Sheth, Gary

From: Neal.Brown@aps.com
Sent: Tuesday, June 5, 2018 1:57 PM
To: Sheth, Gary
Subject: RE: San Juan intake to Morgan Lake
Attachments: san juan river pumping plan presentation.pdf; Four Corners Power Plant San Juan River Intake Pumping Plan Proposal (2-....docx

Hi Gary-

Per your request, the pumping plan for the river station at Four Corners is attached.

Please let me know if you have any questions or require additional information.

Thank you,

NEAL BROWN
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From: Sheth, Gary [mailto:Sheth.Gary@epa.gov]
Sent: Friday, June 01, 2018 2:59 PM
To: Brown, Neal W
Subject: San Juan intake to Morgan Lake

Hello Neal,

Could you please provide me with updated details of the pump station plan for intake of water from the San Juan River to Morgan Lake at your earliest convenience.

Thanks,

Gary

Gary Sheth
NPDES Permits Section (WTR-2-3)
Water Division
USEPA Region 9
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February 7, 2017

Four Corners Power Plant San Juan River Intake Pumping Plan Proposal

Reasonable and Prudent Measure #2 of the Biological Opinion for Four Corners Power Plant and Navajo Mine Energy Project states:

> *Project Proponents will develop and implement a Pumping Plan to reduce the magnitude and types of entrainment of Colorado pikeminnow and razorback sucker. The Pumping Plan will optimize avoidance of entrainment of larvae and impingement of larger fishes through measures that are deemed feasible without altering the current operating configuration at the river pump station.*
>
> *a. The Pumping Plan measures shall be developed with the oversight of OSMRE and the approval of the Service.*
>
> *b. The final Pumping Plan shall be implemented within 2 years of issuance of a Record of Decision.*

APS investigated various options to minimize entrainment and impingement of endangered fish at the Four Corners Power Plant intake on the San Juan River*. As a result APS proposes the following Pumping Plan:

1. Reduce intake velocity by connecting the pump train sumps

   The Pumping Station has two independent pump trains with separate intake screens and suction sumps. APS intends to connect the sumps. That will reduce the screen approach and through screen velocities by up to 50% during one train operation. The intake screen velocities will remain unchanged during two train operation. However, the River Station will operate in one train operation the majority of the time.

2. Strategic pump outages

   The pump trains will not be operated during a two week period in the fall starting when Colorado pikeminnow stocking occurs upstream of the APS pump station. Additionally, if and when USFW determines that Colorado pikeminnow are spawning upstream of the APS pump station, APS and USFW will work together to establish an optimum two week pump train outage when larvae are likely to be present.

3. Existing intake screen opening size selected as optimal for pump station

   An engineering investigation indicated that reducing the current screen size openings would not be beneficial. Reducing the opening size would increase through screen velocity, counteracting the velocity reduction obtained by connecting the sumps. Additionally, smaller screen openings would result in more rapid screen blockage, causing the through screen velocity to further increase. As such, the existing intake screen opening was selected as optimal for the pump station.

* *See* Four Corners Power Plant San Juan River Pumping Plan Presentation to USFW and OSM on December 6, 2016

Four Corners Power Plant
San Juan River Pumping Plan

December 06, 2016

San Juan River Pumping Plan

San Juan River Pumping Plan

San Juan River Pumping Plan

San Juan River Pumping Plan

San Juan River Pumping Plan

San Juan River Pumping Plan

- **Conservation Measures**
  - 4. Project Proponents will develop and implement a Pumping Plan to reduce the magnitude and types of entrainment of Colorado pikeminnow and razorback sucker. The Pumping Plan will optimize avoidance of entrainment of larvae and impingement of larger fishes through measures that are deemed feasible without altering the current operating configuration at the river pump station.
    - a. The Pumping Plan measures shall be developed with the oversight of OSMRE and the approval of the Service.
    - b. The final Pumping Plan shall be implemented within 2 years of issuance of a Record of Decision.

San Juan River Pumping Plan

- **Reasonable and Prudent Measures**
  - 2. RPM 2) Project Proponents will develop and implement a Pumping Plan to reduce the magnitude and types of entrainment of Colorado pikeminnow and razorback sucker. The Pumping Plan will optimize avoidance of entrainment of larvae and impingement of larger fishes through measures that are deemed feasible without altering the current operating configuration at the river pump station.
    - a. The Pumping Plan measures shall be developed with the oversight of OSMRE and the approval of the Service.
    - b. The final Pumping Plan shall be implemented within 2 years of issuance of a Record of Decision.

