Operations and Maintenance Manual for XXX Fishway

Template

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[INSERT PHOTO OF SUBJECT FISHWAY]

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# Introduction

The Fishway Assessment and Monitoring Procedure (NSW DPIRD 2024), clearly describes the rationale, objectives, methodologies, and protocols associated with monitoring operational, hydraulic and biological functionality of a newly constructed fishway. This Operations and Maintenance manual details the specific requirements associated with the XXXX fishway and weir to optimise fishway performance.

It is acknowledged that fishway O&M manuals are living documents and may require regular updates as asset operators familiarise themselves with weir and fishway operation. Any changes to the fishway O&M manual are to occur in collaboration with DPI Fisheries including document sign-off.

## Fishway Background

### Brief description of fish passage barrier and impact on native fish.

* Barrier height
* Type of weir / road crossing (e.g. fixed crest, adjustable release) & construction material
* Waterway
* Restricted upstream / downstream fish species migration (list key ones)

### Provide brief statement of interest on key fish species (e.g. recreational species, threatened species)

* Migration / breeding pattern and seasons
* Size classes undertaking migration
* How did the barrier explicitly block migrating fish.

### What was done – Fishway constructed

* Year constructed
* Who constructed
* Fishway design – e.g. rock ramp; vertical slot, etc.
* Brief description of works undertaken

## Design Criteria

### Brief description of fishway design criteria

* Fish size class range
* Max/Min upstream and downstream water levels
* Maximum headloss
* # ridges / slots
* Ridge / slot maximum headloss
* # pools
* Pool dimensions
* # entrance gates
* # exit gates

Brief statement of how fishway benefits fish –

Include one-to-two photos of the fishway here

## Operational Regime

### Describe any manual / automated weir / fishway operations

* Regulator gates
* Fishway gates
* Fishway dropboards

### Fishway gates / dropboards

Describe in detail fishway gate / dropboard operational protocol – e.g. when headwater (HWL) and tailwater (TWL) reach X, then do XYZ.

### Permit / Fisheries requirements relating to closure of fishway due to low flows

List any present and provide descriptors.

## Maintenance Regime

Maintenance of the fishway will be an ongoing commitment that ensures the fishway remains operational throughout its lifetime. While maintenance is generally not onerous, it is essential that it is regular and ongoing to ensure that issues that may affect fishway performance are not allowed to progress to the point of impeding fish passage or affecting the structural integrity of the fishway.

To this end, inspections of the fishway should be undertaken, as well as detailed survey and hydraulic checks that will inform any further maintenance or rectification works. Refer to the table below for details of maintenance protocol and frequency.

Maintenance activities such as removal of debris, sediment, vegetation, or large woody debris from the waterway or adjacent banks, and physical alterations to the fishway will trigger dredge and reclamation under Part 7 of the *Fisheries Management Act 1994*.

Routine maintenance activities including removal of sediment, debris and vegetation are to be performed in accordance with the details of this document as per the XXXX strategic maintenance permit issued by DPIRD – Fisheries (if present). Prior to undertaking such activities, the maintenance permit should be checked for its currency, conditions and notification requirements.

**Note:** Non-routine maintenance activities such as physical alterations to the fishway are not covered under any strategic maintenance permit linked to the site and instead will require a new permit from DPIRD - Fisheries.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Protocol | Frequency | Details |
| 1. | Fishway operational inspection | Minimum twice per year: (1) July or August (2) January | It is important to check the fishway functionality in July or August prior to the start of the spring fish migration season so that any maintenance issues identified can be rectified before early September. Similarly, an inspection should occur in early summer (January) to ensure optimum fishway operation for the remainder of the fish migration season (e.g. to March / April), including potential downstream migration.  Ideally, the ‘Checklist for Fishway Operation’ should be completed during a period of low flow. If the Checklist identifies a significant issue requiring remediation, a follow-up maintenance plan will be developed in consultation with the DPIRD - Fisheries Fish Passage Manager.  The completed ‘Checklist for Fishway Operation’ should be forwarded to the NSW DPIRD - Fisheries Fish Passage Manager for their records. |
| 2. | Fishway operational inspection | Following fishway drownout flow events > XXXX ML/D (X % flow exceedance) as measured at river gauge XXXX. | Routine inspections should occur following high flow events that drown out the fishway which may result in subsequent damage and reduced operational effectiveness. Fishway drownout is predicted at flows > XXXX ML/D as measured at river gauge XXXX.  Ideally, the ‘Checklist for Fishway Operation’ should be completed during a period of low flow. If the Checklist identifies a significant issue requiring remediation, a follow-up maintenance plan will be developed in consultation with the DPIRD - Fisheries Fish Passage Manager.  The completed ‘Checklist for Fishway Operation’ should be forwarded to the DPIRD - Fisheries Fish Passage Manager for their records. |
| 3. | Debris / sediment management | Following each fishway operational inspection, as per defined criteria. | **Debris Management** – Debris such as logs, limbs, twigs, leaves, rubbish, etc. can collect within the fishway which can partially or fully block fish passage effectiveness (see Attachment D).  As such, all debris should be removed from the fishway at the time of inspection where possible, with rubbish being disposed of appropriately. Natural material such as small limbs, leaves, etc. can be placed on the adjacent bank > 2 m away from the fishway. Large limbs and logs should be removed from the fishway, being careful not to damage the structure, and inserted in the immediate downstream pool where possible. Large machinery may be required to lift larger woody debris.  **Sediment** **Management** – High flows can deposit sediment (silt, gravel, etc.) within the fishway, thereby reducing pool depth. Each pool should have a minimum depth of 0.X m at flows of approximately XXX ML/D. Each pool should be measured during routine fishway operational inspections. Where it is highlighted that a pool has infilled with sediment, fill material within the respective pool should be promptly removed, with an aim of achieving a depth of 0.X m. Care must be taken not to damage the fishway during sediment management activities. Removal and disposal of instream fill material should follow best practice Blue Book recommendations. |
| 4. | Vegetation management | Following each operational inspection, as required. | All trees are to be trimmed / removed if growing within 2 m of any part of the fishway. Trees are to be trimmed in preference to removal except for situations where the tree roots may be detrimental to the fishway.  Large limbs and logs should be placed in the immediate downstream pool where possible. Large machinery may be required to lift larger woody debris. Smaller limbs and vegetation is to be removed from the site and disposed of appropriately.  Works are to be undertaken in accordance with the XXX maintenance permit. |
| 5. | Fishway re-survey | 3 yearly. | Fishway hydraulic and design parameters (e.g. ridge / slot headloss, pool depth) are to be recorded via a detailed survey every 3 years and compared against original design criteria. The survey is to be undertaken in conjunction with DPIRD - Fisheries using their Fishway Assessment Form, which can be arranged by contacting the DPIRD - Fisheries Fish Passage Manager.  If the fishway survey identifies elements outside of design specifications, the DPIRD - Fisheries Fish Passage Manager should be consulted. Any maintenance permit does not authorise alteration works to the fishway other than routine debris, sediment, and vegetation maintenance outlined in this document. Instead, fishway alterations will require a separate permit from DPIRD - Fisheries. |

