

Appendix D - List of Mitigation Measures

Surface Water

Construction phase

Flow Regime Impacts

- Monitor and adjust flows to mimic natural seasonal variations (low/high flows).

Downstream Water Pollution

- Divert the river to create dry conditions for dam construction and reduce pollution risk.
- Use sediment control measures (e.g. silt curtains, sediment ponds, diversion channels).
- Implement long-term water quality monitoring.

Sediment Regime Impacts

- Divert the river to maintain some longitudinal sediment connectivity.
- Monitor and adjust sediment flow to align with natural seasonal patterns.
- Conduct long-term sediment monitoring.

Channel and Stream Bed Morphology Impacts

- Apply sediment control measures (e.g. silt curtains, sediment ponds, diversion channels) in affected tributaries and main river sections.

Operation phase

Phase 1 Flow Reduction

- Implement flow management strategies to maintain seasonal environmental flows.
- Publicly report reservoir releases during operations (WEMMP Action 2).

Reservoir Eutrophication

- Monitor water quality (chlorophyll, temperature, oxygen, pH, nutrients) per Serbian regulations (No. 50/2012).
- Apply adaptive water quality management using OECD trophic state limits.
- Use artificial mixers (e.g. ResMix 5000) if eutrophication occurs (WEMMP Action 3).

Phase 2 Downstream Water Quality

- Continue water quality monitoring for temperature, oxygen, and nutrients
- Use hypolimnetic aeration or mechanical mixers to improve oxygenation
- Reduce nutrient sources and apply adaptive management if eutrophic conditions arise (WEMMP Action 3)

Sediment Retention by Dam

- Conduct annual sediment monitoring across Zones 0–3; monitor turbidity after high flows
- Improve sediment and biodiversity connectivity by removing or modifying the Zone 2 weir for fish passage (WEMMP Action 5)

Sediment Traps in Upstream Tributaries (Zone 0)

- Monitor sediment accumulation long-term
- Remove trapped sediment and translocate it to Zone 2 to maintain sediment connectivity (WEMMP Action 6)

Sediment Accumulation in Reservoir (Zone 1)

- Monitor sediment accumulation long-term.
- Consider sediment flushing or dredging for reservoir maintenance.
- Remove sediment from upstream traps and translocate to Zone 2 (WEMMP Action 6)

Spillway Scour

- Monitor scour development directly below the spillway (WEMMP Action 6)

Air Emissions and Dust Control

Construction Phase

- Use newer-generation vehicles with emission reduction systems
- Avoid idling machinery
- Maintain machinery regularly
- Water-spray roads and dusty stockpiles
- Apply dust suppression near demolition and transport areas
- Cover materials during transport and storage
- Cover demolition waste and sites (e.g., shade cloths)
- Conduct preconstruction ambient air quality monitoring
- Develop and implement CESMP and TMP with dust and emission controls

Operation Phase

- Conduct regular air quality monitoring (PM10, PM2.5, NOx, SO₂, CO)
- Perform visual dust monitoring
- Maintain dust suppression systems

Noise and Vibration Control

Construction Phase

- Limit construction to daytime hours
- Schedule high-noise and blasting activities during low-sensitivity periods
- Reduce blasting frequency and use controlled detonation techniques
- Use pre-split blasting and delay sequencing
- Maintain equipment and turn off when not in use
- Install noise barriers near sensitive areas
- Establish safe distances from sensitive receptors

- Develop and implement CESMP and TMP with noise/vibration controls

Operation Phase

- Conduct noise measurements per legal requirements
- Monitor noise regularly near sensitive areas
- Investigate complaints with accredited labs

Soil, Groundwater, and Housekeeping

Construction Phase

- Maintain site cleanliness and remove waste regularly
- Store and handle materials/chemicals properly
- Inspect and maintain equipment to prevent leaks
- Define zones for refueling and waste disposal
- Segregate and manage excavated materials
- Use impermeable liners in washout pits
- Implement erosion control (e.g., silt fences, mulching, re-vegetation)
- Restore topography and soil structure
- Monitor erosion control measures
- Develop and implement CESMP and Waste Management Plan

Operation Phase

- Monitor groundwater via piezometers
- Verify groundwater status and obtain permits
- Comply with water regulations and protect public supply
- Continue erosion and soil stability monitoring

