

Initial Environmental Examination

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MFF 0054-VIE: Water Sector Investment Program – Tranche 2

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ENVIRONMENTAL MANAGEMENT PLAN

for

Buon Ma Thuot City & Three Districts Water Supply Subproject:

RSC - C20247 (VIE): Supporting Viet Nam Water Sector Project PFR-2

**Submitted
to**

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I. ABBREVIATIONS

CEMP:	-	Contractor Environmental Management Plan
CPC:	-	Commune Peoples Council
DAKWACO	-	Dak Lak Construction Investment Water Supply One Member Limited Company
DDSC:	-	Detailed Design & Supervision Consultant
DoNRE:	-	Department of Natural Resources and Environment
DoH:	-	Department of Health
DoLISA:	-	Department of Labour, Invalids, & Social Assistance
DPC:	-	District Peoples Committee
EARF:	-	Environmental Assessment & Review Framework
EERP:	-	External (local) Emergency Response Procedures
EERT:	-	External (local) Emergency Response Team
EIA:	-	Environmental Impact Assessment
EMP:	-	Environmental Management Plan
EPC:	-	GoV Environmental Protection Commitment
EI:	-	Environmental Institute
ERC:	-	Emergency Response Coordinator
IEE:	-	Initial Environmental Evaluation
GoV:	-	Government of Viet Nam
LEP:	-	Law on Environmental Protection
MFF:	-	Multi-tranche Financing Facility
MoLISA:	-	Ministry of Labour, Invalids, and Social Assistance
PAM:	-	Project Administration Manual
PFR-2:	-	Second Periodic Funding Request
PMU:	-	Project Management Unit
PPC:	-	Provincial People Committee
PPMS:	-	Project Performance Management System
SERT:	-	Subproject Emergency Response Team
SERP:	-	Subproject Emergency Response Procedures
SPS:	-	Safeguard Policy Statement
WTP:	-	Water Treatment Plant
UXO:	-	Unexploded Ordinance
WS:	-	Water Supply System

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II. OVERVIEW

1. The environmental management plans (EMP) for the six water supply subprojects¹ that form the second Periodic Funding Request (PFR-2) of the Multi-tranche Financing Facility (MFF) for Support of the Water Sector in Viet Nam have been upgraded as part of the preparations of the subprojects. The original EMPs were developed with the initial environmental evaluations (IEE) or GoV² EIAs that were prepared for each subproject. The IEEs and EIAs for the subprojects including the IEE for the Buon Ma Thuot City & Three Districts Water Supply Project³ are found under separate cover.

2. The upgrades to the EMPs stem from the findings of a recent review⁴ of the IEEs and EIAs of the subprojects to ensure that potential environmental impacts of a water supply subproject are not overlooked, and moreover, that the EMP for each subproject addresses all potential impacts. The intention of the review was not for the IEE or GoV safeguard document to be modified, rather to identify required additions or changes to an IEE or EIA that could be addressed by updating the respective EMP. Thus, the upgraded EMPs are still supported the parent IEE/EIAs in preparation for the detailed designs of the subprojects.

3. Provided herein is the upgraded EMP for the Buon Ma Thuot City & Three Districts Water Supply subproject. The upgraded EMP is based closely on the original EMP in order to preserve the original potential impacts assessment reported in the IEE. The objective was not to create a new EMP, rather to add content and scope where necessary, and to incorporate subsequent project information such as that provided in the recent draft PAM⁵. The text of the original EMP is left as is and only edited and supplemented as needed.

4. A secondary, important objective of upgrading the six EMPs is to develop specific but consistent EMPs for the six water supply subprojects which will assist the overall implementation of environmental safeguards for the PFR-2. The other five upgraded EMPs are found under separate cover.

5. The original EMP for the Buon Ma Thuot subproject and original EMPs for most of the other 5 subprojects were prepared in view of the environmental safeguard requirements of the ADB (SPS 2009)⁶, and the attendant Environmental Assessment & Review Framework⁷ (EARF) that was developed to support the MFF.

¹ Subprojects in Hai Phong, Quang Tri, Thua Thien Hue, Da Nang, Dak Lak, and Binh Duong

² Government of Viet Nam (GoV) Environmental Impact Assessment (EIA)

³ PPC, 2011. Initial Environmental Evaluation & Environmental Management Plan for Buon Ma Thuot City & Three Districts Water Supply Project, 51 pgs.

⁴ 2012. SC100149 VIE: Supporting Viet Nam Water Sector Project PFR-2, Interim report prepared for ADB, 29 pgs.

⁵ ADB, 2011. Draft Project Administration Manual for Viet Nam Water Sector Investment Program, MFF-PFR-2, 53 pgs

⁶ ADB, 2009. Safeguard Policy Statement.

⁷ 2010. Environmental Assessment & Review Framework, prepared for RSC-C00751 VIE: Preparing Multi-tranche Financing Facility Supporting Viet Nam Water Sector

III. ENVIRONMENTAL MANAGEMENT PLAN

Buon Ma Thuot City & Three Districts Water Supply Project

A. Subproject Components

At the time the EMP was upgraded the Buon Ma Thuot subproject consisted of the following components:

A) Buon Ma Thuot Water Supply System

- new intake for new raw water source at Srepok river
- raw water pumping station & 6 km main from Quynh Ngoc hamlet;
- new WTP (35,000 m³/day) at Tan Lap Hill, Krong Ana District;
- new Booster Pumping Station & reservoir (5000 m³) in Broadcasting Station in EA Tam Ward;
- expanded and improved distribution network in Ea Na & Tan Lap communes.