San Juan River Pumping Plan

- **Terms and Conditions**
  - 2. To implement RPM 2 (Project Proponents shall minimize entrainment and impingement losses of Colorado pikeminnow and razorback sucker through measures taken at the APS cooling water intakes above APS Weir).
    - a. Project Proponents, in consultation with the Service, will develop a Pumping Plan that will identify optimal times to restrict pumping, provided the restrictions are reasonable and prudent and, that will minimize the entrainment injury of endangered fish larvae; and, that will use screening technology to minimize injury to endangered fishes
    - b. Project Proponents will implement the Pumping Plan within two years of issuance of a Record of Decision.

San Juan River Pumping Plan

- Operational modifications investigated (shared with USFW Jan., 2016)
  - Reduce intake velocity
  - Strategic pump outages
  - Reduce intake screen size

San Juan River Pumping Plan

- Proposed operational modifications
  - Connect pump train sumps to reduce approach and through screen velocity.
  - Strategic pump outage(s)

San Juan River Pumping Plan

- Connect Pump Train Sumps
  - APS has determined connecting the pump train sumps is feasible and will result in significant approach and through screen velocity reductions during one train operation.

San Juan River Pumping Plan

Existing Average Approach and Through Screen Velocities under Various Train Operation and Water Elevations

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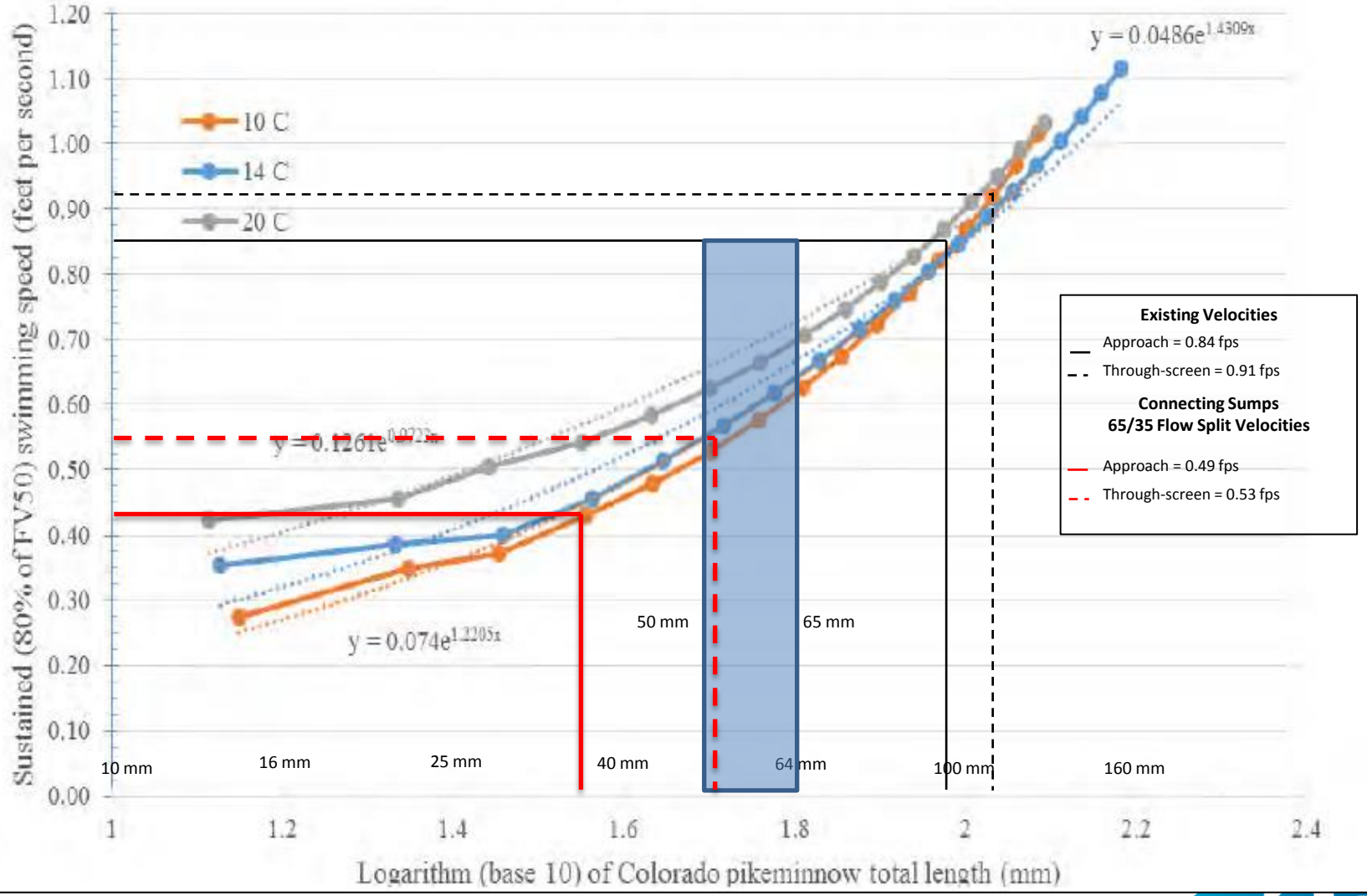
Scenario	Scenario Description	Approach Velocity (fps)	Through-Screen Velocity (fps)
1	One Train Operation and Low Water Level	0.84	0.91
2	One Train Operation and High Water Level	0.63	0.68
3	Two Train Operation and Low Water Level	0.74	0.81
4	Two Train Operation and High Water Level	0.56	0.61