Resource, Material, Water, and Energy Management

Construction Phase

- Restrict extraction to designated sites
- Rehabilitate borrow pits and extraction areas
- Separate and store reusable materials
- Select and stabilize disposal sites
- Monitor disposal site stability
- Secure permits for quarrying, water use, and waste disposal
- Develop and implement RMMP and Water Management Plan
- Use water-efficient technologies and monitor consumption
- Install and maintain sedimentation ponds
- Optimize machinery schedules and track fuel/energy use

- Use fuel-efficient/hybrid machinery and explore renewables
- Plan transport routes and delivery schedules
- Source materials from licensed, environmentally responsible suppliers

Operation Phase

- Maintain long-term site management and vegetation cover
- Monitor and update RMMP and water/energy logs
- Evaluate reuse potential of stored materials
- Continue monitoring and maintenance of sedimentation ponds

Waste, Wastewater, and Pollution Control

Construction Phase

- Selective clearing with biomass repurposing (e.g., mulching, erosion control)
- Waste segregation at source and disposal in registered landfills
- Develop and implement a Waste Management Plan (WMP)
- Install silt fences, sediment basins, and temporary drainage systems
- Provide portable toilets with licensed disposal services
- Secure storage of hazardous materials in secondary containment
- Establish lined concrete washout pits and prevent uncontrolled discharge
- Install drainage ditches, retention ponds, and sediment barriers
- Conduct environmental site assessments for contaminated materials
- Use water-efficient demolition techniques and treat wastewater before discharge
- Implement a Site Clearance Plan with erosion control and revegetation
- Reuse excavated materials for embankments and roads where possible
- Designate controlled disposal sites with drainage and stabilization
- Construct temporary wastewater treatment units or septic systems
- Implement stormwater control measures (e.g., silt traps, retention ponds)
- Develop and implement:
 - Wastewater Treatment and Discharge Plan
 - Concrete Washout and Wastewater Management Plan
 - Stormwater Management and Monitoring Plan
 - Spill Prevention and Response Plan
 - Sediment Management Plan
 - Excavation and Waste Disposal Management Plan

Operation Phase

- Maintain and monitor wastewater treatment systems and sanitary facilities
- Continue sediment monitoring and dredging as needed
- Monitor wastewater quality and ensure treated discharge meets standards
- Maintain erosion control and drainage infrastructure

- Monitor stormwater runoff and implement corrective actions
- Track hazardous waste inventory and disposal through licensed operators
- Maximize recycling through dismantling and material recovery
- Continue safe removal and disposal of hazardous waste
- Maintain and update all relevant management plans (WMP, stormwater, wastewater, sediment, etc.)

Cultural heritage

Construction Phase

- Conduct field investigations and full site surveys with cultural authorities
- Document findings and integrate into project planning
- Implement a Chance Find Procedure (CFP) as part of CHMP
- Stop work and notify authorities upon discovery
- Monitor vibrations near sensitive sites and adjust methods if needed
- Develop alternative access routes and install interpretive signage
- Provide cultural heritage training to all workers
- Assign specialists to oversee compliance
- Coordinate regularly with the Institute for the Protection of Cultural Monuments
- Integrate cultural heritage into the ESMS

Operation Phase

- Maintain signage and access at preserved or relocated sites
- Continue coordination with cultural authorities
- Monitor and manage vibration impacts if applicable
- Uphold long-term cultural heritage commitments in ESMS

Health and Safety

Construction Phase

- Develop and implement:
- Occupational Health and Safety Management Plan (OHSMP)
- Emergency Preparedness and Response Plan (EPRP)
- Traffic Management Plan (TMP)
- Community Health, Safety and Security Management Plan (CHSSMP)
- Decommissioning Plan (if applicable)
- Conduct risk assessments (noise, dust, vibration, traffic, slips, fire, etc.)
- Implement permit-to-work systems for high-risk activities
- Prepare RAMS (Risk Assessment and Method Statements) for high-risk tasks
- Enforce PPE use (e.g., ear defenders, life jackets, respirators, non-slip footwear)
- Establish safety zones for blasting; follow explosive transport rules

