

Selection of appropriate screen aperture for fish exclusion - balancing environment and operations

IFM - Fish Impingement and Entrainment Conference

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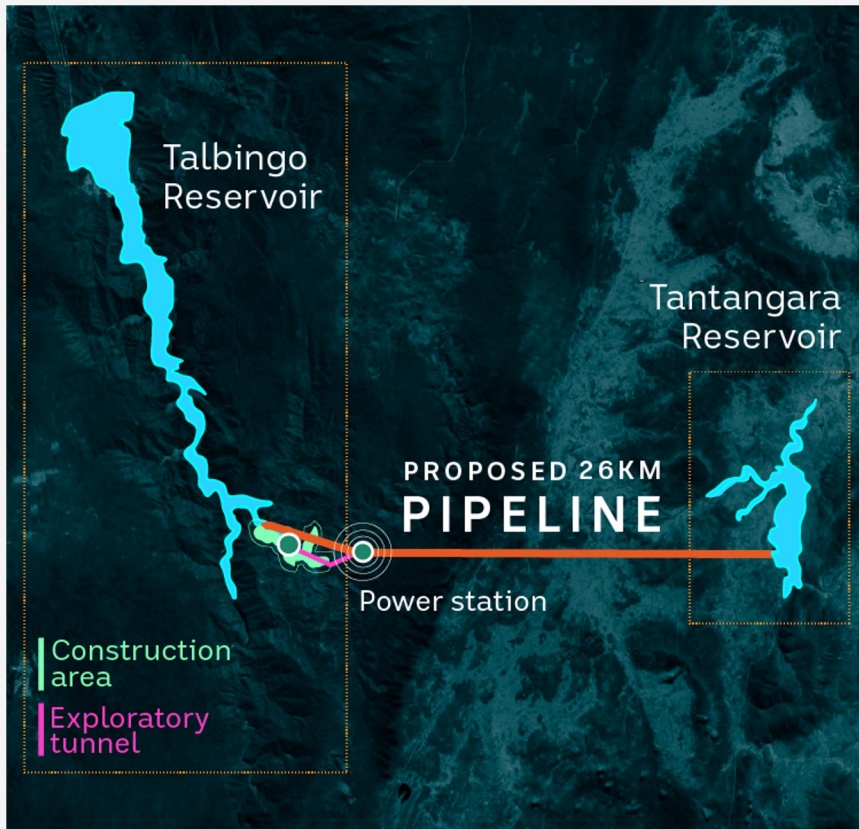
The Snowy Scheme and Snowy Hydro



- The Snowy Scheme is a hydroelectricity and irrigation system located in SE Australia and operated by Snowy Hydro
- The scheme consists of nine power stations, 16 major dams, 80 kilometres of aqueducts and 145 kilometres of interconnected tunnels
- Construction ran from 1949 to 1974
- The project was rated as one of the civil engineering wonders of the modern world in 1967 by the American Society of Civil Engineers.
- Led to the creation of the Kosciusko National Park

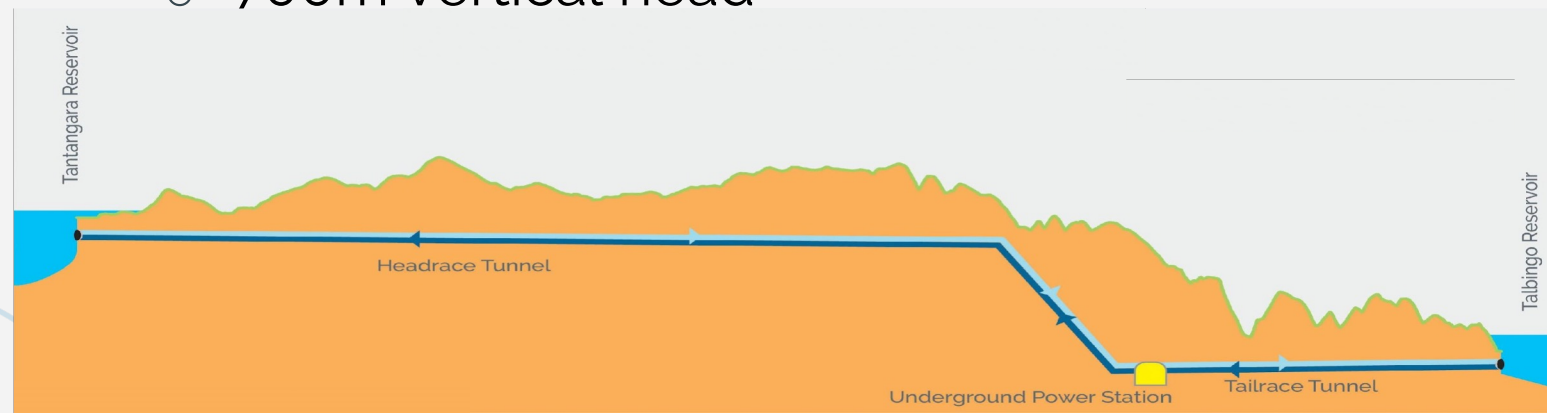
What is Snowy 2.0?