San Juan River Pumping Plan

Estimated Approach and Through-Screen Velocities and Percent Reduction by Connecting Sumps

Velocities	Existing Condition with Separate Sumps	Combined Sumps with 65/35 Split	Percent Reduction	Combined Sumps with 50/50 Split	Percent Reduction
Approach Velocity (fps)	0.84	0.49	43%	0.42	50%
Through-Screen Velocity (fps)	0.91	0.53	43%	0.45	49%

Estimated relationship between Colorado pikeminnow total length and sustained swimming speed at different water temperatures (10 C, 14 C, and 20 C) (based on Childs and Clarkson 1996)



San Juan River Pumping Plan

- Connect pump train sumps (cont.)
  - Hydraulic zone of influence
    - Hydraulic zone of influence is the portion of the water body affected by the cooling water intake structure withdrawal of water.
    - The HZI extends to the approximate boundary where hydraulic velocities from the intake fall below the ambient hydraulic velocities in the water body resulting from the currents.
    - The existing HZI radius ranges from 3.3 - 0.7ft. The normal HZI is about 1 ft (<1% of the river).
    - July/Aug. and Oct./Nov. HZI radius is <0.5 ft after sump modification

San Juan River Pumping Plan

- Connect pump train sumps (cont.)
  - With the closure of Units 1-2-3 FCPP will maintain one pump train operation the majority of the time
  - FCPP may operate both pump trains under the following conditions:
    - A lake level of less than 5325.5 feet (1.5 feet of water less than full pool)
    - A lake temperature > 83 Deg F or 2 Deg F greater than the 3 year average for any date

