Kantack (Inter-Fluve)	Andrew Junge-Dennison

Inter-Fluve Presentation

Jason Gagnon: Thank you everybody for coming. Tonight, we have an informational meeting on a big project here for the precinct, which we're calling our Saco River Erosion project. So, as you all may know, the wastewater plant is built kind of right on the banks of the Saco. If you go that way, a couple hundred feet, you'd be swimming right now in the Saco. Over the years, we have recognized that as we have these flooding events and big storms, the river continues to move back in 2012, the precinct unfortunately lost its original well two to River Movement. When we had Tropical Storm Irene, it was the final blow that kind of took out and eroded underneath the actual well building. So really what we're trying to do with this project is to be proactive, recognizing that the river is moving here just like it was up there.

This wastewater plant is probably the single most expensive public asset within 50 miles. If we had to replace this right now, I don't even want to know how many tens of millions, if not a hundred million dollars we'd be looking to replace this. So, we're trying to be very proactive about protecting it, right? We recognize that the wastewater plant not only serves the economic interests by supporting the tourism economy and everything that we have here in the Sewer shed, but it also protects our drinking water, which is why it was all constructed in the first place. So instead of leaching into the ground directly from people's septic systems, all that waste, not just from North Conway, but now Conway Village, soon to be Lower Bartlett and also Regional Septage now comes here to be treated safely before it's

discharged to recharge our aquifer again with a rapid infiltration basis, right? So, we don't have to discharge directly into the Saco, like 99% of wastewater plants do. And that's really important because the Saco is not just important ecologically, but if you've ever been out there in the summer, you and thousands of your closest friends get to enjoy it.

I'll start off by introducing Nick Nelson. Nick is with Inter-Fluve. Inter-Fluve is our consultant on the project. Inter-Fluve has done river work like this all over the world, really. But they're also, we're also fortunate that they have some local ties to the region. So, I'll let Nick introduce his team and explain some of those local ties. But before I do that, I also want to take a moment introduce Deb Loiselle. She's with New Hampshire DES. So, New Hampshire, DES is the one providing funding for this project through the Clean Water SRF program. And they have been an incredible partner so far, and we look forward to continuing working with them. So, with that, I'll turn it over to Nick and I will be in the back if anybody has questions for me. Thank you, Nick.

Nick Nelson: Thank you very much, Jason. And thank you all for coming tonight. As Jason mentioned, my name is Nick Nelson. I am a fluvial geomorphologist, which means that I study rivers, try not to overcomplicate things, but I look at rivers and, try to understand how rivers interact with their landscapes. I work with two wonderful colleagues over here, Keith Cante and Cam Twombly. Keith is a Geomorphologist and Cam an engineer, both from the Valley here. So, they grew up here and know the valley well and the river very well as well. So, we are going to talk about our Saco River. This particular site that you see up on the screen here, this is going to be a pretty quick presentation, and I'm tied to the microphone here, so I usually wander around, but I'm going to try to talk into this.

We're going to have lots of time for questions, discussion comments, after this brief presentation. And my hope here is to walk us through just a little bit of background and what the goals of the project are. Look at some of the existing conditions. Some of you know the river very well, maybe from paddling or floating, or walking alongside the river. Others may be less familiar. So, we'll all get on the same page with the existing conditions and then go through a few of the proposed alternatives that we have been looking at. We've looked at a lot of alternatives and kind of narrowed things down to a few, that we think are feasible and that have been presented on the posters out here and in some of the handouts if you picked one up on your way in. So, we'll walk through each of those and then look at the next steps as we move forwards from today.

So, just looking at the project timeline and, sorry, the zoom thing on the top there might block a few things, but we'll try to keep it out of the way. In 2021, we got involved in this project to complete a geomorphic assessment and study of the river. Again, that's a complicated word, but mostly it's a study of the river and a look at how the river is moving and what's causing some of those movements. And a look at the erosion that's happening in not just the subject bank right out here, but we covered a few miles of the river to see what it's like upstream and downstream so that we can have a better understanding of the whole context. So, the assessments happened in November field work, a lot of surveying. You might've seen us paddling around with some survey equipment. And then we developed

the erosion study by July of last year, 2022. So, that study helped to put the existing conditions into context, help us understand the existing conditions out here, understand how this river is moving, and the history of movement and where it might be going. This allowed us to begin to think about the various feasible alternatives that we could be considering for this particular project.

After that we again, got back under contract to further analyze these alternatives. And so that's where we are right now. We've been developing, refining these alternatives, gathering more information, studying some of the hydrology and the way the water moves, and doing some modeling, for the site. We had a meeting with the regulatory agencies to check some of these alternatives to see if they could even be permitted and what some of the challenges might be. And that was just last month. And here we are with our public meeting here in December to consider these alternatives.

Okay, so our project goal is to identify and implement sustainable river management options for the Saco River that protect the infrastructure at the wastewater treatment plant. So, we can see the infrastructure in the background there. We can see the issue with the eroding bank moving in that direction. So, we would like to find a way that can reduce the risk to the infrastructure, while also minimizing long-term maintenance. I know Jason doesn't want to continually have to be maintaining the fix that's out there. So, trying to come up with a design that has minimal long-term maintenance. And that doesn't necessarily use really hard structural erosion solutions. In many, you know, urban spaces in particular, we see concrete walls, we see sheet pile, we see lots of large rip rap. Those are really hardened solutions, which are necessary for certain rivers in certain conditions.

But they're not great for the holistic evolution of a river and the ecology that is living within the river and along the riverbanks. So, if we need to use some of those solutions, it's in our toolbox of being able to use them. But if we don't need to, we are going to try not to. Then we would like to maintain or improve the aquatic habitat within this design and certainly maintain the river's recreational opportunities. So, we know that a lot of people use this river, floating, paddling, fishing, whatever it might be. There's a lot of use on this river and, that needs to be maintained, certainly during construction there, there could be some impacts there, but long term, we want the recreational opportunities to be maintained. So just for context to show where we are, you know, where we are in the world, we're in New Hampshire, in North Conway here, the watershed is outlined in the blue boundary, so I can get my mouse to go blue boundary here. So that's the watershed of the Saco River from the wastewater treatment plant upstream. So that's everything. Every drop of water that falls within that blue boundary flows into the Saco River and past the wastewater treatment plant.