- Ensure ventilation in confined spaces; avoid petrol/diesel engines in excavations
- Use fall protection (harnesses, guardrails, nets); train on ladder safety
- Monitor weather; halt work in unsafe conditions
- Apply safe manual handling practices (team lifts, task rotation)
- Manage hazardous substances safely (labeling, ventilation, splash guards)
- Provide hygiene facilities and ensure safe worker accommodation
- Monitor air, noise, dust, and vibration regularly
- Train workers on emergency response, water safety, and hazardous materials
- Coordinate EPRP with Ministry of Interior
- Maintain grievance mechanisms and community notifications

Operation Phase

- Maintain and update OHSMP, TMP, CHSSMP, and EPRP
- Continue monitoring of air, noise, dust, and vibration
- Enforce traffic safety and speed limits
- Maintain hygiene and safety standards in worker facilities
- Monitor and manage risks in ongoing or residual activities
- Implement decommissioning procedures with safety, waste, and community measures
- Provide ongoing training, supervision, and monitoring during decommissioning

Biodiversity

Terrestrial Habitat Mitigation

Avoidance & Minimization

- Limit vegetation clearance to essential areas (e.g., reservoir flooding).
- Preserve non-flooded areas through planning and mitigation.

Offset & Restoration

- Begin replanting before clearance to allow habitat development.
- Convert:
 - *Robinia pseudoacacia* and arable land → native riparian/gallery woodlands.
 - Steep plots → oak/beech woodlands (*Fagetum moesiace*, *Quercetum frainetto-cerris*) for soil stability.
 - Invasive-infested plots → biodiversity-supporting woodlands.
- Replace *Robinia pseudoacacia* with native species: *Alnus glutinosa*, *Populus nigra*, *Salix alba*.

Monitoring & Management

- Long-term ecological monitoring via Habitat Management Plan (HMP).
- Adaptive management to address challenges and ensure stability.

Aquatic Habitat Mitigation

Impact Reduction

- Manage water quality and habitat loss during construction and operation.

Offset & Restoration

- Create/enhance aquatic habitats in suitable locations.
- Stabilize riverbanks and improve water quality.
- Reintroduce native fish and aquatic invertebrates.

Monitoring

- Long-term monitoring to ensure restoration success.

Watercourse Crossing Design

- Fish & Aquatic Species
 - Use bottomless or embedded culverts (≥ 30 cm below bed level).
 - Maintain natural flow, depth, width, and substrate.
 - Avoid shading and altered channel forms.
- Riparian Mammals (e.g., Otters)
 - Ensure safe passage during high water (spate) conditions.
 - Include dry ledges:
 - ≥ 500 mm wide, ≥ 150 mm above flood level, 600 mm headroom.
 - Accessible via ramps or boulders.
 - Made of concrete or bolted steel.

Construction & Operations Phase Monitoring

- Monitor terrestrial biodiversity in project and adjacent areas.
- Focus on main animal activity and vegetation seasons.
- Monthly monitoring from April to October (if overlapping with construction).
- Include systematic searches for injuries/fatalities to inform adaptive mitigation.

Species-Specific Monitoring

- Amphibians – presence and abundance in irrigation channels and surroundings.
- Reptiles – presence, abundance, and skin sheds in ruderal habitats.
- Birds – presence, abundance, habitat use, activity, and nesting.
- Bats – presence, abundance, habitat use, activity, and roosting.

- Other mammals – presence, tracks, faeces, burrows within project area.
- Plants – presence and abundance in River Ub and project boundary.

Targeted Mitigation Actions

- Routine checks of bat/bird mitigation (e.g. bat boxes, bird boxes, roosts).
- Woodland management plans for adjacent areas to boost habitat quality.
- Monitor created/enhanced habitats to ensure they match cleared ones.
- Replace failed mitigation to maintain habitat connectivity.

Target Species & Habitats

- Focus on:
 - PBF fish species: Balkan Loach, Spined Loach, Balkan Barbel.
 - TSM hosts: Common Bleak, Minnow, Roach, Chub, European Stone Loach.
- Monitor:
 - Retained riverine habitats (upstream/downstream of dam).
 - Created open water habitats from impoundment.

Monitoring Phases

- Pre-construction, construction, and operations phases.
- Phase 1 (flood reduction) monitoring defines baseline for Phase 2 (flood + irrigation).

Monitoring Scope & Methods

Assess impacts on:

- Fish, invertebrates, and TSM.

Use:

- Existing and new monitoring sites based on final design.
- Routine annual monitoring + event-based monitoring (e.g. sediment flushing).

Include:

- Survey locations, timing, duration, and trigger values for adaptive response.