San Juan River Pumping Plan

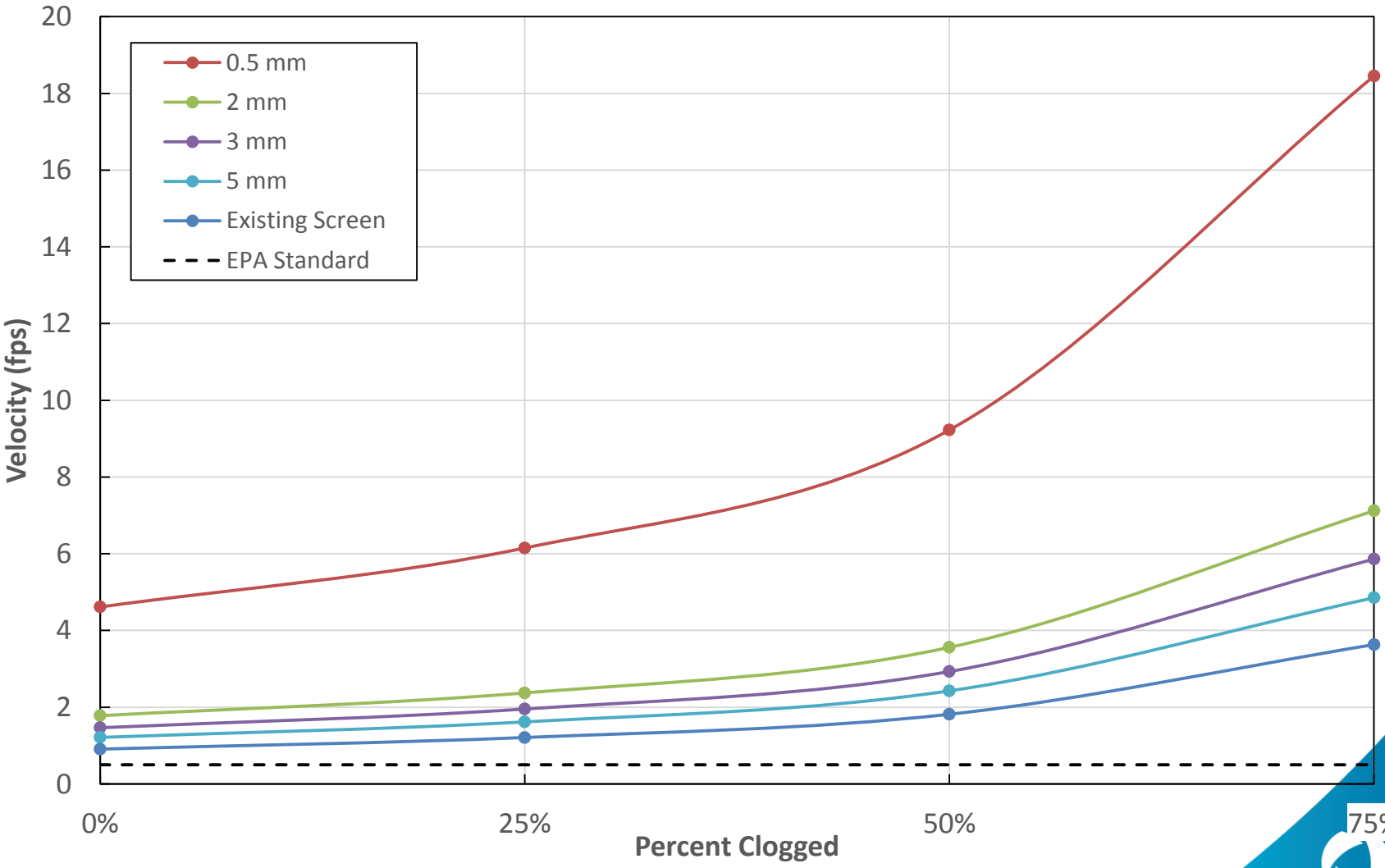
- Strategic Pump outages
  - Two week outage when CPM stocked in the Fall (already in practice)
  - Potential two week outage at peak of CPM spawning season, after confirmed CPM spawning above APS Weir

San Juan River Pumping Plan

- Reduce intake screen size opening
  - APS has determined that reducing screen size alone would not be beneficial.
  - Assessed feasibility of fine mesh screens with mesh sizes of 0.5, 2, 3, and 5 mm
    - Smaller openings will significantly increase the through-screen velocities (TSVs) as compared to existing
    - Debris loading and screen clogging have significant effect on headloss and TSV.