Pumping when there's surplus capacity on energy market

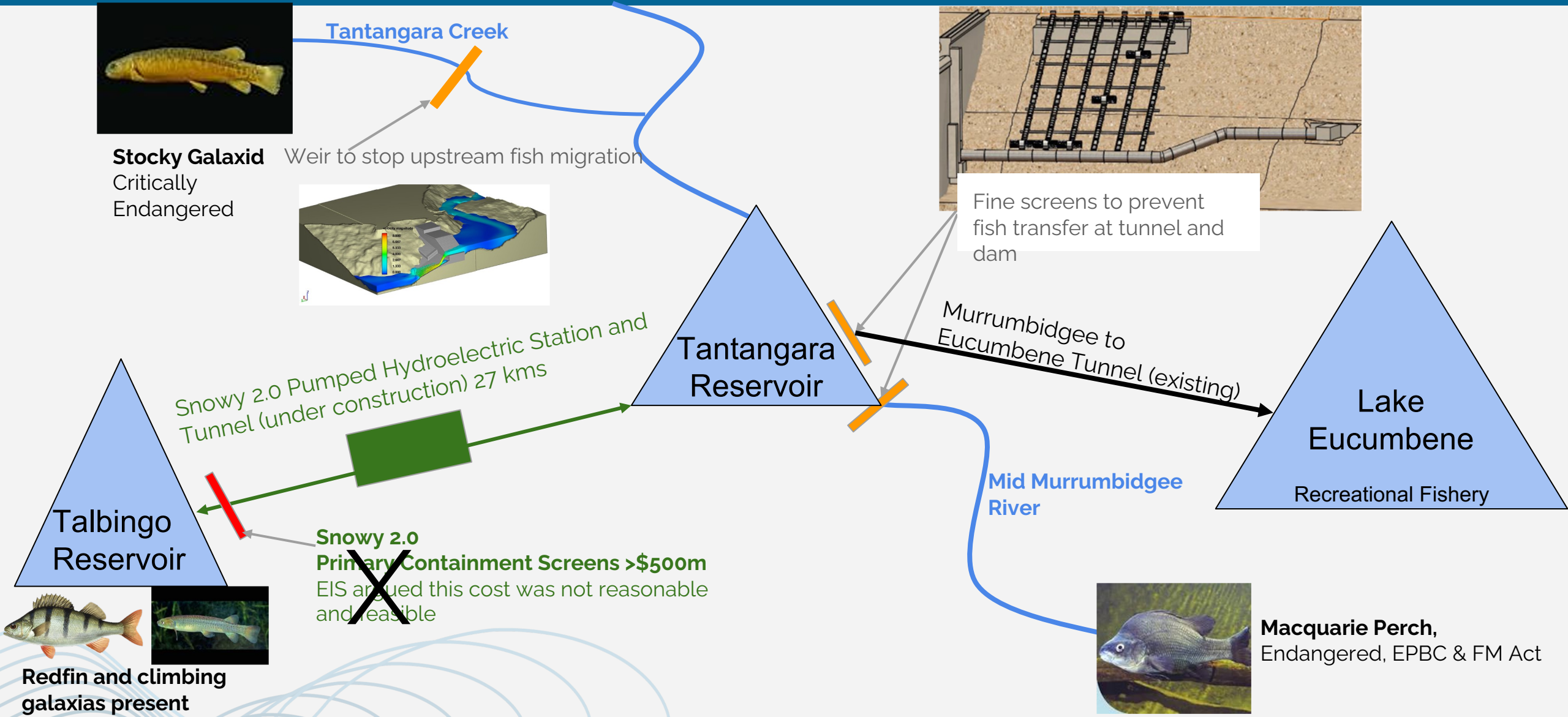


- 2000MW Pumped Hydro Development connecting 2 existing scheme reservoirs
- Tantangara – Upper Reservoir (1229 m AHD)
- Talbingo – Lower Reservoir (545 m AHD)
- 27 km of 10m diameter power waterway
- 700m vertical head