Adaptive Management

If species abundance/diversity declines:

- Stock fish or artificially stock mussels on host fish.

Construction Phase Monitoring

- Biosecurity checks: Clean and inspect all equipment/materials before site entry.

- Regular habitat monitoring: Detect new invasive species early.
- Rapid response: Apply control measures immediately upon detection.
- Control methods:
 - Mechanical and chemical removal of invasive plants.
 - Prefer manual removal in sensitive areas.
- Worker training: Identify and report invasive species.

Operation Phase Monitoring

- Long-term monitoring: Track invasive species trends and control effectiveness.
- Adaptive management: Adjust strategies based on monitoring results.
- Biological control: Introduce natural predators where feasible.
- Habitat restoration: Replant native vegetation to prevent re-invasion.

Pre-Construction Phase

- Ecologist-led checks before any clearance; translocate individuals as needed.
- Bird nesting compensation: Install nest boxes/platforms in suitable nearby habitats.
- Bat roost compensation:
 - Install bat boxes for crevice/cavity dwellers in adjacent habitats.
 - Translocate confirmed roosts to retained woodland.
 - Apply veteranisation techniques in nearby woodland for roost feature replacement.
- Demarcate construction zones to minimize unnecessary clearance.
- Use visible markers (e.g., sticks, flagging tape) or fencing to protect retained habitats.

Construction Phase

- Timing restrictions:
 - Avoid bird breeding season (March–August); if unavoidable, inspect for nests ≤ 48 hrs before works.
 - Avoid bat maternity (late April–early August) and hibernation (October–March) periods.
- If timing cannot be avoided:
 - Conduct pre-clearance inspections.
 - Apply additional monitoring by a bat ecologist.
- Phased clearance: Start from the center and move outward to allow species displacement.
- Baseline surveys for any new construction areas (e.g., quarries, infrastructure).
- Invasive species control: Implement eradication if spread is observed.

- Awareness training: Educate workers on protected species and mitigation protocols.
- Micro-site sediment traps in consultation with ECoW and biodiversity experts.
- Progressive restoration of temporarily cleared areas to prevent erosion and invasive spread.
- Lighting control: Limit artificial lighting to active construction zones.
- Avoid barriers (e.g., bright lights) that hinder bat movement.

Aquatic Habitat Measures

- Avoid in-river works during fish spawning (summer, gravel-bed species).
- Fish translocation:
 - Supervised by ECoW with freshwater expertise.
 - Use netting/electric fishing before dewatering.
- TSM translocation:
 - Move mussels upstream/downstream before impoundment.
 - Conducted by licensed mussel specialist.

Water Quality Monitoring

Regular monitoring of:

- Temperature
- Dissolved oxygen
- Turbidity
- Monitor construction runoff, accidental spills, and operational discharges.
- Track thermal pollution from dam discharge to ensure temperature matches natural river conditions.

Pollution Prevention & Hazardous Materials

- Monitor compliance with:
 - Hazardous material handling protocols (storage, transport, disposal).
 - Spill prevention and emergency response procedures.
- Conduct training programs for staff on environmental standards and spill response.

Erosion & Sediment Control

- Monitor effectiveness of:
 - Sediment traps
 - Silt fences
 - Vegetative buffers
 - Soil stabilization techniques

Continuous Monitoring & Reporting

- Establish system to:
 - Track pollution sources and habitat degradation.
 - Enable adaptive management based on findings.

Aquatic Connectivity & Habitat Monitoring

- Assess species movement and habitat use post-construction.

Monitor effectiveness of:

- Fish passage improvements (e.g. fish pass at redundant weir).
- Environmental flow (e-flow) maintenance in the Ub River.

Noise, Air & Waste Monitoring

Monitor:

- Noise levels from machinery and transport.
- Dust and emissions; apply suppression as needed.
- Waste removal frequency, especially food waste to avoid attracting wildlife.

Vehicle & Access Control

Monitor:

- Vehicle movement (restricted to designated roads).
- Vehicle cleanliness to avoid wildlife attraction.
- Speed limits and animal crossing signage compliance.

Wildlife & Habitat Disturbance

Monitor:

- Human activity levels near sensitive habitats.
- Employee compliance with no-hunting policy.
- Wildlife encounters and response protocols.
- Conduct toolbox talks and routine training on wildlife care and conduct.