San Juan River Pumping Plan

Through Screen Velocities of Various Screen Mesh Sizes - Fine Mesh Screens Alone



San Juan River Pumping Plan

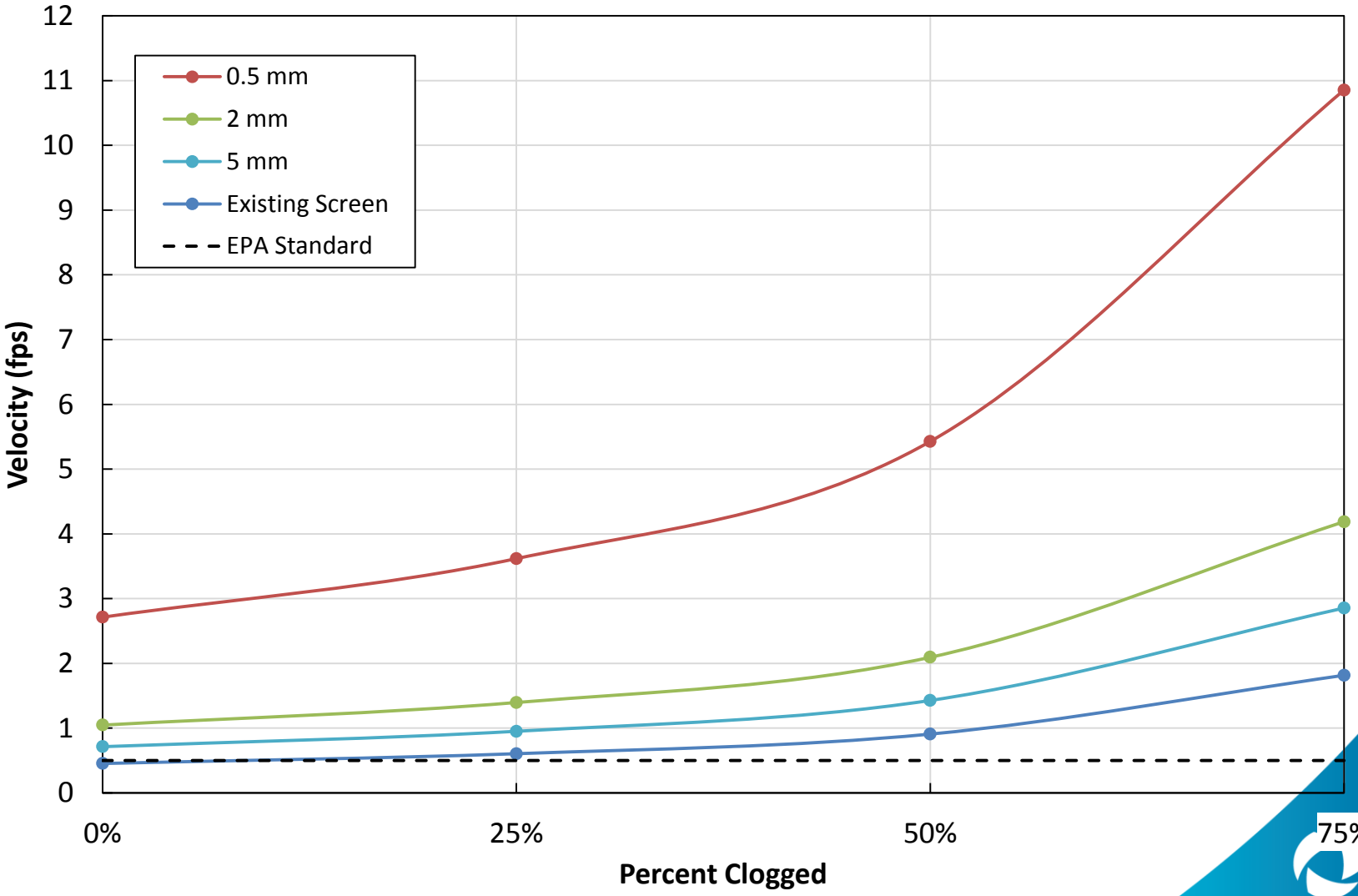
- Reduce intake screen size opening (cont.)
  - Assessed feasibility of fine mesh screens with mesh sizes of 0.5, 2, and 5 mm and connecting sumps
    - Combining the alternatives works against one another (i.e. smaller mesh equals higher velocities)
    - Screen opening cannot be reduced to physically exclude newly hatched larvae
      - Only 0.5-mm fine-mesh screens would physically exclude newly hatched larvae (5.0 to 6.5 mm)
      - 0.5-mm intake screens would unacceptably reduce pump head.
      - TSVs are higher than 5.4 fps at greater than 50 percent clogging
      - Entrained larvae would become impinged

San Juan River Pumping Plan

- Reduce intake screen size opening
  - 2 and 5-mm fine-mesh screens may be technically feasible but TSVs are significantly higher than the EPA recommended 0.5 fps and the existing intake screens
  - Screen opening less than 6.0 mm would physically exclude the stocked 6-month old CPM (50 to 65 mm)
    - TSV is above the sustained swimming speed for stocked CPM for 2 mm
    - TSV is above the sustained swimming speed for stocked CPM for 5 mm mesh
  - Based on operating experience with current screens, APS expects smaller screens may be operationally infeasible

