Dixon Diversion Project

Update and Study Planning Meeting

Meeting Summary

March 5, 2024 8:30 am – 12:00 pm

Location: 813 West Northern Lights Blvd.
Anchorage, AK 99503

Subject: Project Description, FERC license amendment status, Martin River aquatic study plans and 2023 data collection summary

Meeting Materials: Dixon Diversion Project

In-person Attendees: AEA: Bryan Carey, Ryan McLaughlin; Kleinschmidt Associates (KA): Betsy McGregor, Kai Steimle, Mike Gagner; Watershed GeoDynamics (WGD): Kathy Dubé; DOWL: Euan-Angus MacLeod, Brad Melocik; ADFG: Leah Ellis; USFWS: Carol Mahara, Mary Kate Swenarton; ADFG: Leah Ellis; Interested Parties: Gene White.

Virtual Attendees: KA: Finlay Anderson, Mary Louise Keefe, Kim Elkin, Jenn Güt; ADFG: Ted Otis, Tim Blackmon, Joe Klein, Jason Herreman, Kaitlynn Cafferty, Danielle Siegert; ADNR: Carl Reese; NOAA Fisheries: Sean McDermott, Julianne Rosset; USFWS: Stephen Miller (KNWR); USGS: Jeff Conaway; Kenai Peninsula Borough: Julie Denison, Aaron Hughes; Chugach Regional Resources Commission: Dustin Carl; Seldovia Village Tribe: Stephen Payton; Chugach Electric Association: Eugene Ori, Sean Skaling; Homer Electric Association: Jim Levine; Kachemak Bay Watershed Council: Hal Shepherd; Interested Parties: Joe Carson, Alison Edwards, Glenn Walsh.

Meeting Summary

Project Description

Bryan Carey (AEA) presented a summary of the Dixon Diversion to Bradley Lake Hydroelectric Project (Project) description. He described the Dixon Glacier outflow through the East Fork (EF) Martin River, the West Fork (WF) Martin River through Red Lake, and the mainstem Martin River from where the two forks come together downstream to tidewater. Bryan presented two short videos taken on August 26, 2023 showing the high velocity and extremely turbid flow at the mouth of the EF Martin River canyon and in the lower Martin River.

Status of FERC Amendment Process

Betsy McGregor (KA) presented an overview of the status of the FERC) amendment process. She explained that AEA is picking up from where they paused the amendment process. The Draft Study Plan (DSP) was filed with FERC November 2022, a study plan meeting was held on November 17, 2022, and comments were filed by some stakeholders December 2022. AEA is now finalizing the study plans. The scope of the study plans is to collect the necessary data to describe baseline conditions to support impact assessment and FERC's NEPA analysis, and to develop protection, mitigation, and enhancement

measures. The impact analysis will be part of the license amendment rather than the studies or study reports.

Martin River Stream Flow Gaging

Euan-Angus MacLeod (DOWL) provided a summary of the December 2022 DSP comments. He explained that since the comments were submitted the USGS has installed a gage (USGS Gage #15238950) in the EF Martin River near the mouth of the canyon, downstream from the EF Martin River south tributary. Stage and discharge data will be gathered April – November as conditions allow for a period of three years to develop a rating curve, with more frequent measurements occurring during the high flow period. Pressure transducers will not be installed to capture winter flows due to issues with battery life, aufeis, and anchor ice and the data could be erroneous when the water is pressurized under ice cover.

Euan presented an overview of the 2023 hydrology data collection at the four AEA gaging sites, as well as USGS data, and revisions to the DSP based on data collection efforts thus far. He explained that the Martin River was so abrasive that it damaged equipment, including the steel pipes housing pressure transducers. The pictures shown on slide 22 from top to bottom in clockwise order are of: 1) Red Lake outlet; 2) stilling well at the constriction gage site (River Mile [RM] 1.9) – while the rock is friable and good for getting stage data, it is not good for measuring discharge; and 3) gage site at RM 4.3 OCH outlet – in April 2023 there was 2-3 inches of ice and about 1.5 ft of snow. He explained that there were two channels at the constriction site. At the river right constriction gage site, the lower part of the stilling well and the sensor cable was torn off at flows of about 1,500 cubic feet per second (cfs). At the river left constriction gage site, the sensor was worn down by abrasion from the heavy sediment and bedload. In 2024, ultrasonic water surface elevation monitors will be installed in place of pressure transducers because the water is so turbid and too abrasive for long-term pressure transducer deployment.