Mitigation Measures for Terrestrial Critical Habitat (CH)

Avoidance Measures

- Integrate CH avoidance into project design and planning.
- Establish exclusion zones and buffer areas around sensitive CH.
- Conduct detailed pre-construction habitat mapping and surveys.

- Avoid CH during construction wherever feasible.

Compensation & Offset Strategy

- Offset 37.94 ha of CH loss using the Quality Hectares (Qha) method.
- Create ‘like-for-like’ habitats to match both quality and area of impacted CH.
- Use urban or arable land for compensatory habitat creation (natural areas are already CH).
- Implement habitat creation to support species for which CH was designated (e.g., bats, birds, amphibians, reptiles, mammals, invertebrates, fish).

Habitat Management and Enhancement

- Develop and implement a Habitat Management and Enhancement Plan (BMP Action 1).
- Enhance existing habitats and connect them with newly created ones.
- Prevent introduction and spread of alien species during construction and operation.

Monitoring and Adaptive Management

- Monitor habitat creation and mitigation effectiveness via the Ecological Monitoring Plan (BMP Action 2).
- Include routine monitoring during construction and operational phases.

Mitigation Measures for Riverine Critical Habitat (CH)

Habitat Loss & Fragmentation

- Acknowledge that 4.98 ha of lotic riverine habitat will be lost and replaced by lentic (stillwater) habitat.
- Recognize this as an unmitigable impact, but note potential species-level gains due to increased resilience to droughts and floods.

Habitat Compensation & Net Gain

- Apply the Quality Hectares (Qha) method to assess habitat loss and gains.
- Achieve:
 - 224.62% gain in *Littoral zone of inland surface waterbodies*.
 - 386.37% gain in *Surface standing waters*.
- Enhance riparian zones with tree/woodland planting to improve connectivity upstream and downstream.
- Anticipate natural colonization of high-value habitats (e.g., reed beds) at the reservoir’s upstream end.

River Diversion During Construction

- Divert the River Ub during low-flow summer period before major dam works.
- Regulate 800m of riverbed downstream to accommodate diverted flow.
- Separate construction zone from river to reduce pollution risk.

Pollution & Sediment Control

- Construct dam in a dry riverbed using coffer dams/diversions.

Implement:

- Silt curtains
- Sediment ponds
- Diversion channels
- Capture all measures in the Pollution Control Strategy (BMP Action 6).

Watercourse Crossings

- Design all temporary and permanent crossings to allow free movement of fish and riparian species.
- Prevent habitat fragmentation and maintain ecological connectivity.

Monitoring & Adaptive Management

- Monitor aquatic habitat creation and species impacts via the Freshwater Ecology Monitoring Plan (BMP Action 3).
- Include routine monitoring during construction and operation phases.

Mitigation Measures for Amphibians

Habitat Protection & Construction Planning

- Establish 50m buffer zones around wetland and riparian habitats to minimize disturbance and preserve ecological connectivity.
- Avoid construction near aquatic habitats during critical breeding and migration periods (March–June), in line with BMP Action 5 *Sensitive Site Clearance Strategy*.

Wildlife Protection

- Conduct wildlife rescue and relocation to prevent injury or mortality during site operations (BMP Action 5).
- Implement pre- and post-construction ecological monitoring to track species activity and adapt mitigation as needed (BMP Action 2 *Ecological Monitoring Plan: Terrestrial*).

Habitat Compensation & Enhancement

- Create or restore similar habitats near the construction zone to offset habitat loss.
- Plant native vegetation, including aquatic plants, around the reservoir to improve breeding conditions.
- Maintain water quality and ensure suitable aquatic conditions around the reservoir.

These habitat compensation and enhancement measures are part of BMP Action 1 *Habitat Management and Enhancement Plan* and BMP Action 5 *Sensitive Site Clearance Strategy*.

Mitigation Measures for Reptiles

Habitat Protection & Connectivity

- Establish buffer zones around sensitive habitats to reduce disturbance from construction activities.

- Preserve connectivity corridors to maintain movement routes between habitats and prevent isolation (BMP Action 5 *Sensitive Site Clearance Strategy*).

Construction Timing

- Schedule construction to avoid critical life stages and migration periods for reptiles, minimizing disruption during breeding and active seasons.