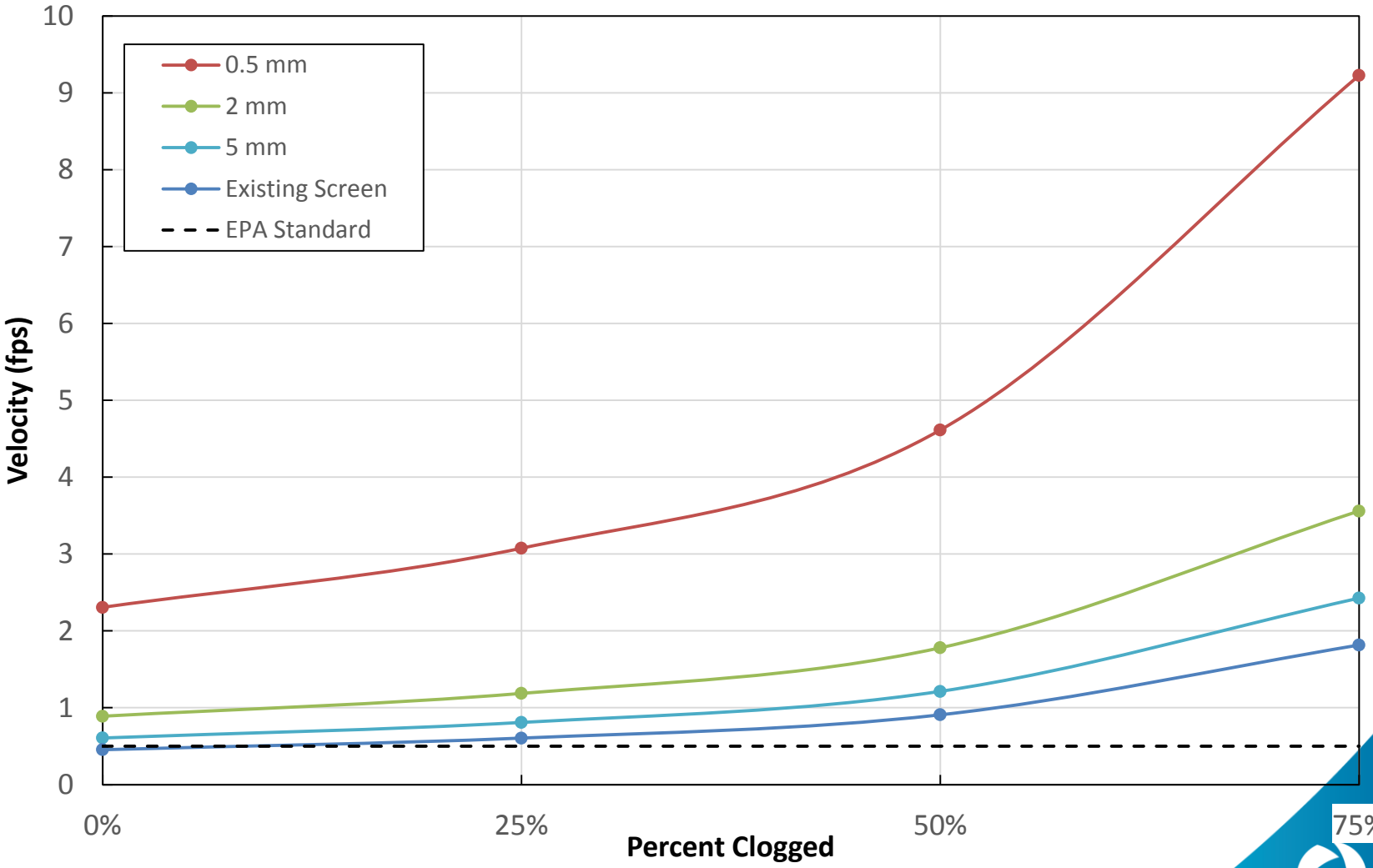
San Juan River Pumping Plan

Through Screen Velocities Using Combined Sumps (65/35 Flow Split) and Fine Mesh Screens