When we look at this site, these aerial photos are helpful to see a lot of the patterns and changes that are occurring at this site and along this river. So, we can see a lot that's going on here. We can see that there's erosion happening along these meander bends. We can see the bend one, what we're calling Bend One is about 1200 feet long. You can see bend two further downstream, a little bit more erosion over there. Bend three is just underneath the zoom bar up there.

And so, there's erosion happening along all these bends. We can see that visually, if you're paddling, boating along the river, you can see that happening. There's pine trees that have fallen down that slope and are in the bottom of that deep pool, really deep pool there. But there's erosion all along those bends that are occurring. And then there's a deposition on the inside of those meander bends. And so, this is typical of Mobile Rivers. Osaka River is a really mobile river. It's historically has moved back and forth across the valley. We can see old scars of where the river used to be on opposite sides of the valley in different areas. So, this is a very mobile river, and it's doing what it has done for a long time. And on the inside of the meander bends, that's where the sand and gravel deposits and it gets eroded from the outside bends.

We also have this Overflow channel right there. When this floods, when the river floods, who's been out there to see the river flood? Yeah. So where does it flood? It floods all the way across the fields, right? It's everywhere. The water, a couple times this past year, has been flowing all the way through these trees and through the overflow channel. The whole valley's flooding or much of the valley is flooding. And so, during those flood flows, it's not just following these meander patterns, it's sort of just going this way. And this is one of those overflow channels. It's got some sand in there, it's sort of devoid of trees for most of that area. But these are geomorphic features that we see on the landscape, riverine features.

So, to look at each of these meander bends, in a little bit more detail, this is that big eroding bank right outside the treatment plant. And from the water level looking up there, it's big. It's 40-50 feet tall from the base of the pool up to the top. A really big eroding bend. So, tall sandy banks, deep pools, lots of trees. You know, in many cases, the trees provide beneficial bank stabilization on rivers throughout the region. But when the banks are this high, they, their roots, aren't able to do that. And so, when the tow, when the bottom of this slope erodes out, everything just kind of collapses down. The overflow channel looks like this. So, you can see some of the sand in there and the overflow channel, some marks of water flowing through there. You can, when you're out there, see some stains on the trees that show where the water levels often are at high water.

And then bend two, this is along the farm field on the west side of the river. So not quite as tall, but definitely eroding along that bend. Lots of sand. We don't really see any large material in there. No buffer zone at all. And then meander Bend three is again on the east side of the river. And you can see the wastewater treatment plant right up here. So, we have a nice, forested slope there. And this is the one spot where we do see some larger stones on the riverbank. So, some larger gravels and cobbles are a bit more stable, but there is a little bit of erosion happening along that edge. Mostly Because the river at lower flows is kind of focused directly onto that bank.

And so, this is one of the analyses that Keith had done, that looked at old aerial photographs going back to 1939 to trace those meander bands. And so, from the, the blue in 1939 to the red, in the current year, you can see how much movement these meander bends have had over time. So, the big picture is this is an active river. It's eroding, it's still eroding, it's still moving. We have other figures that

kind of show that rate of movement. But it's moved several hundred feet since 1939. And it's still moving in that trajectory at a similar pace. So, it's not as if it's slowing down.

So, what are these proposed alternatives that we think might be able to help protect the wastewater treatment plant? We've combined our thoughts and the project team's thoughts into four primary alternatives, feasible alternatives. One is, we'll call a full remeander, sort of full reconstruction of the stream channel. Another one is focused bank stabilization, a wide bench at the big eroding bank. Number three is a narrow bench, and four is protecting that bend, but also the other two meander bends further downstream. And we'll look at each of those in some more detail. This is the remeander alternative. If you have the packet, you've got that right in front of you as well. What we're showing here is, okay, we have infrastructure over here. We have an eroding bank here that is going to keep moving this.

If we were to let this go, the typical trajectory of this is for the Saco River to keep meandering this way. And at a certain point, a big flood will come along, and it'll hop its banks and cut through that meander bend similar to where that overflow channel is. And we see that in other places along the river, cut off, meander bends, they turn into oxbow bends. We know those kind of ponds or pools that are out in the floodplain. And so, this is what we could envision being that future channel alignment. And so, one way to look at this is sort of a fast forwarding of the process of the change process on this river while protecting this bend. So, you no longer have erosive forces. You no longer have the Saco River slamming up against this bend and eroding the sand at the base of the slope there.

This is a lot of construction, so it's a lot of, you know, big heavy vehicles out there digging a new stream channel river channel that's just as wide as the Saco is upstream and using rounded stone and large wood in here to stabilize these banks. This is a typical kind of ecological approach to bank stabilization that we've done in a lot of different places around the country. And in this region as well, where we can use rounded Riverstone appropriately sized for this river, so it doesn't erode away, along with large wood that provides both habitat and bank stability. And then on top of that, we build these, what we'll call fabric, encapsulated soil lifts, which are basically biodegradable fabric burritos wrapped around soil. And you have plants and seeds in there, and those plants grow over time, and those plants send roots down and stabilize the soil.

So, you're essentially rebuilding, the bank through there. And so that would happen along this bank, along this bank, along these banks. And so, you'd have this new kind of remeandering stream channel here with no heavy forces against this bank anymore. And you'd have a little bit more of a buffer zone along here. And again, some protection along the bends there. You'll see in the images on the right are this type of solution done elsewhere. Large wood at the base of the bank, you don't see the stone, but there's some rounded stone in there as well. And then the fabric slopes on top. And over time, that becomes a fully vegetated slope.

Alternative two is to stabilize the bend one, the primary bend in question, using similar methods to the bank stability that we talked about before. This alternative is the wide bench, so it'd be about a

25-foot-wide bench, at the base of the slope. And what that does is, sort of, it would be, these soil burritos built on top of the stone and large wood, for, you know, maybe three to five feet or so. We don't know the exact height yet. And then above that, we'd leave the rest of the slope as it is. And over time, that slope would probably continue to slough down a little bit until it got to, it's what we call an angle of repose, which is the slope that it can be sustained over time and start to stabilize. So that wide bench allows for some of that material to slough down and still provide protection all on that bank. So, this is another case, here where we can see, again, large wood and stone at the bottom, and a pretty steep bank of those soil lifts. This, this is, you know, a pretty steep bank here. I don't know if we'd have as steep a bank for our site, but you can see the infrastructure right on top. So, this is a case again, where protection of infrastructure was key, and after a couple years, you have nice vegetation growing, which provides ecological function and covers habitat in the river channel.