Wildlife Protection

- Conduct rescue and relocation of reptiles at risk of injury or entrapment during construction (BMP Action 5).
- Monitor reptile activity pre- and post-construction to detect adverse effects and apply adaptive management (BMP Action 2 *Ecological Monitoring Plan: Terrestrial*).

Habitat Compensation & Enhancement

- Create or restore similar habitats near the construction zone to offset habitat loss.
- Build refugia (e.g., wood and stone piles from vegetation clearance) to provide safe shelters during and after construction.
- These measures are part of BMP Action 1 *Habitat Management and Enhancement Plan* and BMP Action 5 *Sensitive Site Clearance Strategy*.

Mitigation Measures for Woodland Birds

Sensitive Site Clearance

- Establish buffer zones of 50–500 meters around active nest trees, depending on species sensitivity.
- Maintain woodland corridors to preserve habitat connectivity.
- Phase site clearance from the center outward to allow gradual displacement and reduce abrupt habitat loss (BMP Action 5 *Sensitive Site Clearance Strategy*).

Timing of Construction

- Avoid tree clearance during breeding season (March–August).
- If unavoidable, conduct pre-clearance surveys within 48 hours before felling.
- Postpone clearance if active nests are found until fledging is complete.
- Begin surveys in February for early nesters (BMP Action 5).

Habitat & Nesting Compensation

- Install artificial nest boxes for woodpecker species on retained trees or nearby structures before clearance.
- Enhance and restore habitat before construction to provide alternative nesting sites (BMP Action 1 *Habitat Management and Enhancement Plan*).
- Place cavity-type nest boxes in suitable woodland areas, oriented toward adjacent habitat patches and tailored to species preferences (BMP Action 5).

Ecological Monitoring

- Monitor bird activity and nest box use during construction.

- Adjust mitigation measures if significant impacts are observed (BMP Action 2 *Ecological Monitoring Plan*).

Mitigation Measures for Open Grassland Birds

Sensitive Site Clearance

- Preserve hedgerows and shrub patches where feasible to maintain nesting and foraging structures.
- Phase vegetation clearance to reduce abrupt displacement and allow gradual adaptation.
- Maintain buffer strips to support movement between habitat patches (BMP Action 5 *Sensitive Site Clearance Strategy*).

Timing of Construction

- Avoid vegetation clearance during breeding season (March–August).
- If unavoidable, conduct pre-clearance surveys by a qualified ecologist within 48 hours before works.
- Postpone clearance if active nests are found until nesting concludes (BMP Action 5).

Ecological Monitoring

- Track breeding activity and habitat use during construction.
- Adapt mitigation measures based on observed impacts and implement broader conservation actions as needed (BMP Action 2 *Ecological Monitoring Plan*).

Mitigation Measures for Wetland Birds (e.g., Little Egret)

Timing of Construction

- Schedule in-river and near-water works outside the nesting season (March–August).
- If unavoidable, conduct pre-clearance surveys by a qualified ecologist within 48 hours before works.
- Postpone works if active nests are found until chicks have fledged (BMP Action 5 *Sensitive Site Clearance Strategy*).

Habitat Compensation

- Enhance wetlands by creating shallow ponds, planting reedbeds, and stabilizing banks with native vegetation.
- These enhancements will provide alternative foraging and nesting habitats (BMP Action 1 *Habitat Management and Enhancement Plan*).

Nesting Compensation

- Install raised nest structures suitable for Little Egrets near appropriate waterbodies.
- Design and placement will reflect species-specific preferences and known local use (BMP Action 5).

Ecological Monitoring

- Monitor waterbird usage of riparian and constructed wetland habitats during and after construction.

- Apply additional mitigation (e.g., increased buffer zones or off-site conservation) if significant disturbance or decline is observed (BMP Action 2 *Ecological Monitoring Plan*).

Mitigation Measures for Bats

Sensitive Site Clearance

- Establish 50m buffer zones around identified bat roosts to minimize disturbance.
- Maintain habitat corridors to support bat movement between roosting and foraging areas.
- Phase site clearance from the center outward to encourage displacement toward retained habitats (BMP Action 5).
- Microsite sediment traps to reduce vegetation clearance and avoid sensitive areas, guided by an experienced ecologist (BMP Action 5).

Timing of Construction

- Avoid works during critical life stages:
 - Maternity period: Late April to early August.
 - Hibernation period: October to March.
- If winter clearance is unavoidable:
 - Inspect trees/buildings in summer.
 - Exclude and compensate for roosts before hibernation (BMP Action 5).