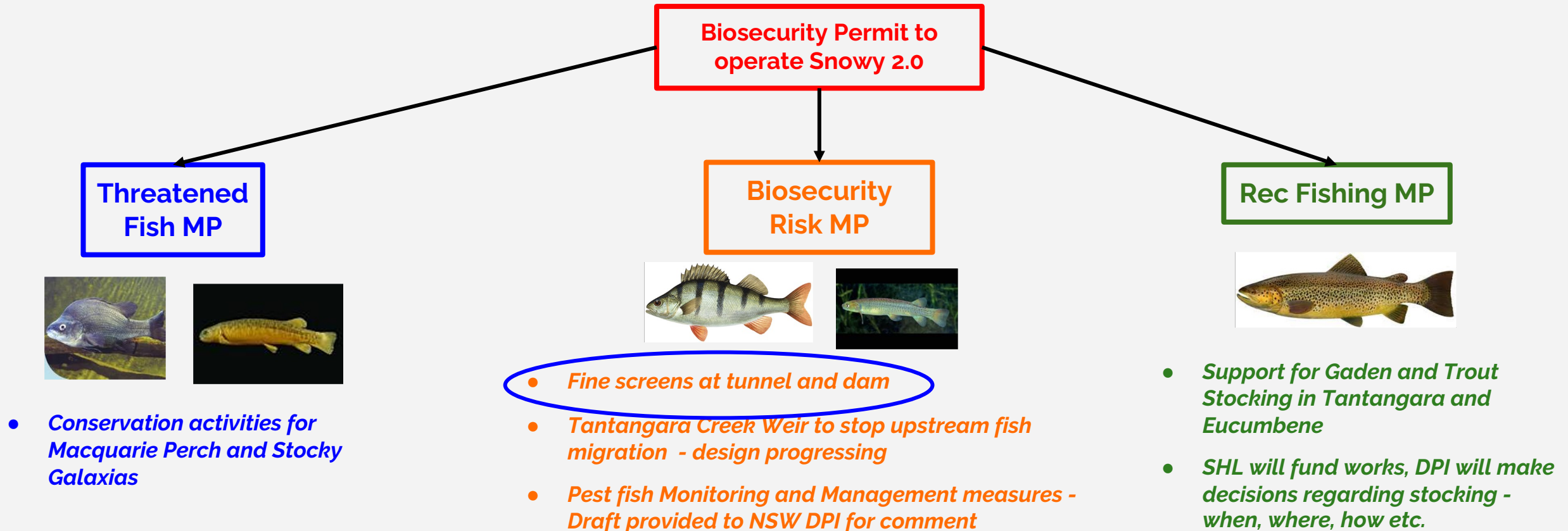
Generating when high electricity demand



Overview of aquatic risks and controls associated with Snowy 2.0



Approvals Framework



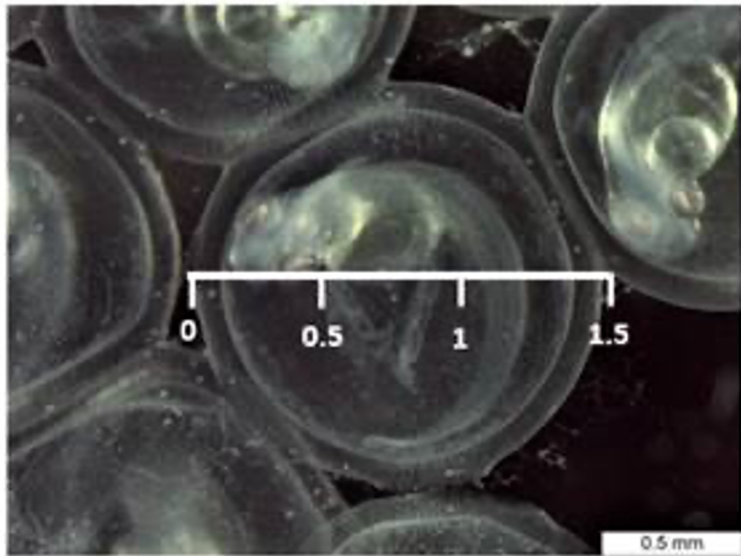
Failure of the screens or weir (Pest Fish Invasion) will trigger