Alternative three is a narrower bench. So, this is about a 12-foot-wide bench along the base of the slope here. This is just wide enough, um, to move an excavator across that bench in order to build it. So, part of our job with this is to figure out how to build this. And it's challenging because you have a big river flowing by. And one of the ways that we can do it, that we think we can do it is by, you know, this is our access here down into the river. We could begin by placing this first course of river stone at the base of the slope here to build up a pad, essentially a road for that excavator to move along here, continue to build that as you move upstream. And then on your way back down, that's when you place the large wood and the fabric covered, the fabric encapsulated soil lifts on top.

So, you're able to kind of use the construction zone as your access up without having to clear all these trees and come from the top because it's just too high a slope to be able to access the river down there. Again, this alternative is limited to the primary eroding bank, not addressing the further banks further downstream. I've been talking a lot about rounded river stone in using those for our bank stability. We are looking at that alternative in contrast to using riprap angular stone, which is used in a lot of cases to stabilize riverbanks. And in many cases, riprap is used to stabilize important infrastructure, bridge infrastructure and other, other elements. On this particular river, because of the water flow and the velocities and the energy that we see in this river, we believe that we can use rounded river stone, in this particular design case and it will stay in place. So that's part of the engineering analysis that's done, for these river projects, is sizing that stone appropriately and designing the installation of it in a way so it stays in place long term.

Lastly is alternative four. And this is a bit of an extension of the other alternatives that essentially builds off of the protection of bend one and adds protection of the next two bends downstream. And again, the overall goal is still protection of the wastewater treatment plant. The reason to continue downstream with this is out of concern for the river eroding in towards the infrastructure this way. So, this provides an option that provides a little bit more long-term security and a bit of an understanding of where the river might be in the future.

Next steps is, you know, following this meeting is to choose a preferred alternative and begin to develop those engineering designs, the detailed designs. These are conceptual renderings meant to allow us to visualize what it might look like. But there's a lot of engineering that needs to go into, you know, actually figuring out how much material, and how it's going to work. So that's going to take a while to get through those designs. There'll be more outreach during that process. There's a lot of permitting that needs to happen, which will have more meetings and more outreach, final designs. And then, we hope by 2025 we have construction bidding and construction process at that point. Keith Cam, I miss anything, Jason, Deb, anything you want to add?

Nick Nelson: Any, any questions?

Karen Umberger: In, alternative two and three are you suggesting that just that change in that one bend will protect down here? I mean it, because that speaks to me to be the place where we've got the closest to the treatment plant.

Nick Nelson: you're wondering about this bend down here? Yeah. So, this protection of this bend would just protect that bend, and this is where we're seeing the most movement of the river and the biggest threat to the infrastructure here. I know this bend is closer, but currently there's not as much movement in that river bend, most likely because of the larger stones that we're seeing in the bank there. And that there's just less energy focused against that bend. So, you're absolutely right, this alternative, the benefit is that it's limited to a small, relatively small area and protects the primary area of concern. But the downside is that it does not address this issue down here.

Jason Gagnon: So, if I might jump in on that too, that's one of the biggest things that we need to figure out from a, from precinct's perspective, is each of these alternatives come with different level of confidence in how long they're going to protect the infrastructure. And as you pointed out on this one here, great, this fixes the immediate threat, but what's going to happen downstream, right? Is that West Bank continues to erode and things push out farther. That's going to change that river geometry, which might actually focus more energy back down on that third bend down below. So, have we then just pushed the can down the road a couple years to then we have to, to fix it again, right? But obviously the flip side of that is the more we do now, the more money it takes to do it. So, we have to figure out what that right balance point is for doing it all once and doing the best we can for the best confidence for as long as we can versus doing what we can afford right now and saying, let's see what happens years down the road.

Bill Hounsell: So, if we do what we can afford now, we may not be doing what we need to for the future. So, the challenge is to make it so we can afford to do the whole thing, right? And now, as I understand, now would be a good time to be seeking the federal, state partnerships to make that this happen,

Jason Gagnon: Right? So the focus of this meeting is really to look at the technical stuff, but alongside that, at the precinct level, at the DES level, we are working very hard to build in your words that funding

coalition that we need to be able to fund this whole project, right? cause as I, as the article that Tom wrote in the paper today, talked about, the precinct has approved 7.8 million for the project with the condition that 50% of it is funded through grants. So, at the bare minimum, we need to hit that 50% threshold of 7.8 million to move forward with this project. Now, something like alternative one may end up costing more than that. The precinct may decide that the extra security, the extra protection, the long-term benefits are worth the higher cost of that option one. If we do that, then yeah, we're going to continue to work really hard to go find those other sources of money to build that funding coalition so we can make it as affordable as we can for the precinct.

Bill Hounsell: Well, don't you think we should? Number one, when you choose which course, which alternative to do, don't you think we should choose the one that does the global view? And then if we have to build it in phases, we will do the global view in phases. In other words, if you need all three bids.

Jason Gagnon: I'll let Nick answer that. Because if you're doing a reconstruction, maybe you have to do it all, or you have to do, I don't know if you would be able to do something like that.

Nick Nelson: I think alternative one kind of needs to happen all at once. I think you might be thinking about alternative four here, where, you know, maybe we have funds for Bend One initially, but then maybe in the future you can do two and three.

Bill Hounsell: I'm suggesting alternative four could be done in phases where you do the, the big bank first, but with the understanding, especially from a public education point of view, that the way we do it allows us to step through of the other phases as we wait. And are successful in getting more grants.