Habitat Compensation & Restoration

- Restore cleared areas progressively after temporary use, aiming for stable vegetative cover to reduce erosion and dust (BMP Action 1).
- Enhance and connect habitats to support long-term bat conservation and net gain (BMP Action 1).

Roost Compensation

- Install bat boxes for crevice- and cavity-dwelling species in adjacent retained habitats before clearance.
- Translocate confirmed roosts to nearby woodland where feasible.
- Veteranisation: Create artificial roost features in living trees within retained woodland, guided by a bat ecologist (BMP Actions 1 & 5).

Ecological Monitoring & Adaptive Management

- Monitor bat activity before and during construction to detect adverse effects (BMP Action 2).
- Adapt mitigation measures as needed based on monitoring results.
- Support off-site conservation through awareness campaigns in collaboration with local NGOs if significant impacts are observed (BMP Action 2).

Mitigation Measures for Terrestrial Fauna

Habitat Protection & Connectivity

- Establish 50m buffer zones around sensitive habitats, especially woodlands, to reduce disturbance and maintain ecological connectivity.

- Preserve movement corridors to prevent isolation of species in fragmented or island-like patches (BMP Action 5 *Sensitive Site Clearance Strategy*).

Wildlife Rescue & Relocation

- Conduct rescue and relocation operations for amphibians, reptiles, and mammals at risk of injury or entrapment during construction (BMP Action 5).

Ecological Monitoring

- Monitor species activity pre- and post-construction to detect adverse effects and enable adaptive management (BMP Action 2 *Ecological Monitoring Plan*).

Habitat Compensation

- Create or restore similar habitats in nearby locations to offset habitat loss within the construction footprint.
- Progressively restore temporarily cleared areas to stabilize vegetation and reduce erosion and dust (BMP Action 1 *Habitat Management and Enhancement Plan*).

Mitigation Measures for Aquatic Species (Fish, Mussels, Macroinvertebrates)

Watercourse Crossings

- Design temporary and permanent crossings (e.g., culverts, bridges) to maintain natural flow and allow free movement of fish and riparian species.
- Install culverts below bed level and use natural substrate to mimic riverbeds.
- Retain or restore riparian vegetation to stabilize banks and reduce sediment runoff (BMP Action 1 *Habitat Management and Enhancement Plan*).

Sediment & Pollution Control

- Use silt curtains, sedimentation ponds, and water filtration systems during in-stream works to reduce turbidity.
- Manage hazardous materials with secure storage, proper handling, and spill response protocols (BMP Action 6 *Pollution Control Strategy*).

Timing of Construction

- Avoid in-stream works during critical life stages, especially summer spawning periods for gravel-bed fish species.

Species Relocation

- Translocate fish and Thick-shelled Mussels (TSM) prior to dewatering or impoundment.
- Use netting or electric fishing under supervision of a licensed Ecological Clerk of Works (ECoW).
- Relocate TSM to suitable upstream or downstream habitats under expert guidance and licensing (BMP Action 5 *Sensitive Site Clearance Strategy*).

Post-Construction Habitat Restoration

- Replant riparian vegetation, improve flow conditions, and create artificial spawning grounds to support aquatic species recovery (BMP Action 5).

Water Quality Monitoring

- Conduct regular water quality monitoring to assess effectiveness of sediment and pollution control measures.
- Monitoring will follow the Water Environment Monitoring and Management Plan (WEMMP) and BMP Action 3 *Freshwater Ecology Monitoring Plan*.

Mitigation Measures for Thick-shelled River Mussel (TSM)

Watercourse Integrity

- Maintain flow continuity at all times to prevent habitat fragmentation.
- Design crossings to preserve natural flow and sediment patterns (BMP Action 1 *Habitat Management and Enhancement Plan*).

Pollution & Sediment Control

- Implement sediment containment (e.g., silt curtains, filtration systems).
- Apply strict hazardous material protocols for storage, handling, and disposal to protect water quality (BMP Action 6 *Pollution Control Strategy*).

Timing & Supervision

- Survey mussel habitats before in-stream works.
- Schedule works to avoid peak sensitivity periods, under supervision of a qualified ecologist (BMP Action 5 *Sensitive Site Clearance Strategy*).