- Pest fish control measures
- Additional ongoing support for Threatened Fish and Rec Fishing MPs
- Potential EPBC offsets

Testing Screen Effectiveness

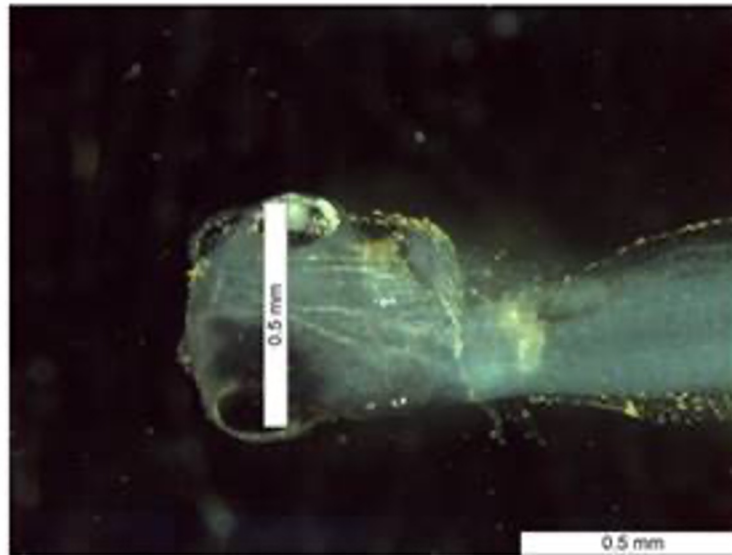
Single redfin egg, approximately 11-12 days (hatching in 1-2 days following development).

Size: 1.4 mm



Redfin larvae, approximately 2-4 days post hatch.