Nick Nelson: Yeah, it's a great question. And I think others should weigh in here. You know, when we have done other similar projects, you know, big projects that have multiple bins, one of the, the challenges with that is, um, the permitting elements of it. Sometimes that needs to be permitted separately if it's three different projects as opposed to one project. Also, it's expensive for the contractor to remobilize. So just the mobilization costs of getting the contractor to the site is significant for a big project like this. So, it's more cost effective to have it all in one as opposed to having them come out one year and then take their vehicles offsite and come back again to do the next. That being said, there are, you know, plenty of projects that we've done where we do phase one and then you, fundraise for a couple of years, and then you're doing phase two and phase three.

Bill Hounsell: So just to follow my public input on that would be, I hope that you give us a best approach, in other words, does the Army Corps have to approve what we do here? Yes. So, we would need to make sure that if the Army Corps lets us do it in phases, we can approach it that way. And then seek the grants. But if we do the, the first big bend, does that put more pressure on the other bends?

Nick Nelson: Yeah, good question. I'll speak to that. And then you had a response to the other point in our modeling, when we looked at our hydraulic modeling of the site, we did not see an exacerbation or worsening of velocities or energy, up or downstream or against these other bends. Certainly, there's

going to continue to be erosion on those bends that are not protected. But that's happening now. It does not appear based on the modeling and based on our understanding of the site that it's not adding pressure. Did you want to speak to the other point?

Jason Gagnon: So just to follow up on that, right, when we first, to give you a little bit of peak behind what the project team discussions had been like as we've gone through this process when we were first presented with sort of these four basic options, I think a lot of people on the team had that same thought built that this seems like a good option where we could do this stuff. But I want to point out something that Nick said earlier in his presentation about that cutoff channel. This works great in the current river geometry, but what happens when we get that big flood and all of a sudden, the river now takes that cutoff channel 10, 15, 20 years from now, then we all bets are off for what's going to happen downstream. Right? So, this does not account for that future where that cutoff channel becomes activated and the entire geometry of the river changes. Could that happen in the next year? Maybe could it not happen for a hundred years? Maybe. We don't know. Right? So that's sort of where we look at these different alternatives and say, all right, what really provides that, that certainty, that long-term certainty? And if we go with a different option, what risks are we assuming and are those risks worth the change in cost for the project?

Bill Hounsell: The critical part of this for the whole valley is the protection of this plant and the protection of the plant is the protection of the drinking water. And the protection of the rivers and everything that people come here for. So, I would think that when you choose an alternative, which is the next step that you would, you might even go to the bigger projects, moving the river right over so it doesn't hit those banks. Now, if money's always a problem, if that's the best long-term solution, doesn't it leave the future generation to wonder why we didn't do better? Then I say the challenges to get the Federal State partnership in doing the right thing at the right time globally. They, I mean, the Department of Environmental Services always tells us to think globally, think beyond regionally. This is a regional issue. This isn't just North Conway's water precincts facility. It's the whole valley. Depends on what we do here and that we do it right.

Karen Umberger: My, my question is, what is on the left side of the river, why do we have to do that? Why is that important? I mean, I understand the top part. Yeah. I understand the bottom part, but I don't understand what the, how doing that then affects anything.

Nick Nelson: Great question again. A lot of this is an attempt to reduce uncertainty of the future. And, without doing anything on that Western Bend, we don't know what will happen over there. And as Jason was saying earlier, if that continues to erode this way, then the Saco River is then coming back this direction and with more force and more energy. We don't know how, what direction that will be. Maybe it goes right at this, you know, bank protection and the bank protection can hold, or maybe it comes down here and loops back up and, and get cuts behind that bank stabilization, we don't know. And so that's it. It provides a little bit more security in the future, just trying to reduce that uncertainty that's there with a really mobile river.

Karen Junge-Dennison: We've owned it for close to 75 years. We are very concerned with what happens. We've lost land 75 years, and now that the precinct is involved, things are happening, but we've tried to keep it natural for all these years, and it's hard for us to think of what's going to be happening.

Nick Nelson: Yeah. and concern about the active construction and...

Karen Junge-Dennison: How it's going to affect, what's the right, the first option looks awful to me.

Nick Nelson: Can you, can you expand on that a little bit, but why?

Karen Junge-Dennison: We're going to be, we're going to have swamp in there.

Nick Nelson: Okay. So, you're in this area back here?

Karen Junge-Dennison: Yes, It looks like it's just going to be dead water and not a pleasant area.

Nick Nelson: Yeah. really good question or, comment there. It certainly, you know, good to be thinking about what this, what this is going to be looking like, sort of a ground view, could have been helpful here also. But, what, what I envision, what I imagine this to be is sort of an active backwater area. So, this is connected to the Saco River here. And, as opposed to being stagnant all the time, because this river floods a lot, you're going to still have water that's coming up and over during flood flows and coming washing through this area and kind of circulating things is, what we're seeing in the modeling anyway. And what we see in reality when it does flood, it floods over, over these bins over here. So, what I would anticipate is that yes, you know, it will be still water at lower flows, and it will provide some refuge for fish and other organisms back here. And then during higher water, you'll get some kind of flushing through that area.

Karen Junge-Dennison: Did you see the river, other than this year?

Nick Nelson: We've, well, I'll let Keith and Cam, they've been on the river a lot, so,

Karen Junge-Dennison: You know, this year was very different.

Keith Kantack: Oh, absolutely. Yeah. And I would just add in terms of your, your interest in keeping it natural that there's probably not another bank stabilization project in the, in New England that's going to be as natural of an approach as, as what we're proposing in any of these alternatives. So, it's definitely front of mind for us for sure.

Nick Nelson: And, for all of these options, we're not really touching the top at all. So, the goal is to come in from the bottom and stabilize where it is. So, you know, recognizing you've lost a lot of land there and not wanting to lose more. And so, it's, it's stabilizing the bottom without pulling down the top or anything like that, I guess.

Karen Junge-Dennison: We personally, selfishly, we use the river, obviously for our recreational use, and that cuts off our use.

Nick Nelson: Right, I got you. Um, so right, cause you're, where do you typically access the river? Do you come up here to where it's a little bit closer?

Karen Junge-Dennison: It would be across from that flood thing you said.

Nick Nelson: Yeah, right over here.

Karen Junge-Dennison: Some in that area.