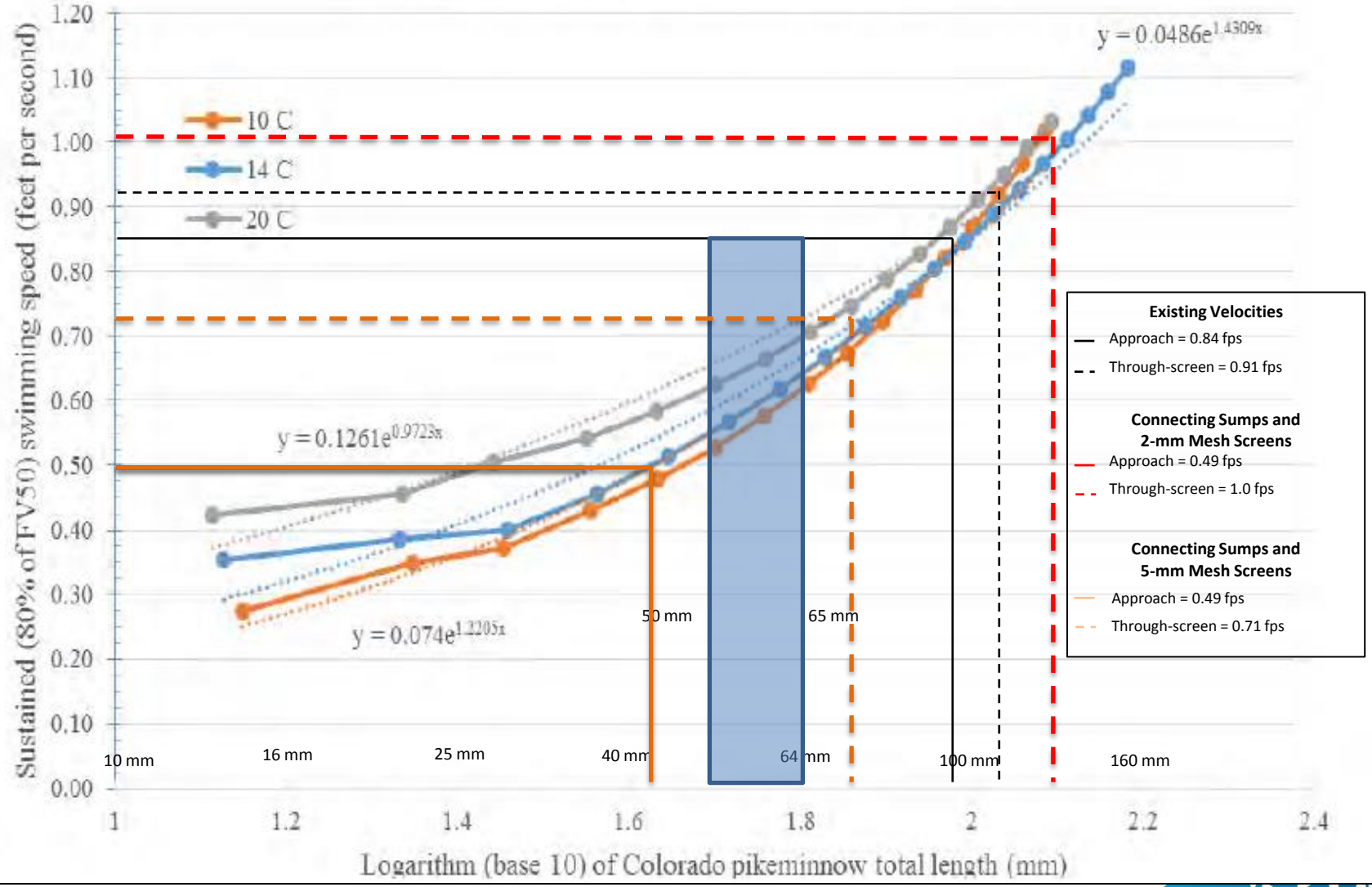


San Juan River Pumping Plan

Through Screen Velocities Using Combined Sumps (50/50 Flow Split) and Fine Mesh Screens



Estimated relationship between Colorado pikeminnow total length and sustained swimming speed at different water temperatures (10 C, 14 C, and 20 C) (based on Childs and Clarkson 1996)



San Juan River Pumping Plan

- Pumping Plan
  - Connect pumping train sumps to reduce approach and through screen velocities during one train operation
  - Strategic pumping station outages
  - Maintain existing inlet screens

Morgan Lake Blowdown Non-escapement Device

- Conservation Measures
  - 5. Project Proponents will develop and implement a Non-native Species Escapement Prevention Plan, which will include the following measures to minimize: (a) the risk of nonnative species (plants, invertebrates, and fish) that inhabit Morgan Lake invading San Juan River; and (b) the introduction of additional nonnative species into Morgan Lake.
    - a. Project Proponents will develop and disseminate public education materials regarding the threat of non-native species targeted to recreational users of Morgan Lake. The materials will recommend practices to prevent the introduction of new nonnative species to Morgan Lake or the transfer of existing nonnative species from Morgan Lake to the San Juan River.
    - b. Project Proponents will install and operate a device designed to prevent the transfer of nonnative fish species from Morgan Lake to the San Juan River.