## Biological Monitoring

The Fishway Monitoring Procedure aimed to demonstrate the effectiveness of newly constructed fishways in attracting and passing the full range of target species and size classes expected at the site over the design flow range (e.g. up to structural drown out).

### Biological monitoring methodology used to assess the fishway

Provide details here.

### Biological monitoring timelines

Provide details here.

## Fishway Headwater / Tailwater Relationship

Include fishway hydraulics across various flow scenarios.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Upstream Water Level (mAHD) | Downstream Water Level (mAHD) | Differential Head | Exit Gate Operation | Turbulence | Slot Differential |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

## Fishway Design Drawings

Include detailed design drawings here.

# Appendix A

Checklist for Fishway Maintenance Inspections

|  |  |  |
| --- | --- | --- |
| Inspection type (circle): | 6 Monthly inspection  (inspect during low flow) | Post-major flow event  (inspect during low flow) |
| Inspecting officer: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Date: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_ |
| Nearest river gauge: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Assessed flow: \_\_\_\_ML/D |

|  |  |  |  |
| --- | --- | --- | --- |
|  | Issue being inspected  (Use fishway plan for reference of identified issues) | Yes / No | Comments & Further Actions |
| 1. | Is there any woody debris / trash that is limiting water flow through the fishway or the trash rack (if present)? If so, where (e.g. ridge / slot number) and to what extent was flow blocked, and has the debris been removed in its entirety? |  |  |
| 2. | Is there any sedimentation within the fishway? If so, where (e.g. pool number) and to what extent, and has the sediment been removed in its entirety? |  |  |
| 3. | Is there any noticeable vegetation growth on or around the fishway? If so, where, and was the vegetation removed? |  |  |
| 4. | Are there any trees growing within 2 meters of the fishway structure? If so, where they removed? |  |  |
| 5. | Are there any signs of scouring at the footing / toe at the bottom of the fishway, or scouring along the waterway margins where the fishway meets the bank? |  |  |
| 6. | Is there any noticeable movement of the rocks in the fishway ridges or pools that has caused scour within the fishway? If so, take a photo and measure the approximate size of the scour. *(check every pool)* |  |  |
| 7. | Are there any aquatic weeds growing within and/or blocking the fishway? If so, were they removed?  *Weeds such as Parrots Feather (Myriophyllum aquaticum) can collect. Action is only required if fish passageway is blocked.* |  |  |
| 8. | Is there any noticeable damage to the fishway other than already noted above? If yes, record (text & photo) in detail where the damage has occurred. |  |  |
| 9. | Measure water height differences for each baffle / ridge and record in the table attached. Are there measurements less than 80 mm or greater than 120 mm? (measure every row). If so, which ridges were outside the design scope. |  |  |

If the answer is ‘Yes’ to any of the above inspection points, please take photos and notify the responsible Asset Manager or Asset Engineer.

Please forward the completed assessment to the relevant DPIRD - Fisheries Fish Passage Manager for their records.

|  |  |  |
| --- | --- | --- |
| Signature of Inspecting Officer: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Date: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_ |
|  |  |  |
| Signature of Supervisor: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Date: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_ |

# Appendix B

Fishway Assessment Guidelines







# Appendix C

Headwater / Tailwater Relationship Curves

# Appendix D

Photo of Debris Accumulation / Sedimentation

Insert photos here.

# Appendix E

Fishway Photos

Insert photos of fishway construction

Insert photos of fishway