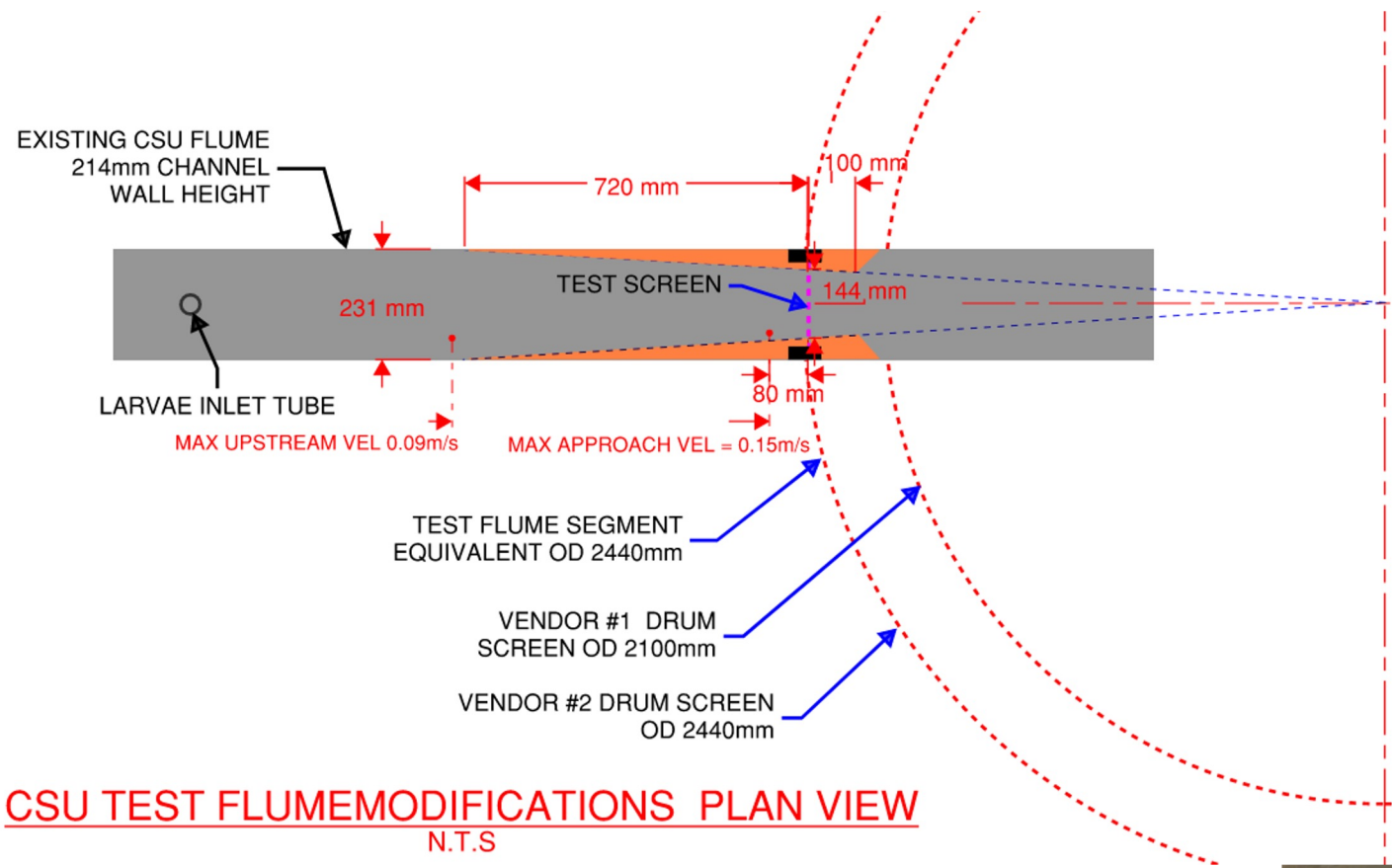
Size: 0.5 mm



Rough dimensions of Redfin eggs and larvae, minimum is 2-4 DPH

Early testing with Chia seeds highlight the maintenance issues

Testing Screen Effectiveness - (Doyle et al. 2023)



Methodology:

1. Developing and building flume
2. Collecting and rearing of eggs and larvae at CSU
3. Optimising experimental design parameters including duration of experiments
4. Undertaking replicated experimental exclusion trials
5. Data Analysis



Testing Screen Effectiveness - (Doyle et al. 2023)



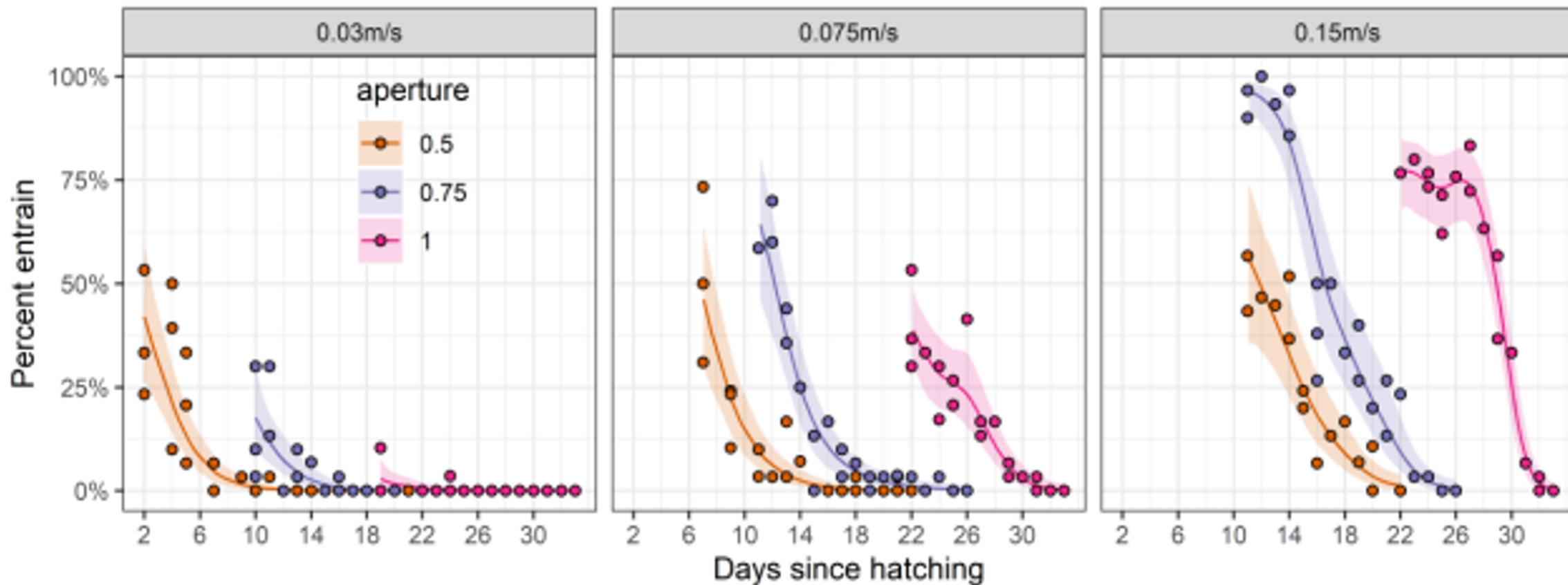
Testing was undertaken based on the following:

- Screen aperture - 0.25mm, 0.5 mm, 0.75 mm and 1.0 mm
- Approach velocity - 0m/s, 0.03 m/s, 0.075 m/s, 0.15 m/sec
- Larvae per test - 30
- Replicates per combination of screen aperture and approach velocity - 3
- Age of larvae tested - 1-2 DPH to 33-34 DPH
- 24 hr post entrainment monitoring of survival.

Testing Challenges:

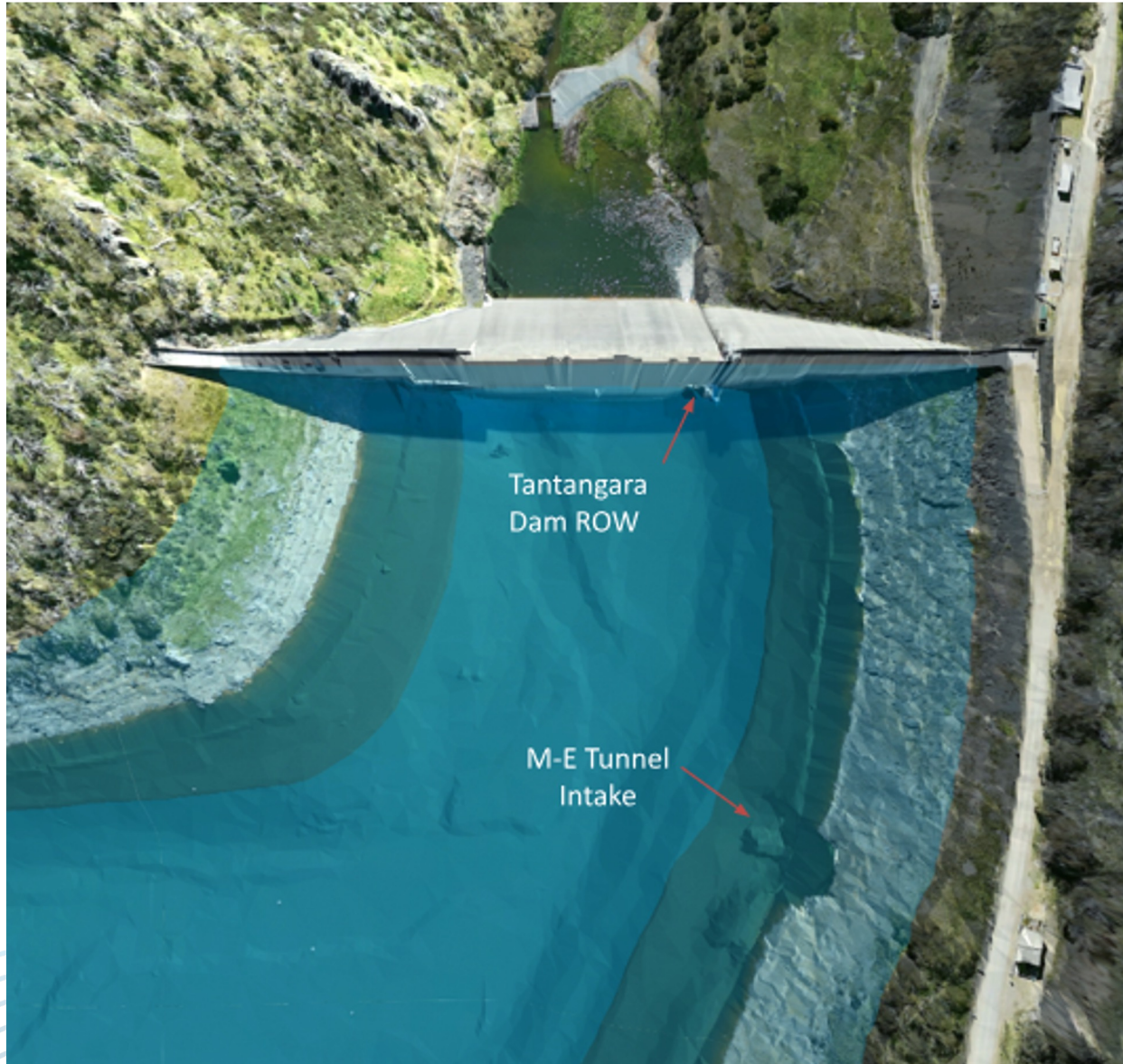
- Naturally spawning larvae
- Space and time
- Velocity