B) New water supply systems in:

- Ea Kar District (2,500 – 5,000 m³/day), raw water source at EA Kar reservoir
- Krong Nang District (1,600 – 3,200 m³/day), raw water source at Dong Ho reservoir
- Buon Duong District (1,000 – 2,000 m³/day), raw water source at Srepok reservoir

B. Institutional Arrangements and Responsibilities

6. The environmental management of the subproject will occur in accordance with GoV policy on decentralization pursuant to Decree 131/2006/ND-CP on management and utilization of Official Development Assistance. The primary framework for the EMP⁸ will be defined by: 1) Dak Lak Construction Investment Water Supply One Member Limited Company (DAKWACO) who is the project owner (PO) and sub-executing agency (EA); 2) a designated project management unit (PMU) to support DAKWACO who will implement the subproject components and the EMP; and 3) a Detailed Design and Supervision Consultant⁹ (DDSC) who will assist with detailed designs of subproject, and update EMP to ensure EMP meets the final subproject designs. The ADB is responsible for monitoring to ensure subproject meets the environmental safeguards of the SPS (2009).

7. The EA (DAKWACO) has the ultimate responsibility for implementation of the entire subproject, including finance and administration, technical and procurement matters, monitoring and evaluation, and environmental safeguards compliance. The DAKWACO will operate the completed water supply system (WS).

8. The Department of Natural Resources and Environment (DoNRE) is the provincial agency which oversees environmental management of Dak Lak. The DoNRE with District staff provides direction and support for environmental protection-related matters including application of the Law on Environmental protection (LEP 2005), and on use of the environmental policy and standards that are in place protect the environment (see Table 3).

⁸ From footnote 5.

⁹ DDSC contract expected to include construction supervision.

9. The PMU will be responsible for the detailed engineering and preparation of construction plans, and construction monitoring with support from the DDSC. It will be responsible for overseeing the overall procurement process (starting from bid documents preparation for specific works, to bid evaluations, award recommendations, to payment for completed works) as well as for the overall financial monitoring of the project.

10. The PMU will be responsible for fulfilling the environmental safeguard requirements of the entire subproject with direct support from the DDSC. At the outset, the PMU is responsible for updating the mitigation plan of the EMP to meet the detailed engineering designs of all components the new Buon Ma Thuot city water supply system (WS), & WSs of EA Kar, Krong Nang, and Buon Don districts, and to include the mitigation requirements in the bid documents and construction contract documents.

The PMU will be responsible for updating and overseeing implementation of the environmental monitoring plan of the EMP, undertaking environment-related investigations that may arise during subproject implementation in coordination with the DONRE, to continue public consultations on the subproject starting during the pre-construction phase that were initiated during the IEE, and for responding to environment or nuisance-related complaints from residents or businesses affected by subproject implementation. An environment sub-unit under the PMU will be assigned take responsibility for the implementation of the EMP

11. Key duties of the PMU are summarized as follows:

- With DDSC review and update the EMP during detailed design and engineering phase to ensure EMP meets detailed subproject component designs;
- As part of the EMP update, ensure that public consultations that continue through subproject implementation document concerns of stakeholders situated downstream of intake points;
- Ensure safeguard requirements of the final EMP are adequately described in the bidding documents (instruction to bidders) so that contractors can prepare their respective site-specific CEMP¹⁰ based on the final EMP, and ensure criteria for evaluating contractor bids and awarding construction packages include relevant safeguard requirements of the final EMP;
- Ensure construction contractors successfully implement impact mitigation measures of EMP as part of their CEMPs;
- Coordinate with the DoNRE on regulatory compliance issues (e.g., for surface water quality affected by construction drainage or erosion from storage areas for excavated soil, noise and vibration from construction sites, sanitation in workers campsite, etc);
- Prepare terms of reference for the military to conduct surveys to detect unexploded ordnance, and ordnance disposal if necessary;
- Advise the PMU director on environment-related concerns arising during project construction, and recommend corrective measures;
- Disseminate to stakeholders the results of environmental monitoring and implementation of safeguards, especially among households or small businesses near the construction sites;

¹⁰ Contractors Environmental Management Plan

- Include monthly contractor reports in quarterly status reports to DAKWACO on status of EMP & environment safeguards, and public stakeholder issues during construction phase of subproject; and
- Prepare ToRs for the EI (see below) for implementation of monitoring plan of EMP, and for assistance with follow-up interviews and consultations with public stakeholders on issues and concerns arising during project construction.

12. A local Environmental Institute (EI) will be hired by the PMU to implement the environmental monitoring plan of the EMP during the construction phase of the subproject using the environmental baseline from the environment surveys of the IEE. It is feasible that the EI will also be commissioned by DAKWACO to implement the monitoring plan during the operation phase of the subproject with regular reporting to PMU.

13. The EI will also support PMU with the follow-on consultations and interviews with local residents to identify concerns or grievances arising during construction. The complete role and reporting protocol of the EI will be defined during the detailed design phase.

14. The contractor(s) of the various construction packages are responsible for developing the CEMP based on the final EMP, implementing the mitigations that are detailed in the CEMP, and for developing and implementing emergency response procedures for the subproject (see section III-G below). Contractors will be responsible for providing brief monthly reports to PMU on the environmental status and mitigation activity at construction areas.

