UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
650 Capitol Mall, Suite 5-100
Sacramento, California 95814-4700

November 24, 2021

Ms. Tonia Herrera
Senior Engineer
Nevada Irrigation District
1036 West Main St.
Grass Valley, CA 95945

Re: Comments on the Draft Conceptual Design Report for the Nevada Irrigation District's (NID) Hemphill Diversion Structure

Dear Ms. Herrera:

The National Marine Fisheries Service (NMFS) has reviewed the Draft Conceptual Design Report (CDR) for the Nevada Irrigation District's (NID) Hemphill Diversion Structure. Staff also attended the online presentation portion of the Review of the Draft Conceptual Design for Hemphill Fish Passage Meeting held on November 15, 2021.

The environmental impact report (EIR) dated May 17, 2021, outlined a flat plate vertical screen as the preferred alternative. The CDR submitted on November 5, 2021, was the first time NMFS was made aware the proposed alternative outlined in the EIR was changed to a horizontal screen. While horizontal screens are in use, they are still considered experimental technology by NMFS and, therefore, NMFS must be consulted throughout the development of the design process. The process to evaluate experimental technology is described in Section 16 of the NMFS 2011 Anadromous Salmonid Passage Facility Design (NMFS 2011). NMFS has concerns with moving from a conceptual design for the horizontal screen directly to a 50% design within the next four weeks without the recommended collaborative process agreed upon in early 2021 meetings with NID.

Since January 2021 as NID entered into the EIR process, NMFS has emphasized the importance of collaborative project development. Once the fish passage alternative was approved by NID's board, we reached out to NID multiple times to schedule meetings with your consultant, so that we can assist with design recommendations and to prevent hiccups that may slow your desired accelerated schedule for construction in summer 2022. However, those collaborative meetings have not been accepted to-date. Going forward, NMFS would like to remind NID that it is imperative to have a full dialogue between NMFS and the design consultant in order to ensure that fish passage criteria are met and permitting can be achieved. We have fish passage engineering expertise that we would like engaged on all remaining project development.

In addition to establishing a meeting schedule with NMFS, we request that NID provide a detailed schedule outlining the 50-, 90-, and 100% design submittal packages, permitting timeline, and in-water construction dates. The horizontal screen design process submittals must

include modeling to demonstrate that sufficient hydrologic and hydraulic conditions are favorable at this location, in order to ensure that the facility will provide safe, timely, and effective passage for fish.

The criteria tables in the CDR list some metrics for juveniles and adults, but do not provide details of capabilities for juveniles (i.e., swimming speeds). Given that peak spawning for steelhead is between January to March, there could be rearing/migrating juveniles smaller than 100mm present during the irrigation season. All juveniles, and especially smaller ones, will have reduced capabilities compared to adults.

Fish Screen #2 for future expansion is shown on the plan set. Please clarify if it is being built now and just not used or if it will be phased in at a future date. If it is being phased in, when is the second screen proposed to be built? NMFS cannot consult on multiple alternatives, so please confirm that the 20 cfs screen is part of the proposed project. For all questions asked by NMFS, provide analysis and responses for both the single 10 cfs screen and the full proposed future buildout for the 20 cfs screen.

Horizontal Screens

Horizontal screens have been evaluated as experimental technology, because they operate fundamentally differently from conventional vertically oriented screens. This fundamental difference relates directly to fish safety, because when inadequate flow depth exists with vertically oriented screens, there is no potential for fish to get trapped over the screened surface. In contrast, when the water level on horizontal screens drops and most or all diverted flow goes through the screens, there is a high likelihood that fish will become impinged and killed on the screened surface. In addition, if depths become shallow and flow rate is high over a horizontal screen, the resulting cross-section velocity may be too high to allow fish to swim away from the horizontal screen surface (NMFS 2011).

Table 2-6 references NMFS Section 11.9.3.7 for the change Bypass Flow Criteria. Please reference the Horizontal Screen Section 11.6.1.7.8 Bypass Flow Amount.

Below are sections quoted from NMFS 2011 describing criteria for use of a horizontal screen. After each section, NMFS provides comments or questions (italicized) that were not addressed in the CDR or plan set.

<u>Section 11.6.1.7.2 Hydrologic and Hydraulic Analysis:</u>

Calls for hydrologic and hydraulic analyses to be performed to demonstrate required conditions can be maintained throughout the entire juvenile outmigration season. Part of the analysis is to ensure there is adequate bypass flow required for the horizontal screen and for the stream channel for all flow conditions during outmigration.