Nick Nelson: Yeah. So, I think that could be, again, I don't want to say like, this is going to be a big change. Obviously, this option is the biggest change for you, and I recognize that. And I know that's scary. And unnerving, what I envision this to look like is, you know, you're forested area that's here right now. This, this is what's there right now that will continue across the existing channel at that, a similar elevation and tie into and match the forested area on this side, on this edge of your property here. So, where you might come down here, you would have very similar, I think, similar access point, but that is something that we can work together on to think about what that looks like over there as well. If,

Karen Junge-Dennison: If they do that alternative.

Nick Nelson: Right. If this is the chosen alternative, you know, this is something that we can discuss, you know, what your access is and what that looks like.

Jason Gagnon: Yeah. I think just to follow up on that, recognizing that is all your land up there. Yeah. And we can't do anything there unless we're working with you and it works for, so Right. We,

Karen Junge-Dennison: So, it's not imminent to me.

Jason Gagnon: No, no. We want to work with, okay. We want to work with people. We don't, fighting people is the wrong way to do things. Yeah,

Mark Hounsell: I really appreciate the precinct doing this and taking this initiative. This is a regional issue. It certainly affects the town and the leadership of the precinct greatly acknowledged and appreciated. I would like to say that my choice, if I was to have one, and I don't, because I understand I'm not a member of this precinct, what I'd like to see happen is this right here, that looks like it's going to be eventual anyway. It looks like the solution that'll have the best opportunity to solve the issues in the long run. The question I would have been with this flow here, what does that do to bend three? What seems to me like you're putting an awful lot at that point.

Nick Nelson: Yeah. Coming down here, there. Yeah. We're, for all of these bends we're sort of softening, those meander bends for all of them. And that reduces the energy against each of them. So, there's a

little bit of softening on this bend also to help redirect the water downstream. And the railroad bridge is just downstream of this. So, trying to get it into that alignment to go underneath.

Mark Hounsell: That's Rock bridge. Bridge does rock you down there anyways.

Nick Nelson: Yep. And along this edge appears to be a little bit coarser.

Mark Hounsell: like that one.

Jim Umberger: If you had to tell the switches the best alternative, which would it be? <laugh> I didn't think I'd get an answer.

Nick Nelson: I mean, that's what everybody would like to know, but it's dependent on how much you're weighing different elements, different metrics of it. So, like Jason was saying, if we're looking long term, you know, one and four provide more long term, stability and certainty, anything can happen, right? You can build any of this and, something crazy can happen. But this and alternative four provide more of that long-term stability. But there's, there's lots of other things that you need to consider landowner concerns, funding, you know, we don't know if we can get the funding for something that's as large as this. Now's a good time certainly for that. But it's a lot of money.

Jim Umberger: Can you come forward and show us the difference?

Nick Nelson: Yep, So this one is, you know, just keeping the river where it is, but stabilizing those three bins and each of these have different challenges with construction. You know, when we think about doing this work for this, this effort, alternative one, you know, we have to think about what do you do with the Saco River while you're digging this channel, and how to manage that water, and what do you do if it floods during construction? You know? So, there's lots of logistics there to sort through. Certainly, things that have been done on other projects that we can look towards and learn from. So, you know, it's a feasible option because we think it's constructible. But there are challenges with each of them, you know, challenges with this as well. How do you keep the river from coming up against your constructed bank there during construction as well?

Bill Hounsell: Yeah. What will the army core of engineers go along with each of these alternatives,

Nick Nelson: Yeah. Good question well speak globally to the regulatory process maybe. And Deb, can I ask you to speak a little bit to sort of the regulatory process a bit?

Deb Loiselle: Yeah, certainly. I think Jason and Nick mentioned that we actually had a kind of like a pre permitting meeting just to broach these subjects, and the alternatives to all the permitting authorities. And that includes state and federal agencies. And, I think Jason was there, Nick, Keith, there was several others. It was a very good conversation. There was a lot of input. They made it very clear they, they weren't going to say which alternative they would prefer, but they just gave kind of their feedback on

what would be permissible and what would not. So, as they evaluated all of the alternatives that were presented that you saw here today, there was nothing that came up as a huge red flag. There certainly is some more information that needs to be vetted through. And we told them that we would continue to stay in touch with them.

Nick Nelson: A couple of points to add onto that is one of the questions that we had was, will this work require mitigation, you know, beyond what's happening? And if a project is deemed to have restoration, ecological restoration value, there's less concern about also doing mitigation. And so, these types of designs have the possibility to provide that ecological function and potentially go through permitting as an ecological restoration type of a project, while also stabilizing, the stream banks. If we were to use rip rap, that would be much more challenging or impossible to have that go through as a restoration project. There was another point that I was going to make, but I forgot.

Bill Hounsell: So, follow up on this, if ecological, enhancement for the long term for the next generation, is federally advantageous by the regulatory agencies at the federal level, doesn't that maybe give us a better chance of getting enough money to do the more expensive project? In other words, we're seeking federal partnerships, they're going to have a lot in the skin in the game, and at least half of it.

Jason Gagnon: Yeah. Generally, you get more money for high-risk things, right? Like FEMA, SRF who wants to protect their investment in this plant and all the things that we've done so far. There are other sources of money out there potentially. Things like USDA, their natural Resource Conservation Service NRCS, who are very concerned about protecting farmland. So, in the West Bank, there is the potential for a funding opportunity there. Nick mentioned on alternative one, we create that backwater, right? Which is an excellent fish habitat. And I know organizations like Trout Unlimited have funded other river projects where they were improving fish habitat. So that's an area that we can look into there. There are lots of different things like that that are out there, some of them larger pots than others, but that's one of, one of our jobs is to leave none of those stones unturned to try and figure out how we can build the most beneficial funding coalition for the project.

Bill Hounsell: So, you really can't nail down the alternative you want until you find out how to match up the alternative with the, the greatest access to funding options.

Jason Gagnon: I think the two-work side by side, right?

Bill Hounsell: So, I guess one saying is, even though we choose one, is it, are we flexible on going to another one.