15. The DoNRE may conduct random environmental monitoring and inspection before, during, and after construction, as well as in the event of emergencies. It will also review the monitoring reports of the EI. If abnormalities are found, the DONRE may impose fines and issue a notice of rectification with a specific deadline to the responsible entities. If complaints are formally received from the public through the People's Committee, the DONRE will carry out verification inspections, as described in the grievance redress mechanism (see section IV).

16. The EA will develop a Project Performance Monitoring System (PPMS) to monitor the overall performance of the project¹¹. The PPMS will include a broad range of indicators that address financial, technical-engineering, and operational components of the subproject during construction phase through to the operational phase. The PPMS will include key indicators of environmental safeguard compliance from the EMP (Table 5). The EA will refine the PPMS within 12 months of project implementation.

17. It is anticipated that an independent qualified institute will audit environmental safeguard compliance throughout the construction phase of the subproject. The auditor will be separate from the main project Auditor. Within three months after construction is completed, or no later than one year, an environmental acceptance monitoring and audit report on the completion of the project components will be prepared by the selected institute. The report will be reviewed and approved by the DoNRE and submitted to ADB.

C. Summary of Potential Impacts

18. The IEE¹² of the Buon Ma Thuot and 3 Districts subproject indicated that impacts of the subproject are primarily short-term construction-related impacts which are summarized in Table 1.

¹¹ ADB 2011. Draft Project Administration Manual

¹² Footnote 3.

Table 1. Summary of Potential Impacts from IEE

Pre-construction Phase
<ol style="list-style-type: none"> 1) Land acquisition & resettlement addressed by separate RP; 2) <u>Buon Ma Thuot water supply system</u>: vegetation & fruit tree removal, dust, noise, solid waste, disturbance of community activities from site clearance, demolition, and heavy equipment movement & operation; and 3) <u>Ea Kar, Krong, Nang, & Buon Don water supply systems</u>: vegetation & fruit tree removal, dust, noise, solid waste, disturbance of community activities from site clearance, demolition, and heavy equipment movement & operation.
Construction Phase
<ul style="list-style-type: none"> • <u>Exhaust fumes</u>: Most waste gases produced from operation of equipment, machinery and vehicles using gasoline and diesel. Typical emissions are CO, SO_x, NO_x VOC, and, PM from fuel combustion. • <u>Wastewater</u>: Primarily domestic wastewater produced from worker activities such as bathing, cooking and from toilets. A small amount of wastewater is produced from construction equipment cleaning defined by oil, grease, sand, cement, soil and mud. • <u>Solid waste</u>: Domestic solid waste includes paper, metal, wood and glass, plastic bottles, damaged batteries, ashtray, etc. Construction waste consists aggregates of sand, concrete, materials debris, and spoil.. • <u>Waste oil</u>: Waste engine oil will be produced from maintenance of construction equipment, machinery and vehicles at maintenance area. • <u>Dust, noise</u>: From operation of construction equipment, machinery and vehicles and earthwork will produce noise and dust that directly impact on residents in the area of construction site. • <u>Land erosion from earthworks & sedimentation of rivers</u>: Construction of intake structures on Srepok river, EA Kar reservoir, Dong Ho reservoir and near at Srepok dam will cause soil erosion and siltation of rivers. • <u>Pollution of surface and ground water</u>: Pollution of rivers & ponds, and shallow groundwater caused by discharged liquid and solid wastes from construction sites and worker camps. • <u>Traffic disruptions</u>: Construction traffic and excavations near roadways will cause traffic disruptions. • <u>Other social issues</u>: (i) Worker & public health issues caused by chemical exposure & accidents caused at construction sites & by traffic; (ii) disruption and stoppages of community & business activities, (iii) social and public health issues generated migrant labour force; (iv) periodic water supply outages.
Operation Phase
<ol style="list-style-type: none"> 1) Improper management of solid and liquid wastes produced at WTPs (e.g., domestic, alum, chlorine); 2) Chemical spills at WTPs (e.g., chlorine, lime); 3) Improper process management and disposal of WTP sludge.

1. Public Consultation

19. A public meeting was held with the affected community in Buon Ma Thuot City and Krông Ana district to document the community concerns and issues of the project. The meeting was held to review the original GoV Environmental Protection Commitment¹³ (EPC) that was prepared for the subproject in Dak Lak. The affiliations of the 21 meeting participants are summarized below:

- Representatives of Dak Lak Water Supply, Construction and Investment Company;
- Representatives of Commune & Ward PCs;
- Representatives of District & City Departments, and Mass Organizations; and
- Affected Households.

Overall the meeting participants agreed with the potential impacts of the subproject components (Buon Ma Thuot city, EA Kar Krong Nang, & Buon Don water supply systems) reported in the EPC for the pre-construction, construction, and operation phases of the subproject. Specific recommendations of meeting participants are as follows:

- Subproject should comply with the Law on Environmental Protection (LEP, 2005).
- The employer requested to provide a more detailed environmental report to the relevant departments so that they can review and comment.
- Subproject should study waste treatment, storage of waste dumps, and sludge.
- Subproject should review flow of Srepok river during dry season to ensure river will meet requirements of subproject, and whether subproject affects water quality, and other uses of river such as irrigation

20. All issues raised during the single public consultation are addressed by the upgraded EMP. As part of the initiation of the public Grievance Redress Mechanism during pre-construction phase (see section IV), the public consultation process must be continued. Disclosure of the EMP to stakeholders should also occur during pre-construction phase (see PAM).

a. Downstream Affected Persons

21. Subsequent consultations with the public need to be expanded to include persons affected by the development of all four water supply systems. In particular, follow-on consultations must explicitly document concerns of residents, businesses or other stakeholders that are situated downstream of the final intake locations on the three raw water supply reservoirs to determine any concerns or conflicts of the water extractions among other users requested for the Srepok river during the initial public consultation. The follow-on public consultations form part of a needed review of the sustainability of raw water quantity and quality that must be conducted for each supply reservoir during detailed design phase.