> *Flow Splits: Please provide what the flow split will be between the canal (horizontal screen diversion flow plus bypass flow with adequate depth on the screen) and the roughened ramp for the daily low flow during the irrigation season. Identify splits for the single 10 cfs screen and the full proposed future build out for 20 cfs.*

Is there sufficient stream flow (down the ramp) and screen bypass flow available at all times during irrigation season when the horizontal screen is in use for both the single 10 cfs screen and the full proposed future buildout for 20 cfs?

Section 11.6.1.7.3 Screen Geometry:

Horizontal screens must be set at specific slopes and geometry consistent with prototypes approved by NMFS. The screen design must include reference material for an example prototype that confirms the adequacy of the design.

Please provide reference material for an example prototype of comparable size installed in a watershed with similar basin characteristics.

Section 11.6.1.7.5 Flow Regulation:

Describes the need for a good headgate.

Please provide design details for the proposed headgate and its operational schedule for regulating flows on the horizontal screen and bypass.

Section 11.6.1.7.6 Channel Alignment:

Horizontal screens must be installed such that the approaching conveyance channel is completely parallel and in line with the screen channel (no skew), so uniform flow conditions exist at the upstream edge of the screen. A straight channel should exist for at least twenty feet upstream of the leading edge of the horizontal screen, or up to two screen channel lengths, if warranted by approach flow conditions in the conveyance channel. Flow conditions that require a longer approach channel include turbulent flow, supercritical hydraulic conditions, or uneven hydraulic conditions in a channel cross section. Horizontal screens must be installed such that a smooth hydraulic transition occurs from the approach channel to the screen channel (no abrupt expansion, contraction, or flow separation).

Please provide a hydraulic analysis for the approach flow conditions in the conveyance channel.

What is the length of the inlet flume? Is it adequate to provide a smooth hydraulic transition to the screen face?

Section 11.6.1.7.7 Bypass Flow Depth:

Sufficient flow depth is required to prevent underwatering of a screen and to ensure adequate fish passage.

Please provide hydraulic analysis that demonstrates the minimum depth of 1 foot will be achieved at all times during irrigation season over the downstream end of the screen.

How will the bypass for fish screen #1 and #2 be coordinated? How will the depth change when screen #2 is put online?

Section 11.6.1.7.8 Bypass Flow Amount:

Bypass flow is used for transporting fish and debris across the plane of the screen and through the bypass conveyance back to the stream. Bypass flow amounts must be sufficient to continuously provide the hydraulic conditions specified in this section, and bypass conditions specified in section 11.9. In general, for diversion rates less than 100 cfs, about 15% of the total diverted flow should be used as bypass flow for horizontal screens. For diversion rates more than 100 cfs, about 10% of the total diverted flow should be used for bypass flow for horizontal screens. Small horizontal screens may require up to 50% of the total diverted flow as bypass flow. The amount of bypass flow must be approved by NMFS engineers.

Please provide hydraulic analysis that shows how the required bypass flow amount will be achieved.

How will the bypass for fish screen #1 and #2 be coordinated? How will the additional flow amount change the hydraulics in the pipe and at the outfall?

Section 11.6.1.7.9 Diversion Shut Off:

If inadequate bypass flow exists at any time (per Sections 11.6.1.7.7 and 11.6.1.7.8), the horizontal screen design must include an automated means to shut off the diversion flow, or a means to route all diverted flow back to the originating stream.

Table 2-4 states manual control is sufficient. Please clarify how this meets the automated Diversion Shut Off requirement.

Section 11.6.1.7.10 Sediment Removal:

The horizontal screen design must include means to simply and directly remove sediment accumulations under the screen, without compromising the integrity of the screen while water is being diverted.

As outlined in NMFS' comments in the EIR dated May 17, 2021, Northwest Hydraulic Consultants, Inc.'s (NHC) 2021 report titled "Hemphill Diversion Structure and Fish Passage Assessment – Final Report (NHC-Final Report) states on page 26, regardless of the final fish screen design, we [NHC] recommend conducting a hydraulic analysis of the preferred alternative to understand the hydraulics and sediment transport in and around the screen. NMFS agreed with NHC's recommendation to conduct a hydraulic analysis of the preferred alternative to understand the hydraulics and sediment transport in and around the screen. Given the geologic conditions along Auburn Ravine, and the observed sediment accumulation, plugging of the horizontal screen is a consideration that should be addressed.