Species Translocation

- Translocate mussels to secure upstream or downstream habitats prior to dewatering or impoundment.
- Ensure suitable hydrological conditions at relocation sites and conduct under appropriate Serbian licensing (BMP Action 5).

Post-Construction Habitat Restoration

- Restore mussel-supporting habitats by reintroducing clean substrates and improving flow conditions.
- Replant riparian vegetation to reduce long-term sediment input (BMP Action 5).

Monitoring & Adaptive Management

- Monitor mussel populations post-translocation to assess survival and establishment.
- Use water quality data from BMP Action 3 *Freshwater Ecology Monitoring Plan* to guide adaptive management.

Mitigation Measures for Riparian and Aquatic Macroinvertebrates

Protection of Riparian Zones

- Retain existing riparian vegetation wherever feasible to preserve shading, bank stability, and habitat continuity.
- Replant disturbed areas post-construction with native species to restore ecological function (BMP Action 1 *Habitat Management and Enhancement Plan*).

Sediment & Flow Control

- Minimize sedimentation during construction using settling ponds, erosion barriers, and other control measures.
- Maintain clean substrate conditions essential for macroinvertebrate colonization (BMP Action 6 *Pollution Control Strategy*).

Timing of Works

- Avoid construction near riparian margins and water edges during periods of adult emergence and larval development for dragonflies and other sensitive species.

Monitoring & Adaptive Management

- Survey macroinvertebrate diversity and abundance before and after construction to assess recovery of ecosystem function.
- Adjust mitigation measures based on monitoring results to support long-term habitat quality (BMP Action 3 *Freshwater Ecology Monitoring Plan*).

Habitat Restoration and Management

- Post-construction habitat restoration to ensure long-term stability and resilience (BMP, Action 1).
- Habitat restoration to enhance fragmented areas, improving movement corridors and access to food and shelter.
- Habitat enhancements managed through a Management Plan to achieve net gain and connectivity (BMP, Action 1).
- Riparian vegetation management to stabilise banks and improve water filtration.

Invasive Species Control

- Invasive species management to control and eradicate non-native species.
- Develop and implement an INNS Management Plan during construction (BMP Action 4).
- Acknowledge the challenge of managing Topmouth Gudgeon and Prussian Carp during operation.

Wildlife Monitoring and Protection

- Regular monitoring of habitat quality, flora, and fauna (BMP, Action 2).
- Wildlife monitoring for amphibians, reptiles, birds, bats, and mammals to track health and populations.
- Translocation of sensitive species (e.g. during reservoir filling, hibernation, or nesting).
- Monitoring of compensatory measures during construction and operation (BMP, Action 2).

Noise and Light Mitigation

- Use of low-impact lighting and sound barriers near sensitive wildlife areas (BMP, Action 5).
- Avoid night-time work in sensitive bat habitats.
- Develop operational lighting plans in consultation with a bat ecologist.

Water Quality Management

- Water quality monitoring for aquatic species and riparian habitats (BMP, Action 3).
- Monitor parameters like chlorophyll, temperature, oxygenation, pH, and nutrients (WEMMP Action 3).
- Apply OECD trophic state limits to manage eutrophication.
- Use artificial mixers to reduce stratification and improve water quality.

Flow and Hydrology Management

- Flow management strategies to maintain environmental flows and seasonal variability.
- Environmental flow monitoring via flowmeter and public disclosure (WEMMP Action 2).
- Reservoir operations to mimic natural hydrological regimes and reduce flood magnitude.

Sediment Management

- Silt control through sedimentation basin maintenance and dredging.
- Sediment monitoring using bathymetry and turbidity checks.
- Sediment translocation to maintain downstream sediment balance (WEMMP Actions 4, 5, 6).
- Periodic sediment flushing timed to minimise ecological impacts.

Fish and Aquatic Species Protection

- Develop and implement a Freshwater Ecology Monitoring Plan (BMP Action 3).
- Fish stocking and trap-and-transport from downstream to upstream (BMP Action 3).
- Improve fish passage at redundant weirs (BMP Action 7).
- Fish screening on irrigation and E Flow pipes to reduce injury/mortality.
- Address entrainment risks during flood events and maintain genetic diversity.

Monitoring and Adaptive Management

- Adaptive management to adjust based on monitoring results
- Continuous monitoring and timely interventions for unforeseen impacts.
- Public disclosure of flow and water quality data to ensure transparency.