D. Mitigation Plan

22. The mitigation measures of the original EMP of the IEE have been expanded in detail and scope into a comprehensive mitigation plan (Table 2) for the pre-construction, construction,

¹³ The original GoV EPC that was prepared was subsequently modified into the current IEE to meet the requirements of the ADB SPS (2009)

and operation phases of the four water supply systems. The plan addresses the environmental issues and concerns that were raised at the public stakeholder meeting during the IEE.

23. The mitigation plan identifies responsible parties, location, and indicative costs, and timing. The mitigation plan needs to be updated to meet the detailed designs of the subproject.

Table 2. Environmental Impact Mitigation Plan

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
Pre-construction Detailed Design Phase: for Water Supply Systems at Buon Ma Thuot, EA Kar, Krong Nang, & Buon Don								
Confirmation of required resettlement and temporary relocations	No community impacts	1. Affected persons well informed well ahead of project implementation.	At all component sites of each water supply system	Before subproject implemented	See resettlement plan	See resettlement plan	DAKWACO / PMU ¹⁴	Resettlement committees
Disclosure, & engagement of community	No community impacts	2. Implement information disclosure and activate grievance redress mechanism (section IV)	At all construction sites.	Beginning of subproject	Quarterly	No marginal cost ¹⁵	DAKWACO	PMU
GoV approvals	No negative impact	3. Notify DoNRE of project initiation to ensure GoV EIA requirements approved , and obtain required project permits and certificates.	Entire subproject	Before construction	As required	No marginal cost	PPC & DDSC ¹⁶	PMU
Detailed designs	Minimize negative	4. Complete detailed designs of all components of the four new water supply systems in: 1) Buon Ma Thuot city; and 2) the three district towns of EA Kar, Krong Nang, & Buon Don. Detailed designs to incorporate the following: a) updated review & assessment of reservoir raw water sources to ensure that <u>sufficient</u> and <u>sustainable</u> supplies of <u>treatable</u> raw water will be available to all four water supply systems long after commissioning stage; b) review of the assertion of IEE that no protected areas, critical habitat, rare or	(a-d), At final locations of	Before	Once with	No marginal	DAKWACO / DDSC	PMU

¹⁴ Project Management Unit under DAKWACO

¹⁵ No marginal cost indicates that costs to implement mitigation are to be built into cost estimates of bids of contractors

¹⁶ Detailed Design & Supervision Consultant

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
	environmental impacts	<p>endangered flora or fauna, or cultural property or values will be affected by any water supply component of subproject (see Update EMP section below);</p> <p>c) minimal acquisition of agriculture and forested lands;</p> <p>d) no or minimal disruption to water supply, utilities, and electricity with contingency plans for unavoidable disruptions; and</p> <p>e) final review of ability of existing wastewater infrastructure to accommodate the increased wastewater that will be produced.</p>	<p>all components of each water supply development</p> <p>e) collection areas (e.g., canals)</p>	construction initiated	detailed designs documents	cost		
Update EMP	Minimize negative environmental impacts	<p>5. In direct consultation with DoNRE and wildlife experts for Dak Lak province confirm that detailed designs will not negatively affect critical habitat, rare & endangered species cited in Viet Nam Red Book, and other valued ecological resources that could be affected by construction & operation of the four new water supply systems</p> <p>6. Commission original ecological surveys if available data are insufficient for assessment.</p> <p>7. Re-sample water quality parameters at three source reservoirs, & Srepok river if locations of intakes re different. Compare data to updated surface water quality standards (Table 3).</p>	All areas directly & indirectly affected by 4 water supply projects	In parallel with completion of detailed designs completed	Once, as part of detailed designs	<p>No marginal cost</p> <p>Original wildlife / resource surveys if needed (see Monitoring Plan)</p> <p>WQ survey if needed (see Monitoring Plan)</p>	DAKWACO / DDSC	<p>PMU</p> <p>PMU / EI¹⁷</p>
		<p>8. Update all mitigation measures and monitoring requirements of EMP where necessary to meet detailed designs.</p> <p>9. Identify any new potential impacts of project</p>						

¹⁷ An Environmental Institute to be identified during detailed design stage.

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
Update EMP	Minimize negative environmental impacts	<p>and include in EMP.</p> <p>10. Submit updated EMP with new potential impacts to ADB to review.</p> <p>11. For the four water supply systems develop individual environmental management sub-plans for: a) Securing GoV approvals; b) UXO survey & removal; c) Forest clearing, tree/ vegetation removal, & site restoration; d) Civil works; e) Cultural chance finds; f) Contaminated spoil identification & disposal; g) Construction materials acquisition, transport, & storage including borrow pit management; h) raw water intake construction i) Erosion & river sedimentation control; j) Construction site drainage; k) Noise, dust & NOx, SOx, CO, CO₂ emissions; l) Worker camp operation; m) Solid and liquid waste disposal; n) Hazardous chemical & waste management; o) Construction & urban traffic (especially along raw water pipeline); p) Utility and Power Disruption; q) Worker and public Safety (especially along raw water pipeline); r) Raw water quantity & quality sustainability; s) Training & capacity development plan; t) WTP chemicals & sludge management; and u) Treated water quality management.</p>	Entire subproject	In parallel with completion of detailed designs	Once, as part of detailed design phase	No marginal cost	DAKWACO / DDSC	PMU
Develop bid documents	No negative environmental impact	<p>12. Ensure updated EMP is included in contractor tender documents to enable contractors to develop their CEMP¹⁸, and that tender documents specify implementation of CEMPs must be included in cost estimates.</p> <p>13. The environmental management sub-plans identified in 11) above should be identified in the appropriate contractor tender documents, for the contractor to detail into CEMPs for</p>	All project areas	Before construction begins	Once for all tenders	No marginal cost	DAKWACO / DDSC	PMU / DDSC