Please provide the results of the hydraulic and sediment analysis for the Horizontal Screen.

Please describe the sediment removal and cleaning system and the likelihood of small sediment being lodged in the openings in the screening material.

Include in the maintenance and operation plan how the water to the canal will be shut down if the screen needs to be cleaned during fish migration periods to not trap/strand fish.

Section 11.6.1.7.11 Screen Approach Velocity:

Recent prototype development has demonstrated that better self-cleaning of a horizontal screen is achieved when the ratio of sweeping velocity and approach velocity exceeds 20:1, and *approach velocities* are less than 0.1 ft/s.

Following CDFW criteria for screens that are not self-cleaning, allowable approach velocity should be less than 0.1 ft/sec, lining up with NMFS' findings from prototype type development.

Section 11.6.1.7.12 Screen Sweeping Velocity:

For horizontal screens, the sweeping velocity should never be less than 2.5 ft/s and must gradually increase for the entire length of the screen. Higher sweeping velocities may be required to achieve reliable debris removal and to keep sediment mobilized.

Please provide hydraulic and bedload analysis through the canal to demonstrate the required sweeping velocity is adequate or if additional flow may be required.

Section 11.6.1.7.13 Screen Cleaning:

For passive horizontal screens, *approach velocity* and *sweeping velocity* must work in tandem to allow self-cleaning of the entire screen face and to provide good bypass conditions.

Please provide hydraulic analysis and modeling that demonstrates sweeping flow for a passive screen will provide similar cleaning and hydraulic characteristics to a successful prototype.

Section 11.6.1.7.14 Inspection, Maintenance and Monitoring:

Daily inspection and maintenance must occur for the screen and bypass to maintain operations consistent with these criteria. Post-construction monitoring of the facility must occur daily for at least the first year of operation. This monitoring must occur whenever water is diverted, and include a inspection log (in table form) of date and time, water depth at the bypass, debris present on screen (including any sediment retained in the screen openings), fish observed over the screen surface, operational adjustments made, maintenance performed and the observer's name. A copy of the inspection log must be provided annually to the NMFS design reviewer, who will review operations and make recommendations for the next year of operation.

Please provide a fully developed Inspection, Maintenance and Operating and Monitoring plan with the 50% design.

General Questions

- Will the new 24-inch pipe be under pressure flow at any time?
- How will the inlet flume and the future fish screen be coordinated?
- What are the velocities coming out of the 24-inch pipe?
- Will the canal bank need to be enforced for any scour potential at the outlet of the 24-inch pipe?
- Table 2-6 shows the bypass flow as 5% of the total diverted flow citing section 11.9.3.4. For the Horizontal Screen Section 11.6.1.7.8 Bypass Flow Amount states, for diversion rates less than 100 cfs about 15% of the total diverted flow should be used as bypass flow for horizontal screens. Small horizontal screens may require up to 50% of the total diverted flow as bypass flow. Please use the bypass flow criteria found in the section for horizontal screen design.
- Please show the juvenile bypass outfall location in the profile for the rock ramp on the drawing.
- What is the velocity in the scour pool by juvenile bypass outfall at the end of the rock ramp?
- Please provide a cross-section that shows the low flow channel in the rock ramp.
- What is the flow capacity of the canal?
- How wide and how long is the horizontal screen?
- When Screen #2 is put online, will there be flow control to shut one of the screens down if flows are low or maintenance needs to be performed?
- If the boulders need to be anchored what is the method that will be used?

Thank you for the opportunity to review and comment on the Draft Conceptual Design Report. NMFS recommends setting up technical meetings as soon as possible and recurring on a frequent basis to cover the concerns and recommendations listed here in order to keep the project moving forward in a direction that can meet the permitting requirements of the Placer County Conservation Plan.

Please contact our office at your earliest convenience to schedule our first meeting to discuss design recommendations.

Please direct questions regarding this letter to Jean Castillo at the NMFS California Central Valley Office at 916-930-3613 or jean.castillo@noaa.gov.

Sincerely,

Ellen Roots McBride
Sacramento River Basin Branch Chief

cc: To the File ARN 151422-2021-SA00137
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