Questions

In light of USFWS December 2022 comments, Carol Mahara (USFWS) requested clarification on the 2023 relocation of the EF Martin River USGS gage from its previous upstream location closer to the Dixon Glacier (and upstream of the small EF Martin River south tributary) to its current location near the mouth of the EF Martin River canyon. Euan responded that the gage near the diversion point was relocated because it was not in a safe location to be tended, especially at higher flows; there was a cliff and waterfalls at the site. The new location is near large boulders and is not perfectly stable, but it is the most feasible location, and it is a relatively easy and safe site to measure discharge at low flows. Carol indicated that the USFWS may follow up because they had been interested in the flow coming from the small EF Martin River south tributary. Bryan added that given the limited accuracy of gages, it would be difficult to determine the amount of flow contribution from the EF Martin River south tributary by gaging the EF Martin River near the glacier and also gaging the river near the canyon mouth.

Leah Ellis (ADFG) requested clarification on when the diversion would operate and how it would be designed or operated to start and stop diversion. Bryan explained that the diversion would only be operated during the open water season. Bryan referenced the discharge data noting that the glacier is frozen about six months out of the year; it freezes up in about October as shown by the substantial drop in Martin River flows. The lower Martin River has some groundwater and tributary inputs but very little glacial input from late Oct/early Nov through May – no water would be diverted at that time. Bryan explained that the diversion operations could be controlled in a couple of ways. Similar to the Battle

Creek diversion, all of the water would flow down through the canyon when not in operation. There would be power to the gate to close off the diversion tunnel and lift the gate to use the tunnel. There could be a sump allowing all the water to flow through the diversion dam. Even when in operation, first priority would be for water to flow through the EF Martin River canyon before any water is diverted. It would be designed and operated for the bedload coming from the glacier to continue to flow to the canyon because AEA does not want rocks going through the diversion tunnel.

Leah asked about the type of remote-control boat that was used in the study that was capable of handling 14 feet per second (fps) flows. Euan indicated the make of the boat and that it was capable of being operated in water up to 16 fps.

Leah asked about the data shown on slide 22 and if the USGS gage stopped operating in June 2023. Euan responded that the AEA gage in the Martin River saw damage during that period. Bryan added that the red line on the graph represented the capacity of the proposed diversion tunnel and noted that the Martin River flows exceeded the capacity of the proposed tunnel about three times per month from late June to September from storms. With the proposed diversion, the Martin River could still see flow events of 500-1,000 cfs and later in the season as much as 1,500 cfs during high flow events.

Hydraulic Modeling and Fish Habitat Connectivity Study

Mike Gagner (KA) provided a summary of the December 2022 DSP comments. Mike confirmed the study would identify the flows necessary for habitat connectivity and channel maintenance under current conditions and alternative operational scenarios the study would consider the adult upstream migration and juvenile outmigration passage needs of Sockeye and Coho salmon. He reminded the group that the river channel is dynamic and constantly changing in response to high flow events and as such, the modeling and passage conditions will be based on a snapshot in time for a given channel morphology. The modeling addresses surface water only and the DSP would not determine the amount of flow necessary to saturate the substrate before surface flows occur.

Mike Gagner (KA) presented a summary of the Hydraulic Modeling and Fish Habitat Connectivity Study. He cited the considerable planning efforts AEA has undertaken to obtain concurrent aerial imagery and topobathymetric LiDAR data in 2024. Revisions to the DSP include the addition of timelapse cameras to document channel changes. Mike provided a summary of the draft fish passage criteria currently under consideration (Slide 34) and welcomed input on criteria. He indicated fish passage criteria will include both depth and velocity, noting there is not a lot of typical holding habitat with pools and structure in the Martin River. Examples of the model output were presented on slide 35.