¹⁸ Contractors Environmental Management Plan

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
		their bidding documents. 14. Specify in bid documents that contractor must have experience with implementing EMPs, and/or provide staff with EMP experience.						
UXO survey, & removal	Injured worker or public	15. Ensure military is consulted and clears areas where necessary.	All construction sites.	Before any clearing or excavation	Once	See Monitoring Plan below	PPC & military	military
Training & capacity development	No negative environmental impact	16. Develop and schedule training plan for DAKWACO / PMU staff to be able to fully implement EMP, and manage implementation of mitigation measures by contractors. 17. Create awareness and training plan for later delivery to contractors whom will implement mitigation measures.	For all project areas	Before construction begins	After each training session	No marginal cost	DDSC	DDSC / DAKWACO
Procurement of Contractor(s)	No negative environmental impact	18. Ensure winning contractor bid(s) include a CEMP that addresses items 8 – 11 in "Update EMP" section above.	All project areas	Before contracts signed	Once	No marginal cost	DAKWACO / DDSC	DAKWACO / DDSC
Recruitment of workers	Community mischief, & sexually transmitted disease	19. Use local workers as much as possible, reducing #s of migrant worker	For all work locations	Throughout construction phase	After worker hiring stages	No marginal cost	DAKWACO / DDSC	Contractor's bid documents
<p align="center">Construction Phase –</p> <p align="center">for Raw Water Intakes, Mains, WTPs, and Boosted Treated Water Networks Buon Ma Thuot, EA Kar, Krong Nang, & Buon Don</p>								
Initiate EMP & sub-plans,	Prevent or minimize impacts	20. Initiate updated EMP including individual management sub-plans for the different types of potential impacts identified in pre-construction phase. See sub-plan implementation guidance below.	For all construction sites	Beginning of construction	Once	No marginal cost	DAKWACO / DDSC	PMU & contractors

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
Obtain & activate construction permits and licenses	Prevent or minimize impacts	21. Contractors to comply with all statutory requirements set out by DoNRE for use of construction equipment, hazardous waste & chemicals management, and operation of construction plants, e.g., concrete batching.	For all construction sites	Beginning of construction	Once	No marginal cost	DAKWACO / DDSC	PMU & contractors
Worker camp operation	Pollution and social problems	22. Locate worker camps away from human settlements. 23. Ensure adequate housing and waste disposal facilities including pit latrines and garbage cans. 24. A solid waste collection program must be established and implemented that maintains a clean worker camps 25. Locate separate pit latrines for male and female workers away from worker living and eating areas. 26. A clean-out or infill schedule for pit latrines must be established and implemented to ensure working latrines are available at all times. 27. Worker camps must have adequate drainage. 28. Local food should be provided to worker camps. Guns and weapons not allowed in camps. 29. Transient workers should not be allowed to interact with the local community. HIV Aids education should be given to workers. 30. Camp areas must be restored to original condition after construction completed.	All worker camps	Throughout construction phase	Monthly	No marginal cost	DDSC & PMU	contractor
Training & capacity	Prevention of impacts through education	31. Implement training and awareness plan for DAKWACO / PMU (Environmental staff) and contractors.	PMU offices, construction sites	Beginning of construction	After each event	No marginal cost	DDSC	DDSC & PMU

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
Tree and vegetation removal, and site restoration sub-plan	Damage or loss of trees, vegetation, and erosion of landscape	32. Contact local forestry department for advice on how to minimize damage to trees and vegetation. 33. Restrict tree and vegetation removal to within designated RoWs. 34. Within RoWs minimize removals, and install protective physical barriers around trees that do not need to be removed. 35. All RoWs to be re-vegetated and landscaped after construction completed. Consult forestry department to determine the most successful restoration strategy and techniques.	All construction sites.	Beginning and end of project	Monthly	No marginal cost	DDSC / PMU	contractor
Civil works	Degradation of terrestrial resources	36. All construction sites should be located away forested, plantation, & agricultural areas as much as possible. 37. No unnecessary cutting of trees. 38. All construction fluids such as oils, and fuels should be stored and handled well away from forested and plantation areas. 39. No waste of any kind is to be discarded on land or in forests/plantations.	All construction sites	Throughout construction phase	Monthly	No marginal cost	DDSC & PMU	contractor
Civil works for intakes	Degradation of water quality & aquatic resources	40. Protective berms, plastic sheet fencing, or silt curtains should be placed between all earthworks and surface waters in Srepok river. 41. Minimize earthworks & final area of foundations for intakes in reservoirs and Srepok river. 42. Erosion channels must be built around aggregate stockpile areas to contain rain-induced erosion. 43. Earthworks should be conducted during dry	All construction sites	Throughout construction phase	Monthly	No marginal cost	DDSC & PMU	contractor