Jason Gagnon: Well, I think that's ultimately up to the voters, right? As part of this process, we will figure out which alternative makes the best long-term sense minimizes risk. And we may rank them, say, this is number one, this is our, preferred alternative, assuming we can get the funding. If we can't, here's our number two option, which minimizes risk not quite as much, but you know, a little bit better than,

Bill Hounsell: Well, I think that clarifies it from the public point of view, that we're going to try to do the, the best we can from a regulatory perspective to match the, to make it as affordable as we can to do the proper thing.

Jason Gagnon: Deb, did you have another question?

Deb Loiselle: Yeah, I was just going to add onto to that, and then Mark, I know you've raised your hand several times. I think it's important we go to you is that that is the challenge. As Jason mentioned, you know, so as we're doing some preliminary assessment, trying to figure out what are the various alternatives, we're evaluating those. And then I've been working with Jason and Alexis on, okay, what are the potential funding sources depending on what the needs are, what the type of project it is. So that's always a challenge. And I'll agree with Jason in my many years working on restoration projects, it's always better to have your selected alternative and then move forward to looking for more definitive funding sources. Because they want to know that your project, you know, has the support, the alternative has been selected. So, there's confidence in that versus presenting to somebody for alternatives, you're unsure. So, there's that uncertainty of, well, you know what, maybe they're not ready this year, and then your kind of, you don't score well on that. So as Jason had mentioned, I mean, we're doing some parallel efforts and we're working really hard, you know, to identify the funding sources. And I think that we've identified a multitude of different funding sources and now we're just kind of waiting. The other thing that becomes challenging as well is the timing of the funding sources. Some funding sources will pay only for the planning portion. Some will pay for the construction phase. So again, we're like, we're juggling all those balls at the same time. But I'm hopeful that we will find the funds necessary that they will need whatever alternative, preferred alternative is selected. And I promise you, I worked very hard with them to make sure that happens.

Jason Gagnon: To sort of piggyback on what Deb said, what we're really doing is we're following the same model that the precinct has always used. We do the work up front, right? Right. We, in the past, we've funded all of that design work, we've had the alternatives, they've been ready so that when we go to those funding agencies, they say, these guys got their stuff together. This is a project that's worth funding. And so, we put in that work ahead of time, it helps get us to the front of the line.

Bill Hounsell: I think it's a good point that, from this meeting that's on camera, so the public understands that the Department of Environmental Services is working as a close partner in our ability to make, make the best alternative affordable.

Mark Dindorf: So, I sort of echo those sentiments and you'd say, I've been sitting in on monthly update meetings on this project for a while now, and, have been impressed with, all the preliminary work that's gone into it. The study, the analysis and the careful consideration of the different alternatives and the partnership between the precinct and Department of Environmental Services, Inter-Fluve and really the community as well. I've been participating in my capacities chair of the Saco Swift River Local Advisory Committee. And whatever alternative is selected will come before our committee for review and

recommendations to the reviewers at DES for final consideration there. I want to go back to something you said earlier on Jason, about wanting to choose the alternative that has the greatest confidence of long-term solutions and success. And as I look at these four alternatives, I think it's got to either be alternative one or alternative four. I don't see that alternative two or three really mitigates the risks at Bend three, to your infrastructure here. And so, listening to the other commentary, I'm also seeing there both would be big undertakings. Now alternative four could perhaps be done in phases like Bill suggested, but at the same time, you know, Nick identified some obstacles to that as well. I was trying to think of it from a perspective of which of those two alternatives is actually a bigger project. And it's not entirely clear from the graphics and things that I've seen. They both look like big projects, but I'm assuming that alternatives one is a bigger project in terms of equipment time and materials moved and overall logistical effort and cost. Is that a correct assumption or is that a premature assumption? cause it looked like particle or alternative for is also a pretty significant undertaking.

Jason Gagnon: Correct me if I'm wrong, but I think logistically they're pretty similar. The big difference in alternative one is just the physical quantity of material that needs to be moved and, and yeah. And placed.

Nick Nelson: And that's the big difference in cost. And I don't know how much you want to go into specific numbers, but the volume of material, you can see all of this earth would need to be excavated and all of this would need to be filled in. All of this would need to be filled. And this isn't, you know, the exact alignment of, you know, what would be designed. There's a lot, there could be adjustments to this as we move into detailed engineering designs, but in the other option, there's none of that major earth moving and that earth moving's expensive. So, you know, generally it's, between \$10 and \$20 per cubic yard. And this could be, you know, what are we a hundred plus thousand cubic yards of material Yeah. Being moved around or some very large number of cubic yards.

Keith Kantack: So, four million dollars just in earthwork for option one.

Mark Dindorf: So, can I ask a follow up question then? Is there a higher level of confidence in the alternative one providing the best long-term solution versus alternative four?

Nick Nelson: Yeah, I think what Jason was saying earlier, what this one does is it looks to the future of, of when the river might be cutting through that cutoff channel anyway, and kind of preemptively does that. Whereas this one, it's stabilizing the major bends. But if next year or five years, or 25 years from now the river abandons this channel and comes right through here, then, you know, there are lots of unknowns about what the river will do, from there. So that's, you know, added uncertainty. I'll leave it at that.

Jason Gagnon: So, this is probably a question that I will have would've eventually asked during our project meetings, right? But is that something that we can look at with modeling, say if we did this, what happens if, if that channel's abandoned and it takes that cutoff channel? So, we have some I, and again,

it's a model, right? It's, it's only you take that for what it's worth. We do the best we can, but they're, none of them are perfect. So, but it might give us some idea about, alright, what would happen Yeah. If we did this and then that channel jumped.

Nick Nelson: That's a good question. I think that's something that we can look into in this next phase of, kind of, not just the water flowing through there, but what happens, all that sediment that gets eroded out of that area, and the trees moving through and that, that sort of thing. But we can think about that for sure and see what those impacts may be.

Karen Umberger: Would you mind putting up that 1939 to, I think that that is extremely important as to, you know, the movement that is seen on both sides and it doesn't seem to ever want to go through that cutoff. Just doesn't, just doesn't look like its ever going to that. Well, what now? 60 80 years.

Jason Gagnon: Yeah. So, one of the things that Nick was saying is as this bend gets wider, the forces driving it to take that cutoff get bigger. Right? So, you're better at explaining that than I am.