Questions

Sean McDermot (NOAA Fisheries) asked if the study plans being presented were the same as the DSP filed in November 2022. Mike confirmed there were no proposed changes to the DSP for this study.

Geomorphology Study

Kathy Dubé (WGD) presented a summary of the geomorphology data collection and observations made in 2022 and 2023. She noted that the 2023 Geomorphology Observations Report was available online on AEA's website for the project. Bryan provided further guidance to the location of Dixon Diversion Project reports and meeting materials on AEA's website.

Geomorphic reaches and geomorphic units have been delineated and mapped. Pebble counts were conducted at 16 sites generally showing a decrease in grain size with distance downstream from the EF Martin River. Timelapse cameras were installed in 2023 at three locations documenting when channel changes occurred that were correlated to provisional USGS stage height data. Review of historic aerial imagery and recent observations confirmed that the Martin River is a braided channel system that migrates multiple times a year, carries a high sediment load, and is a rapidly aggrading system; current off-channel areas were formerly part of the active channel and will be again in the future. In early August 2023, the levee upstream of the delta was breached and the Martin River now flows through the mitigation ponds, out of the northeast corner of the lowermost pond and into the small unnamed basin to the east of the Martin River before entering tidewater. Upstream of the breach, the river channel has been headcutting and channel adjustment to the levee breach will likely continue for years to decades.

Questions

Carol (USFWS) inquired about how much water would be lost through the substrate and if there is aggradation, what minimum flows would provide adequate fish passage conditions. What would reduced flows look like in the future? Kathy noted that there are a lot of fines present in the substrate and water would not flow through the fines. The geomorphology study does not address what flows would saturate the substrate or groundwater or hyporheic interactions. Mike indicated that we are considering how this would be assessed and quantified. It is a very complicated question. The interaction between surface and groundwater operates on many different temporal and spatial scales making it difficult to directly link an impact to project operations (i.e., nexus).

Mary Kate Swenarton (USFWS) asked about passage criteria considering both depth for adults and velocities for juveniles. Mike confirmed that the study will consider both. First, use by species/life stage will be determined, especially of lateral habitats. Then timing of use and migration will be considered. The study will evaluate the connectivity to these habitats at various flows. Mary Kate added that juveniles may spend multiple years overwintering in some areas and that movement of juveniles to/from overwintering habitats should be considered. Kai Steimle (KA) added that the study focuses on key analysis areas for connectivity; flow and channel geometry will determine the seasonal connection. Then the timing of when fish use an area will be considered.

Mary Kate asked if climate change was being considered. Bryan responded that it is hard to project what will occur in 10 to 20 to 40 years – will peak flows be 2,000 or 3,000 cfs? He noted that the peak flows in the basin are influenced by storms and that 104 inches of precipitation can fall in the basin annually – that is almost 9 feet of precipitation on every inch of a 19 square mile basin. He added that if climate change impacted the glacier melt rate, the energy production at the project would take the hit and not the Martin River or the fish resources.

Leah (ADFG) asked if the levee breach had just occurred in 2023 and asked about the mitigation fish ponds. The Martin River breached the levee in 2023 allowing the river to flow into the ponds. Bryan remarked that there has always been some groundwater input to the ponds and that fish have used the ponds in the past. He added that Cook Inlet Aquaculture Association had looked into the ponds as a possible Sockeye Salmon rearing site about five years ago as a potential alternative to Tutka Bay. Kai provided background on the mitigation ponds – they were created during construction of the original Bradley Lake Project in the 1980s and then an access channel to the ponds was developed in the early 1990s as mitigation to provide off-channel habitat. Kai noted that because of subsequent aggradation of

the Martin River channel, there was no fish access to the ponds observed during May 2023 site reconnaissance, but the river breached the levee in August creating fish access to the ponds.