Testing Screen Effectiveness - (Doyle et al. 2023)



- Eggs were not entrained by any aperture of screen tested
- No screen options were completely effective excluding all life stages
- Entrainment decreases with finer apertures and lower approach velocities
- Some risk of entrainment and transfer for a short period of time following hatching

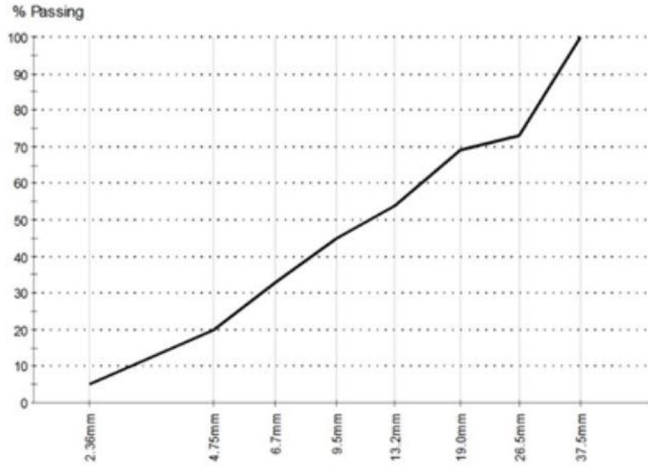
Operational Considerations



In designing the screens to meet the project objective without compromising the operational requirements of the Tantangara Dam ROW and M-E Tunnel, the following functional requirements need to be considered and incorporated:

- Availability of proven technology capable of preventing the movement of pest fish
- Dam Safety Legislation relevant to the operation of Tantangara Dam
- Safe operation of the M-E Tunnel
- Personnel and public safety
- Existing Licence requirements from Tantangara ROW (environmental volume requirements, water release capacity and water extraction from the near surface)
- Tantangara ROW and M-E Tunnel capacity and functional requirements
- Asset reliability
- Asset durability
- Asset robustness
- Asset redundancy
- Constructability
- Maintenance requirements
- Asset lifespan.