Nick Nelson: Yeah, no. So, I think, you know, when we think about how rivers move and change shape, when those meander bends are pretty limited, like this, you know, meander bends aren't too crazy, pretty gentle. There's not a lot of, reasons for the river jump. Its banks. When it really starts to spread out here, and if it goes even further, then it's sort of looping back on itself and it's a lot easier for the river to jump over and begin to take a new path. And so that's what we see in other river systems is, yeah, there's no, taking that cutoff when you have these gentle meander bends. But as soon as we start to go way out, then, then it hops across and cuts things off.

Jason Gagnon: Is the Suncook a good example of when that would happen? What happened down there? Is that a different system?

Nick Nelson: That's a little bit different. That was created by a few other scenarios, dam construction and sand excavation. But Keith, you did a lot of these studies and then studied the geomorphology here. Anything you wanted to add to that?

Keith Kantack: No, I mean, except for that, these, these cutoffs, these meander bend diversions is what the Saco does like every, throughout its history. If you scroll to the, beyond the end, nick, there's, I think there is this, the lidar slide that might be cool to look at this one, you can see all these, these arcing features on the floodplain there away from the, the purple channel. And those are just old channel alignments that it has abandoned. And typically, you don't see it happening until it happens more or less catastrophically.

Nick Nelson: Now this is a really good example here, right? Right. So big, big loopy meander band. This probably, you know, did something like that. And once it got way over here, then just sort of cut, cut straight through.

Keith Kantack: Yeah. And the fact that there is that high flow channel that's doesn't have trees in there and it has sand moving through it during floods suggests it's, it's pretty likely. And the tightness of that bend, compared to the tightness of the, the bends that have been abandoned historically is, is very similar. So, all signs point to it being a, a fairly likely inevitability, like Jason has said in geologic terms that that could be a hundred years from now, but it could also be next spring. You know, so it's one of the huge uncertainties we're kind of grappling with.

Nat Lucy: I have a comment, a question. My comment is about basically the back, what Keith is saying. There has been quite a few places where this is happening. And then this may not be the time or the place to ask this question, but I'm wondering about praetorian property ownership. If you did, number one, I'm assuming that the land ownership is different on either side of the river, and I'm assuming that, deed goes to the thread of the stream now. And if you were to do number one, would the land ownership change?

Jason Gagnon: That's a question I hadn't even thought about. Yeah, I don't know the answer to that. Something we'll have to look into.

Nick Nelson: Yeah. And that's something we deal with that on projects throughout the country and it's different every, it depends on the deeded, you know, and I don't know what the deeded says. Maybe, you know, are you to the edge of the bank or are you to the middle of the river? Or typically in the center line or the bank? Well, the thread, the lowest point.

Deb Loiselle: I think Nick, that's a good point. Because, and you are correct, typically it is to the thread of the stream. But I've seen a couple projects, dam removal projects where the deeded was completely different. Sometimes people owned over to the other side of the bank, others owned, you know, to the top of the bank. So that would be something that once the elective alternative is evaluated, probably deeded research, would be required. And that would be determined at that point.

Nick Nelson: And again, like working with landowners to understand that in more detail and understand these alternatives as well. Yeah, that's a great question.

Bill Hounsell: Well, I just want to make sure that, in thinking one alternative to recommend that, we accentuate the fact that the sand glacial deposit is a jewel. It's the only reason we aren't discharging into the river. The only reason we don't have an EPA discharge permit. It's the reason our biological system works so well under these conditions. There's nothing else like it. Not in the state of New Hampshire, not in this whole area. I mean, it's a very, very unique discovery. We didn't know it was there when we built it. And then when we found that the discharge from the clarifier into those fields, is pure within the first two feet and it's 20, 28 feet before you get down to the river, that needs to be protected. By all means. I think we need to just accentuate the fact that this whole valley is able to handle these solids, wastewater, because of that. And that by all means, needs to be protected. And no matter what the cost, it's minuscule compared to 75 billion, we put the project since 1990.

Jason Gagnon: And I think if we had, if we were forced to do something different here, we might spend as much, again, as what we've spent over the last 30 years just on that one project to be able to fix what we've got here. Now,

Bill Hounsell: If we have to change the whole process, we discharge into the river, we're talking, I mean, you need to weigh the cost when you're trying to skip too much on what we're doing here. You need to weigh it against the, uh, the value of what we have and what we're trying to protect for, for everyone.

Jason Gagnon: So, part of the process too, I'll just mention this. Our goal is right now, everything has been desktop level. Our hope is to be able to bring some contractors with river experience in, to get their perspective and to get their evaluation of how our estimated costs and how our estimated methods reflect what they would do. And are there opportunities to save some costs, to do things differently, and reduce the amount of work that we have to do cause that reduces the cost. You know? So, all those things will be part of this process as we continue to refine these alternatives.

Nick Nelson: One of the things I was thinking we might do as well to address your questions about what that backwater might look like is we can go to those other examples in the valley that you know about and that we know about. Take a look at what those look like and, that might help inform, you know, our designs a little bit more in that area as well.

Bill Hounsell: This is a huge challenge for you.

Nick Nelson: Any other questions or comments?

Jim Umberger: I just have a comment that this river affects everyone's zoning. The water and the wastewater treatment plan is critical for the area, many people in the area. I'm glad to see some come up tonight and be involved.

Jason Gagnon: Yeah, we, right from the start, we've recognized that, although our use is very important, we're not the only ones who use the river. And that's why we wanted to have these public sessions so that we could get input from the community and make sure that whatever we do fits our needs, but also fits the needs of the greater community that uses the river.

Tom Eastman: So, this was built in 1997,

Jason Gagnon: The wastewater.

Tom Eastman: Yep. So, the river has been moving and changing. So was this brought up, I don't remember. Was this brought up at the time that, you know, the plant was a, could be someday in the dire?

Jason Gagnon: I wasn't here, so I'm not sure. I've never seen anything about,

Bill Hounsell: This property was imminent domain and we discovered that the sand was here to the extent it could be built. The way it's the modern flow designed for the biological treatment was chosen first. But after we eminent domain the property and saw, and they discovered all the sand Egyptians said, sand's the best way to build the water. And that was a discovery. It was a wonderful discovery.