Water Quality Study

Kai Steimle (KA) presented a summary of the 2023 water quality data collection completed by DOWL and an overview of the study plan. (The 2023 Water Quality Report was posted on AEA's Dixon Diversion Project website.) In 2023, water temperature, turbidity, conductivity, dissolved oxygen, and pH were measured at the four AEA stream gage sites and continuous water temperature monitors were installed at the four sites as well. Water temperatures at the Red Lake outlet and RM4.3 OCH channel were significantly different than the temperatures measured at the two sites influenced by Dixon Glacier meltwater at the mouth of the EF Martin River canyon and the lower Martin River (slide 56). At the first two sites, water temperatures ranged from less than 2 degrees Celsius to about 19 degrees Celsius from late April through early November and peaked in August. During the same April to November period, the EF Martin River was between zero and 2 degrees Celsius, while the lower Martin River constriction site ranged from zero to less than 5 degrees Celsius. Monthly turbidity measurements were near zero NTU at the Red Lake outlet and RM4.3 OCH channel sites throughout the study period, and ranged from more than 100 NTU to nearly 450 NTU at the EF Martin River canyon and the lower Martin River sites during the June through September period. A second year of data will be collected during 2024 using the same methodology.

Aquatic Habitat Characterization Study

Kai presented a summary of the May 2023 field reconnaissance and overview of the study plan. The 2023 work identified three potential fish barriers in the EF Martin River canyon and the potential for fish habitat in the lowermost reach of the EF Martin River at low flows that may be possible to wade during low flows (slide 61 photo). It was noted that the boulders shown in the slide 61 photo have a 2 to 3-foot diameter, and that 1-foot diameter boulders can be heard moving down the river at higher flows. Remote line mapping will be conducted in 2024 in a hierarchical approach by geomorphic reach; the reaches have been delineated as part of the geomorphology study. Ground mapping of off-channel and tributary habitats is proposed for 2024.

Martin River Fish Use Study

Kai provided an overview of the December 2022 DSP comments and the study plan. Because of the May 2023 observations of relatively high velocities and riffle habitats and the August 2023 Martin River channel changes at the mouth and the relatively high gradient from the mitigation ponds to tidewater, the eulachon sampling has been removed from the study plan. Passage conditions do not allow eulachon to migrate into the lower Martin River to spawn. ADFG operated the Autonomous Video Counting Tower (AVCT) at the Red Lake outlet during 2023 and will do so again in 2024, providing three years of fish counts. Ted Otis (ADFG) presented the 2022 and 2023 AVCT adult Sockeye and Coho salmon fish count results and run timing.

Questions

Kathy (WGD) asked it the AVCT fish count data had been correlated to Martin River flows and if there was any indication of freshets or Martin River flow conditions associated with fish movement into the WF Martin River. Ted responded that evaluation of flow conditions has not been done yet for the fish

movement data. He noted that the travel time for salmon from tidewater to the AVCT in the WF Martin River is also unknown.

Julianne Rossett (NOAA Fisheries) asked why the AVCT video had outages during the monitoring period and if there were quality control plans in place for subsequent years to prevent data loss. Ted responded that the missing data was a result of human error and not an equipment issue. The setup relied on data being recorded to a hard drive located on site that was visited periodically and downloaded. A Starlink connection to send the data remotely was not feasible because it would be expensive and challenging to power with batteries and solar panels, especially during the shorter days in the fall. Similarly, the equipment could be programmed to send a text message to a cell phone, but the cell phone coverage in the remote area is not consistently available. The site is remote and only accessible by helicopter which is very expensive; site visits were budgeted and planned accordingly. Both periods of missing data in 2023 were a result of the hard drive unexpectedly filling up before it was downloaded. In 2023, the same data collection resolution settings were used as the year before. But underwater lighting was installed during 2023 to capture nocturnal migration and the hard drive filled up faster than anticipated because most of the fish migrated past the counter during the night. The second period of missing data was a result of the program returning to the default setting of recording 30 frames per second after the hard drive was downloaded rather than the previously set rate of three frames per second.