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
		<p>periods.</p> <p>44. All construction fluids such as oils, and fuels should be stored and handled well away from surface waters.</p> <p>45. No waste of any kind is to be thrown in surface waters.</p> <p>46. No washing or repair of machinery near surface waters.</p> <p>47. Pit latrines to be located well away from all surface waters.</p> <p>48. No unnecessary earthworks in or adjacent to all water courses.</p> <p>49. No aggregate mining from surface waters (rivers, lakes).</p> <p>50. All existing irrigation canals and channels to be protected the same way as rivers and lakes.</p>						
Cultural chance finds	Damage to cultural property or values & chance finds	<p>51. As per detailed designs all civil works should be located away from all cultural property and values including cemeteries and pagodas.</p> <p>52. Chance finds of valued relics and cultural values should be anticipated by contractors. Site supervisors should be on the watch for finds.</p> <p>53. Upon a chance find all work stops immediately, find left untouched, and PMU and CPC notified. If find deemed valuable, provincial cultural authorities must be notified.</p> <p>54. Work at find site will remain stopped until authorities allow work to continue.</p>	All construction sites	At the start , and throughout construction phase	Monthly	No marginal cost	DDSC & PMU	contractor
		55. All borrow pits and quarries should be approved by DoNRE.						

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
Construction materials acquisition, transport, and storage sub-plan	Pollution, injury, increased traffic, disrupted access	<p>56. Select pits and quarries in areas with low gradient and as close as possible to construction sites.</p> <p>57. Required aggregate volumes must be carefully calculated prior to extraction to prevent wastage.</p> <p>58. Pits and quarries should not be located near surface waters, forested areas, critical habitat for wildlife, or cultural property or values.</p> <p>59. All topsoil and overburden removed should be stockpiled for later restoration.</p> <p>60. All borrow pits and quarries should have a fence perimeter with signage to keep public away.</p> <p>61. After use pits and quarries should be dewatered and permanent fences installed with signage to keep public out, and restored as much as possible using original overburden and topsoil.</p> <p>62. Unstable slope conditions in/adjacent to the quarry or pit caused by the extractions should be rectified with tree planting.</p> <p>63. Define & schedule how materials are extracted from borrow pits and rock quarries, transported, and handled & stored at sites.</p> <p>64. Define and schedule how fabricated materials such as steel, wood structures, and scaffolding will transported and handled.</p> <p>65. All aggregate loads on trucks should be covered.</p> <p>66. Piles of aggregates at sites should be used/or removed promptly, or covered and placed in non traffic areas.</p>	For all construction areas.	Throughout construction phase	Monthly	No marginal cost	DDSC / PMU	Contractor(s)

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
Excavation spoil management sub-plan	Contamination of land and surface waters from excavated spoil	<p>67. Uncontaminated spoil to be disposed of in DoNRE-designated sites, which must never be in or adjacent surface waters. Designated sites must be clearly marked and identified.</p> <p>68. Spoil must not be disposed of on sloped land, near cultural property or values, ecologically important areas, or on/near any other culturally or ecologically sensitive feature.</p> <p>69. Where possible spoil should be used at other construction sites, or disposed in spent quarries or borrow pits.</p> <p>70. A record of type, estimated volume, and source of disposed spoil must be recorded.</p> <p>71. Contaminated spoil disposal must follow GoV regulations including handling, transport, treatment (if necessary), and disposal.</p> <p>72. Suspected contaminated soil must be tested, and disposed of in designated sites identified by DoNRE as per GoV regulations.</p> <p>73. Before treatment or disposal contaminated spoil must be covered with plastic and isolated from all human activity.</p>	All excavation areas	Throughout construction phase	Monthly	<p>No marginal cost</p> <p>Testing of contaminated soil (see Monitoring Plan below)</p>	DDSC, PMU & DoNRE	<p>Contractor</p> <p>DoNRE</p>
Construction Drainage sub-plan	Flooding from loss of drainage & flood storage	<p>74. Provide adequate short-term drainage away from construction sites to prevent ponding and flooding.</p> <p>75. Manage to not allow borrow pits and quarries to fill with water. Pump periodically to land infiltration or nearby water courses.</p> <p>76. Install temporary storm drains or ditches for construction sites.</p> <p>77. Ensure existing road & street drains do not become plugged with construction waste .</p> <p>78. Protect surface waters from silt and eroded</p>	All areas with surface waters	Design & construction phases	Monthly	No marginal cost	DDSC & PMU	contractor

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
		soil.						
Solid and liquid construction waste sub-plan	Contamination of land and surface waters from construction waste	<p>79. Management of general solid and liquid waste of construction will follow GoV regulations, and will cover, collection, handling, transport, recycling, and disposal of waste created from construction activities and worker force.</p> <p>80. Areas of disposal of solid and liquid waste to be determined by DoNRE.</p> <p>81. Disposed of waste should be catalogued for type, estimated weigh, and source.</p> <p>82. Construction sites should have large garbage bins.</p> <p>83. A schedule of solid and liquid waste pickup and disposal must be established and followed that ensures construction sites are as clean as possible.</p> <p>84. Solid waste should be separated and recyclables sold to buyers in community.</p> <p><u>Hazardous Waste</u></p> <p>85. Collection, storage, transport, and disposal of hazardous waste such as used oils, gasoline, paint, and other toxics must follow GoV regulations.</p> <p>86. Wastes should be separated (e.g., hydrocarbons, batteries, paints, organic solvents)</p> <p>87. Wastes must be stored above ground in closed, well labeled, ventilated plastic bins in good condition well away from construction activity areas, all surface water, water supplies, and cultural and ecological sensitive receptors.</p> <p>88. All spills must be cleaned up completely with</p>	All construction sites and worker camps	Throughout construction phase	Monthly	No marginal cost	DDSC, PMU, & DoNRE	contractor