Tom Eastman: Of the river.

Bill Hounsell: The river. They dealt with the river for many years. Yes. And since, let's see, how do I put that? The river's been controlled by locals. The erosion has been controlled by just doing non-authorized by the precinct or by the people. But, but it, but it was done to some extent.

Jason Gagnon: Deb may be able to comment on that. In the nineties, you could still, without a permit, put a bulldozer in the middle of the river and do what you wanted. Things have changed dramatically. So, the idea that we would have a project at this scale to think about erosion probably wasn't on anybody's radar back then because it wasn't an issue. Like I said, you just put a bulldozer in and, you did it. You know, that's where I was previously at, my previous job, we had an Army Corps regulated levee, and every year they would put a bulldozer in the Cocheco River, and they would move the accumulated sediment out of the Cocheco that came down from the mad right at the confluence. And that's just what they did. And then all of a sudden when they couldn't do that anymore because of changing regulations, it changed the whole management plan, it changed the cost, it changed everything. And those are things that at the time when that levee was built, weren't contemplated because those regulations didn't exist. And I think the same is true here.

Bill Hounsell: That's a good way to describe what the locals have been doing through the years.

Karen Umberger: And, and still do. And hope nobody notices <laugh> now.

Bill Hounsell: They're very quiet about it. It's, nobody goes down there to see what's going on. But the people that are close to the river know what's going on and know what has to be done. But you're right, regulatory, all sides changed all of that.

Nick Nelson: And when this building, when this was first developed, then the river was out in this area here with those kind of yellowish green lines.

Bill Hounsell: Let's just say it'd be a lot worse than it is now. Had that done.

Tom Eastman: And then second question, Robert Barsamian is going to be building his, I think it's, 128 units, next door to south. What does this do to people downstream of the river? All four alternatives. What does it do? Does it transfer the energy to wipe out someone else further down?

Nick Nelson: Yeah, really good question. Again, we can look to our modeling and the results of the modeling to look at that. And that's what we were concerned about also is to see if there were increased

velocities or energies up or downstream and be, I think, somewhat because of the low slope of this river and low energy in general. We're not seeing that. And so, it's pretty localized just to the work area, in terms of those impacts. You've got the railroad crossing downstream. There's really nothing that extends into that area that is caused by this project. Again, there's going to be erosion up and down the river in the future. Cause that's what this river does. But we're not seeing direct impacts from this work.

Tom Eastman: And my last question for now, you mentioned recreation uses, and we all know that that's a big economic part of the valley summertime use, especially what also angling, but the river use are, is there anybody here tonight from the recreational industry, the valley? So, do you have deliveries? Are you guys just starting in?

Steve Angers: I'm in the angling business, so you know, this is a big plus it's going to be a big plus for the angling community. Cause we'll finally get river stabilization and better habitat for the fish than what's going on right now. So, it's going to be a big plus to the angler community.

Tom Eastman: But we don't have the canoe delivery kayak here tonight. Have they been part of the discussions yet, or?

Jason Gagnon: Yeah, so one of the liberty owners reached out to me. We actually had a phone conversation today. We talked a little bit about the project. And really as long as the river flows, that's important for them. And one of their biggest issues is what they call strainers. When these trees on these eroding banks are falling in and people are getting caught in down trees, as the precinct knows, we get called for rescue calls for that all the time. So, stabilizing these banks would have a positive effect in the immediate area to reduce some of those trees that are falling in and causing those safety hazards from people going down the road.

Tom Eastman: There will be a disruption during construction levels, preventing people from using the river, this part of the river during construction, or would you still be able to pass?

Jason Gagnon: Yeah, see that's all part of what we're working on, right? So, they, we can do construction in different times of the year and as we go through the permitting process, we have the opportunity to work with the regulators to say when this work can be done, if the regulators say it has to be done at absolute low flow, well that's usually in the summer, right? And we may, there may be impacts if the regulators allow us the flexibility to say it doesn't have to be at absolute low flow, but it has to be below a certain flow, then we can maybe move some of that construction or maybe all of that construction outside of the times where the river is really busy and minimize that impact on recreation and fishing and things like that. But we won't know any of that until we really go through the permitting process and know what the conditions are that they will impose on us for construction.

Nick Nelson: And I think, a lot of that will go into sort of the construction sequencing also. You know, oftentimes the time of construction depends on, you know, when you're done doing the designs and

funding is there and just sort of roll right in. Sometimes it's dependent on regulatory time of year restrictions like you were talking about. But I think there are a number of things that we can work on, to be creative around that in terms of like, if this were the chosen option, you know, all the new channel construction can mostly be done, while the river is still flowing in its existing location. And so, a lot of this excavation can happen offline. We call it offline, where it's not in the active flow of the river. And then once you're ready to connect it, that's a relatively short period of time of doing that work to connect it for these other options. You know, there's going to be some sort of a, a barrier between the work here and the river, whether it's a turbidity curtain or some sort of barrier here as we're doing this work while the river flows next to it, you know what that looks like. And if that's safely passable for tubers or boaters, that's something that, you know, we will be able to look at further into designs that that's going to be a big element of that phasing. Often, we love to say like nobody's allowed in our work area, um, during construction. Uh, but we recognize the value of Saco during the summer period for the valley here. So that's something that we'll, we'll work closely on for sure.

Jason Gagnon: Thank you. Do you have any other questions? No,

Bill Hounsell: Trout unlimited that jumped in my mind. A US Fish and Wildlife, all those, those start to have an interest in the project.

Jason Gagnon: So, we've been reaching out we've spoken a little bit, when the project first kicked off, but we hadn't gotten anywhere significant enough to have those next conversations, so I'm glad you showed up.

Bill Hounsell: Yeah, they can help us along.

Jason Gagnon: Yep. Anything else? Thank you everybody for coming. Thank you, Nick. Yes, Keith, cam, Deb.

Nick Nelson: Feel free to reach out. You can reach out to Jason; he can get you in touch with us as well to answer further questions.

Jason Gagnon: Yeah. Thank you everybody and have a good night.

Respectfully,

Alexis Wagoner
Executive Assistant