Morgan Lake Blowdown Non-escapement Device

- Reasonable and Prudent Measures
  - 3. RPM 3) Project Proponents will develop and implement a Non-native Species Escapement Prevention Plan, which will include the following measures to minimize: (a) the risk of non-native species (plants, invertebrates, and fish) that inhabit Morgan Lake invading San Juan River; and (b) the introduction of additional nonnative species into Morgan Lake.
    - a. Project Proponents will develop and disseminate public education materials regarding the threat of non-native species targeted to recreational users of Morgan Lake. The materials will recommend practices to prevent the introduction of new nonnative species to Morgan Lake or the transfer of existing nonnative species from Morgan Lake to the San Juan River.
    - b. Project Proponents will install and operate a device designed to prevent the transfer of nonnative fish species from Morgan Lake to the San Juan River.

Morgan Lake Blowdown Non-escapement Device

- Terms and Conditions
  - 3. To implement RPM 3 (Federal agencies and Project Proponents shall develop and implement a Nonnative Species Escapement Prevention Plan).
    - a. Federal agencies and Project Proponents will work with others to develop and implement a Nonnative Species Escapement Prevention Plan.
    - b. A risk management approach will be used to identify, evaluate, treat, monitor, and prevent existing or novel nonnative species in Morgan Lake from invading the San Juan River
    - c. The Project Proponents will contribute information to the Navajo Nation Department of Fish and Wildlife for the comprehensive inventory of nonnative species that occur in Morgan Lake that may pose a threat to endangered fishes in the San Juan River. . This may include, but are not limited, invasive plants, invertebrates including mollusks, and especially nonnative fish.
    - d. Educational materials and the device installed to prevent nonnative fish release will be developed and designed based on risk posed by the nonnative species detected, their life histories and any potential for those species to transport or disperse through the FCPP facilities, the risks of escapement, and the consequences of such escapement to endangered fishes in the San Juan River.
    - e. Working with the federal agencies, the Proponents will select and implement those reasonable and prudent educational measures and device design necessary to contain, treat, or manage nonnative species that pose the greatest risks of escapement into the San Juan River and to the endangered fishes or their critical habitat
    - f. Monitor the containment or treatment implemented and report on nonnative species in Morgan Lake, their risks of escapement, and the measures implemented to contain or treat those risks, and any educational and outreach efforts within three years of issuance of a Record of Decision.

Morgan Lake Blowdown Non-escapement Device

Spill Contingency Countermeasures Plan

- Conservation Measures
  - 8. Project Proponents shall provide a Spill Contingency Countermeasures Plan which addresses potential Ash Pond Failure impacts on suitable habitat of Colorado pikeminnow, razorback sucker, southwestern willow flycatchers or yellow-billed cuckoos.
    - a. All necessary equipment, training, and materials will be made available for emergency response to a potential Ash Pond Failure.
    - b. A practice response table-top drill with appropriate authorities will be conducted every 10 years.

Spill Contingency Countermeasures Plan

- Reasonable and Prudent Measures
  - 6. RPM 6) FCPP Project Proponents will minimize potential takes of Colorado pikeminnows, razorback suckers, flycatchers, or cuckoos by providing a Spill Contingency Countermeasures Plan which addresses potential Ash Pond Failure impacts on suitable habitat.
    - a. All necessary equipment, training, and materials will be made available for emergency response to a potential Ash Pond Failure as soon as feasible.
    - b. A practice response table top drill with appropriate authorities will be conducted every 10 years for the duration of the Project.

Spill Contingency Countermeasures Plan

- Terms and Conditions
  - 6. To implement RPM 6 (Provide Spill Contingency Countermeasures Plan for Ash Pond Failure) the federal action agencies shall:
    - a. Direct Project Proponents to submit for review and approval a Spill Contingency Countermeasures Plan which addresses potential Ash Pond Failure impacts on suitable habitat, including plans to make available all necessary equipment, training;
    - b. Promptly submit the final amended Spill Contingency Countermeasures Plan to the federal action agencies and the Service's NMESFO
    - c. Direct Project Proponents to conduct an initial practice response (table-top) drill with appropriate authorities within ten years of issuance of a record of decision