Next Steps

Betsy (KA) presented the next steps for the study planning process and schedule for the FERC license amendment. There will be a terrestrial resources study planning meeting on March 19, 2024 10:00 am – 11:00 am focused on determining the extent of the study area for vegetation mapping and the list of wildlife species to be included in the analysis. There will also be a yet-to-be-scheduled NHPA Section 106 consultation meeting to define the indirect Area of Potential Effect for historic properties and cultural resources.

General Discussion and Questions

Carol (USFWS) referred to USFWS' previous study request about the EF Martin River south tributary and a potential change in the outflow path of the glacier and noted that the project would not be viable if it impacted the KNWR. Bryan (AEA) responded that the section of glacier at the south tributary may be about 100 feet higher than the crack; the meltwater is currently backing up but as the glacier melts, the crack will become dry. Bryan noted that what happens to the small section of glacier has no influence on the water coming from the Dixon Glacier; the project would be required to meet minimum flows in the EF Martin River and the compliance point would be downstream of the south tributary confluence with the EF Martin River. From the geology, it appears that the main flow from the Dixon Glacier will continue going to the proposed diversion location. He confirmed that there are no structures proposed within the Refuge.

Leah (ADFG) asked if there will be juvenile fish sampling in the spring and what mainstem sampling is planned for adult salmon. Kai (KA) confirmed that targeted sampling of clearwater habitats described in the DSP is planned for the spring and fall. There will be adult visual surveys in the fall during the coho spawning window and the AVCT will be operated at the Red Lake outlet in 2024. Surveys for adult fish in the mainstem are proposed to be contingent of 2024 evaluation of mainstem habitats including 2024

data on channel change frequency, water quality, and age-0 fish distribution. All of the data will be reviewed at the end of 2024 in the fish use study report and discussed-with recommendations for mainstem adult fish sampling in 2025. Stephen Miller (USFWS-KNWR) questioned if AEA has adequately funded ADFG to assess aquatic resources, i.e., AVCT study. Bryan (AEA) responded that the AVCT would be implemented in a similar manner in 2024 because the loss of data was human error rather than a funding issue. Bryan noted the power source limitations to operate a Starlink system, especially during October when there would be lower solar energy generation at the same time the batteries would be needed to power the lights to capture nocturnal Coho Salmon migration. It is not feasible to bring in more batteries just to power the Starlink. Previously site visits were conducted at least once a month. Helicopters can cost $10,000 per day and it can be difficult to find helicopter availability. There will be more trips to the area for other studies during 2024 and opportunities for ADFG to visit the site more frequently.

Hal Shepherd (Kachemak Bay Watershed Council) noted that the Coho Salmon returns were very low and asked why and if it was related to climate change. Bryan responded that the AVCT picked up the entire Coho Salmon run in 2024, but Red Lake is a small lake that does not have a lot of coho habitat and may be too warm in the summer. Climate change has likely made Red Lake warmer and more productive. Fifty to 75 years ago, the Portlock Glacier drained into Red Lake but it has since receded and no longer contributes water to the lake's basin.

Hal remarked that FERC does not require climate change analysis but asked if climate change was going to be included in this analysis in any way and if AEA will do a separate cumulative impacts analysis. Bryan noted that there is a lot of uncertainty and that the changes in ocean conditions are having the most effect on salmon runs. If in 50 to 100 years Dixon Glacier recedes so that there is just a trickle of water coming down the canyon, all of that water would flow through the EF Martin River rather than be diverted to Bradley Lake until the minimum flow requirements were met. Climate change impacts to the glacier are a risk to the project and not the Martin River.

MaryKate (USFWS) commented that agency requests for flow requirements would include more required than just minimum flows (e.g., freshets). If conditions change in the future, they would want a diversity of flows and not just minimum flows. Bryan agreed and referred to the Battle Creek diversion flow release requirements. He anticipates minimum flows would vary seasonally and mimic freshets and flood flow releases at some frequency to maintain channel, grade, etc. He added that the 2023 hydrology data showed that the flows exceeded the capacity of the proposed diversion tunnel 8-10 times last year.

Meeting Adjourned.