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
		all contaminated soil removed and handled with by contaminated spoil sub-plan.						
Noise and dust sub-plan	Dust Noise	89. Regularly apply wetting agents to exposed soil and construction roads especially in high density areas. 90. Cover or keep moist all stockpiles of construction aggregates, and all truck loads of aggregates. 91. Minimize time that excavations and exposed soil are left open/exposed. Backfill asap. 92. As much as possible restrict working time between 07:00 and 17:00. In particular are activities such as pile driving. 93. Maintain equipment in proper working order 94. Replace unnecessarily noisy vehicles and machinery. 95. Vehicles and machinery to be turned off when not in use. 96. Construct temporary noise barriers around excessively noisy activity areas where possible.	All construction sites.	Fulltime	Monthly	No marginal cost	DDSC & PMU	contractor
Utility and power disruption sub-plan	Loss or disruption of utilities and services such as water supply and electricity	97. Develop carefully a plan of days and locations where outages in utilities and services will occur, or are expected. 98. Contact local utilities and services with schedule, and identify possible contingency back-up plans for outages. 99. Contact affected community to inform them of planned outages. 100. Try to schedule all outages during low use time such between 24:00 and 06:00.	All construction sites.	Fulltime	Monthly	No marginal cost	DDSC, PMU & Utility company	contractor

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
Erosion sub-plan	Land erosion	101. Berms, and plastic sheet fencing should be placed around all excavations and earthwork areas. 102. Earthworks should be conducted during dry periods. 103. Maintain a stockpile of topsoil for immediate site restoration following backfilling. 104. Protect exposed or cut slopes with planted vegetation, and have a slope stabilization protocol ready. 105. Re-vegetate all soil exposure areas asap.	All construction sites	Throughout construction phase	Monthly	No marginal cost	DDSC & PMU	contractor
Worker and public safety sub-plan	Public and worker injury, and health	106. Proper fencing, protective barriers, and buffer zones should be provided around all construction sites. 107. Sufficient signage and information disclosure, and site supervisors and night guards should be placed at all sites. 108. Worker and public safety guidelines published by MoLISA should be followed. 109. Population near blast areas should be notified 24 hrs ahead, and evacuated well before operation. Accepted GoV blast procedures and safety measures implemented. 110. Speed limits should be imposed on all roads used by construction vehicles. 111. Standing water suitable for disease vector breeding should be filled in. 112. Worker education and awareness seminars for construction hazards should be given. A construction site safety program should be developed and distributed to workers. 113. Appropriate safety clothing and footwear	All construction sites.	Fulltime	Monthly	No marginal cost	DDSC & PMU	contractor

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
		should be mandatory for all construction workers. 114. Adequate medical services must be on site or nearby all construction sites. 115. Drinking water must be provided at all construction sites. 116. Sufficient lighting be used during necessary night work. 117. All construction sites should be examined daily to ensure unsafe conditions are removed.						
Construction and local vehicle traffic sub-plan	Traffic disruption, accidents, public injury	118. Schedule construction vehicle activity during light traffic periods. Create adequate traffic detours, and sufficient signage & warning lights at all construction locations. 119. Post speed limits, and create dedicated construction vehicle roads or lanes. 120. Inform community of location of construction traffic areas, and provide them with directions on how to best co-exist with construction vehicles on their roads. 121. Increase the number of pedestrian crossings away from construction areas. 122. Increase road and walkway lighting.	All construction sites	Fulltime	Monthly	No marginal cost	DDSC & PMU	contractor
Post-construction Operation of Four Water Supply Systems								
Raw water supply from three reservoirs, and	Unsustainable quantity or quality of raw	123. Establish committees of users of Srepok river & reservoir, and EA Kar and Dong Ho reservoirs to regularly review water demand forecasts especially during the dry season to ensure sustainable supply to all users. 124. Establish a water quality monitoring program funded by all users of Srepok rivers and all	Srepok river & reservoir, and Ea Kar and Dong Ho	once	biannually	No marginal cost	DAKWACO / DoNRE / other users	DAKWACO

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
Srepok river	water	three reservoir that meets the information needs of all users (See Environmental Monitoring Plan below).	reservoirs				DAKWACO / other users / DDSC	EI
Treated water supplies	Unsustainable quantity or quality of treated water	<p>125. Develop and implement O&M manuals for all equipment and operations of each of the four water supply systems which include regular maintenance of treatment system components, and materials supply to ensure treated water production (m³/day) always meets WTP design specifications. Incorporate contingency and back-up plans for planned and unplanned system shutdowns.</p> <p>126. Establish a regular treated water quality monitoring program for four supply systems to ensure the quality of treated water meets original WTP design specifications. Incorporate contingency and response plans to address episodes of decreased treated water quality, including public notification. (See Environmental Monitoring Plan below).</p> <p>127. As part of #125 coordinate with Dept of Health for them to periodically monitor treated water quality to ensure it meets potable quality standards</p>	<p>Four WS systems</p> <p>At outlets of four WTPs and at select locations along distribution networks</p>	Quarterly, and as needed	As needed	No marginal cost	DAKWACO / DDSC	<p>DAKWACO</p> <p>EI / DoH</p>
Operation of raw & treated water pipelines	Local flooding from ruptures	128. As part of implementation of O&M manuals for the four WS systems instate a regular inspection program of all pipeline networks starting at reservoir intakes to WTPs and then along entire distribution network with focus on junctions and end-user connections.	At all pipeline locations	Quarterly, and as needed	As needed	No marginal cost	DAKWACO / DDSC	DAKWACO
Operation of WTP	Chemical spills, and pollution from solid and	129. As part of O&M manuals provide clear methods and procedures for safe handling and storage of planned treatment chemicals	At WTPs	Continuously	As needed	No marginal cost	DAKWACO	DAKWACO