Maintenance Considerations



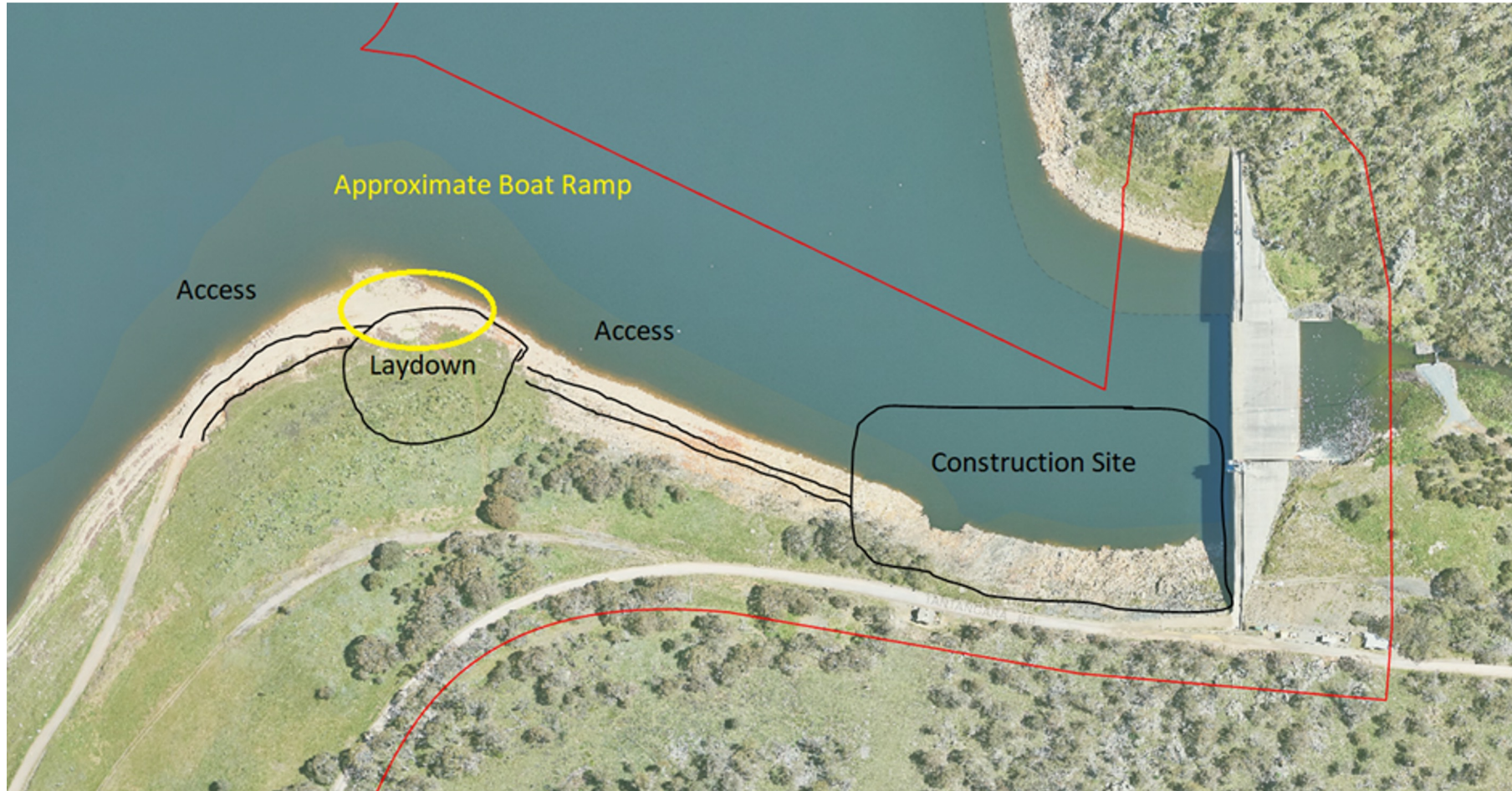
Drying by: Oven
Date Tested: 13/05/2020

Note: Sample Not Washed

Sieve Size	% Passing
37.5mm	100
26.5mm	73
19.0mm	69
13.2mm	54
9.5mm	45
6.7mm	33
4.75mm	20
2.36mm	5



Construction Considerations



Tantangara Road 14k of upgrade TBM cutterhead. About another 1km to the dam.

Maintenance Snow clearing to intersection.

Emergency services available from Cooma or Tumut. Paramedic room. Chopper pad if required.

Reception. Comms Tower.

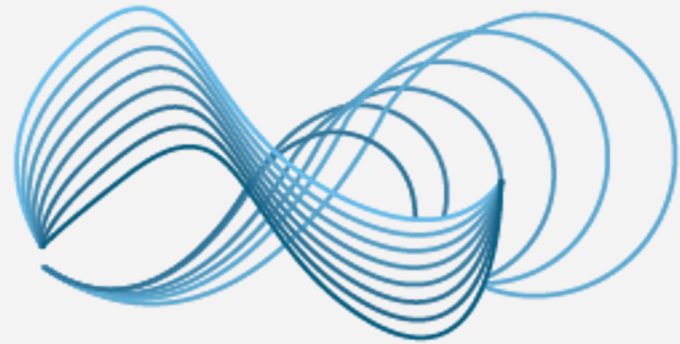
Power 11kV Essential energy link.

Accommodation Adaminaby.

Public Tantangara Road public access - camping, fishing competition, boat ramp used on weekends.

Environmental Releases ability to release year round

Dam Safety minimise the time for cutoff of the outlets



snowy2.0

ANY QUESTIONS?