Williams, Marshall <marshall_williams@fws.gov>

[EXTERNAL] Response to USFWS Request for BA Information: BNSF Sandpoint Junction Connector (SJC) Project

PaDelford, Sue S. <Sue.PaDelford@jacobs.com> Fri, Nov 30, 2018 at 9:54 AM
To: "Sugarman, Shelly CIV" <Shelly.H.Sugarman@uscg.mil>, "Williams, Marshall" <marshall_williams@fws.gov>, "Fischer, Steven M CIV" <Steven.M.Fischer3@uscg.mil>, "Moore, James M CIV" <James.M.Moore2@uscg.mil>, "Smith, Jason (Seattle)" <Jason.Smith6@jacobs.com>
Cc: Katy Fitzgerald <katy_fitzgerald@fws.gov>, "Broadhead, Craig" <Craig.Broadhead@jacobs.com>, "Keim, Matthew" <Matthew.Keim@bnsf.com>, "Santiago, Railin" <Railin.Santiago@jacobs.com>, "Buckley, Maggie" <Maggie.Buckley@jacobs.com>, "Austin Hurst, BNSF-Structures" <austin.hurst@bnsf.com>, "Bordenave, Pierre" <Pierre.Bordenave@jacobs.com>

Ms. Sugarman, et al –

Clarification responses to Mr. Williams, USFWS biologist reviewing the BNSF SJC project BA, follow (*red, italicized text*) his comments emailed on 11/21/2018.

Thank you,

Sue PaDelford | Jacobs | Senior Biologist – Project Manager Environmental - Rail | [redacted] mobile | Sue.PaDelford@jacobs.com | www.jacobs.com

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From: Sugarman, Shelly CIV <Shelly.H.Sugarman@uscg.mil>
Sent: Wednesday, November 28, 2018 12:18 PM
To: Williams, Marshall <marshall_williams@fws.gov>; Fischer, Steven M CIV <Steven.M.Fischer3@uscg.mil>; Moore, James M CIV <James.M.Moore2@uscg.mil>
Cc: Katy Fitzgerald <katy_fitzgerald@fws.gov>; PaDelford, Sue S. <Sue.PaDelford@jacobs.com>; Broadhead, Craig <Craig.Broadhead@jacobs.com>; Keim, Matthew <Matthew.Keim@BNSF.com>
Subject: [EXTERNAL] RE: [Non-DoD Source] BNSF Sandpoint Connector Project BA - Request for information

Hello Mr Williams – I just received your voicemail. Sorry for not responding sooner. BNSF and Jacobs are working on responses to your questions. We hope to have something back to you shortly. Thanks for following up.

Shelly Sugarman

From: Williams, Marshall <marshall_williams@fws.gov>
Sent: Wednesday, November 21, 2018 3:47 PM
To: Sugarman, Shelly CIV <Shelly.H.Sugarman@uscg.mil>; Fischer, Steven M CIV <Steven.M.Fischer3@uscg.mil>; Moore, James M CIV <James.M.Moore2@uscg.mil>
Cc: Katy Fitzgerald <katy_fitzgerald@fws.gov>; PaDelford, Sue S. <Sue.PaDelford@jacobs.com>; Broadhead, Craig <Craig.Broadhead@jacobs.com>
Subject: [Non-DoD Source] BNSF Sandpoint Connector Project BA - Request for information

Ms. Surgarman, and others;

I'm currently reviewing the Biological Assessment (BA) on the Sandpoint Connector Project and need some additional information for this consultation. The BA states that bull trout rearing and reproduction does not occur in the Project area (p. 44). While this is true, the BA also states the following:

"Adverse effects on survival and fitness can occur even in the absence of overt injury. Exposure to elevated noise levels can cause a temporary shift in hearing sensitivity (referred to as a temporary threshold shift), decreasing sensory capability for periods lasting from hours to days (Turnpenny et al. 1994; Hastings et al. 1996). Popper et al. (2005) found temporary threshold shifts in hearing sensitivity after exposure to cumulative SELs as low as 184 dB. Temporary threshold shifts reduce the survival, growth, and reproduction of the affected fish by increasing the risk of predation and reducing foraging or spawning success." p. 46.

If there is an indirect effect to "reproduction" or "spawning success" as a result of the proposed action that occurs later in time, and is reasonably certain to occur, it should be analyzed in the BA.

The referenced text from the BA is intended as a generalized statement regarding the potential effects to fish species from pile driving. Regarding the reference above, Popper (2005) clarifies in the section titled "Areas of Uncertainty and Studies Needed; Recommended Studies" that not enough is known about the long-term behavioral effects of pile driving on fish. Specifically, Popper notes "While there may be few or no apparent effects on immediate behavior (e.g., rapid swimming), physiology (e.g., hearing, effects on other organs), or mortality, there may be longer-term behavioral effects such as those from continual sounds from pile driving preventing fish from reaching breeding sites, finding food, hearing and finding mates, etc. This could result in long-term effects on reproduction and population survival." Unfortunately, the statement isn't validated with data.

While high-intensity noises may temporarily or permanently damage the hearing of fish, this is dependent on auditory thresholds and varies from species to species (Popper and Fay 1973, 1993). We couldn't find any information specific to bull trout, but Popper et al. (2005) did study sound threshold shifts in broad whitefish (Coregonus nasus), a salmonid that is assumed to hear similar to bull trout. After stimulation with five blasts of a seismic air gun, with a received mean peak sound level of about 205 dB re 1 µPa (a received mean SEL of about 175 dB re 1 µPa2 -s), the broad whitefish showed no temporary threshold shift. Two other species, northern pike (Esox lucius) (a hearing generalist) and lake chub (Couesius plumbeus) (a hearing specialist) showed 10-15 dB of hearing loss. Without specific data on bull trout, it isn't possible to determine if a temporary threshold shift is reasonably certain to occur, nor can we quantify the resultant effects to reproduction or spawning.

Popper et al. (2014) states the threshold for a temporary threshold shift (TTS) in species that exhibit hearing loss is 186 dB cumulative SEL (Popper 2014). This is only one dB less than the threshold for injury of 187 dB cumulative SEL (for fish greater than 2 grams) (WSDOT 2018). If we assume bull trout do exhibit hearing loss from pile driving (which is not known), then any bull trout within the zone of injury during pile driving could exhibit a temporary threshold shift for a short time afterward. These fish would be at risk for predation and reduced foraging success. However, due to the short duration of reduced hearing (less than 24 hours; Popper 2005), behavioral responses that may limit bull trout exposure in the zone of injury, and work occurring in relatively shallow water during daylight hours where bull trout are least likely to be present, these effects are discountable.

Initial questions, and observations that come to mind:

- In addition to temporary threshold shifts, Popper (2005) speaks to permanent threshold shifts. Are there long-term physiological effects from pile driving that will affect reproduction in bull trout? *Permanent hearing loss (i.e., PTS), resulting from exposure to very loud sounds, occurs in humans and other mammals. Permanent threshold shift is not known to occur in fish, since unlike mammals, they can repair and regenerate the sensory cells of the ear that are damaged (Lombarte et al., 1993; Smith et al., 2006). Because fish have the ability to repair damaged sensory hair cells and continuously add to their hair cell number, fish are not likely to ever become deaf permanently. This would indicate a long-term loss of hearing is not an indirect effect associated with pile driving.* or are the physiological effects from the action of short enough duration they will not affect bull trout reproduction that occurs outside of the action area? *Even if bull trout exhibit TTS while passing through the zone of injury, the effect would be temporary. Popper (2005) notes studied fish returned to their normal respective hearing thresholds within 18 to 24 hours. There are no bull trout spawning areas in the project action area. The nearest bull trout documented spawning area is Trestle Creek, approximately 8.6 miles from project pile driving activity. While avoidance of the area may delay bull trout migration into spawning streams during pile driving activities, the indirect effect of reduced hearing will not likely affect spawning in these areas. It is expected that hearing will have returned to normal prior to spawning occurring.*

- How big an impact on reproduction can be expected? For how long? *See response above. Affects associated with TTS can last up to 18-24 hours but are not expected to impact spawning success since the nearest spawning stream is approximately 8.6 miles from the project area.*

- An electronic search for "reproduction" and "spawning" of Popper (2005), cited directly before the statement on reproduction and spawning success, was unsuccessful; *See language above for the statement reference.* Turnpenny, et al, 1994, focused on marine fish where spawning may occur in the area of hydroacoustic activity, rather than migratory freshwater fish, and a search for reproduction within the document was unsuccessful, and spawning returned only one reference that wasn't applicable; I was not able to obtain a copy of Hasting, et al, 1996 to review - please provide an electronic copy for this consultation. *An electronic copy of the article is attached to this email.*

Bull trout use tributaries on Lake Pend Oreille for spawning reproduction. Since the BA states that hydroacoustic impacts can have an effects to reproduction or spawning success, please provide the analysis on those impacts.

The main mechanism of effect to bull trout spawning or reproduction is covered in the BA as the effect of delayed migration. If bull trout exhibit a behavioral response to pile driving and do not migrate through the project action area during pile driving, spawning could be delayed. However, minimization measures such as pile driving during daylight hours only, when bull trout are least likely to migrate, will minimize this effect.

Additional References Not Included in the BA:

Lombarte, A., H.Y. Yan, A.N. Popper, J.C. Chang, and C. Platt. 1993. Damage and regeneration of hair cell ciliary bundles in a fish ear following treatment with gentamicin. Hearing Research 66:166-174.

Popper, A.N. and R.R. Fay. 1973. Sound Detection and Processing by Teleost Fishes: Critical Review. Journal of the Acoustical Society of America 53(6):1515–1529. 1993.

_____. 1973. Sound Detection and Processing by Fish: A Critical Review and Major Research Questions. Brain Behavior and Evolution 41:14–39. February 1993.

Popper, A.N., A.D. Hawkins, R.R. Fay et al. 2014. Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI. Springer Briefts in Oceanography.

Smith, M.E., A.B. Coffin, D.L. Miller, and A.N. Popper. 2006. Anatomical and functional recovery of the goldfish (Carassius auratus) ear following noise exposure. Journal of Experimental Biology 209:4193-4202.

Thank you, Marshall Williams

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Fish and Wildlife Biologist

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Hastings et al 1996.pdf
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