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
	domestic waste	defined by, alum, soda (lime), and chlorine (Buon Ma Thuot) in designated chemical houses on WTP properties, including spills action plan. 130. With O&M manual define and implement formal solid and domestic waste collection and disposal protocols for all four WTPs.						
Production of WTP sludge	Contamination of environment	131. Review and confirm with DoNRE that the Ea Na landfill location is appropriate to dispose of planned dried sludge produced at the four WTPs. 132. Ensure planned technology for dewatering sludge at WTPs is maintained in good working order, and can more than accommodate production capacity of WTPs. 133. Ensure sludge is covered when transported to designated landfill. 134. Never dump or temporarily store sludge on lands outside landfill site, WTP property, or near water courses. 135. Develop and implement regular sludge quality monitoring to document sludge quality (See Environmental Monitoring Plan)	At WTPs	Continuously	As needed	No marginal cost	DAKWACO / DoNRE	DAKWACO
Production of treated water	Wastewater production too much for city wastewater management	136. Review and clarify wastewater loads generated from treated water from four WTPs can be handled by existing wastewater collection and treatment systems.	At WTPs	Periodically	As needed	No marginal cost	DAKWACO	DAKWACO
Operation of entire WS system,	Worker and public injury	137. Educate workers in workplace safety of WS system operation according to MoLISA regulations. Prevent public access to WTP properties, all reservoir intake areas, and all pipeline areas with fencing and appropriate signage.	WTPs and all pipeline property	Continuously	As needed	No marginal cost	DAKWACO	DAKWACO

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
		138. Enforce WTP truck drivers to follow speed limits on roads and highways. Provide adequate signage informing public of WTP truck traffic routes, and pipelines service routes. 139. Ensure all vehicles in good working order.	WTPs area & road to landfill site All facilities					

E. Monitoring Plan

24. The environmental monitoring requirements identified in the IEE were carried forward and expanded with more detail into a comprehensive monitoring plan (Table 4) that addresses both environmental effects and performance monitoring (Table 5). The monitoring plan focuses on all three phases (pre-construction, construction, post-construction operation) of the four water supply systems and provides environmental indicators, the sampling locations & frequency, method of data collection, responsible parties, and the estimated costs.

25. The purpose of the monitoring plan is to determine the effectiveness of the impact mitigations, and to document any unexpected positive or negative environmental impacts of the subproject. The PMU will be required to oversee the implementation of environmental monitoring plan by the EI. Similar to the mitigation plan, the monitoring plan will need to be updated at the detailed design stage to ensure it meets the monitoring needs of the detailed designs of the subproject

26. The key environmental protection laws, policy, and environmental standards that need to be followed with the implementation of the EMP are listed in Table 3 including allowable pollutant concentrations of discharged liquid residue of sludge settling ponds (e.g., QCVN 24:2009/BTNMT). Allowable ambient water and air quality levels are provided in QCVN 08:2008/BTNMT and QCVN 05:2009/BTNMT, respectively, as well as standards for domestic wastewater discharge for worker camps, and allowable contaminants in excavated soil for disposal are also provided.

27. Monitoring the success of the required resettlement of households and businesses, and the temporary relocation of secondary structures will be undertaken as part of the Resettlement Plan prepared under separate cover.

Table 3. Applicable Laws, Policy and Environmental Quality Standards.

GoV Laws
<ul style="list-style-type: none">• Law on Environmental Protection (LEP) No. 52/2005/QH11• Law on Water Resources No 08/1998/QH10• Law on Construction (LoC) No. 16/2003/QH11• Cultural Heritage Law 28/2001/QH10 dated 29th June 2001• Biodiversity Law 20/2008/QH12 dated 13th November 2008• Land law No.13/2003/QH11 dated 26th November 2003
GoV Decrees & Circulars
<ul style="list-style-type: none">• Decree No. 12/2009/ND-CP on managing construction and investment projects• Decree No. 209/2004/ND-CP dated 16th December 2004 on managing the quality of construction projects.• Decree 110/2002/ND-CP, supplementing some articles of Decree 06/1995 on labour code of occupational safety and health

<ul style="list-style-type: none"> • Decree 06/1995, elaborating provisions of labour code on occupational safety and health. • Decree No. 149/2004/NĐ-CP dated 27/07/2004 on regulation of licensing to invest, exploit, use water resource, discharge wastewater in water source. • Decree No. 59/2007/NĐ-CP dated 09/04/2007 on solid waste management. • Decree No. 88/2007/NĐ-CP dated 28/05/2007 of Government of Drainage in Industrial Park and Urban Area • Decree No. 35/2003/NĐ-CP dated 4/4/2003 of Government on detail regulations for implementing some articles of the Law of Fire Prevention and Fighting. • Circular No. 37/2005/TT-BLĐTBXH dated 29/12/2005 of Ministry of Labour, War Invalids and Social Welfare instructing training for work safety and labor sanitation. • Circular No. 02/2005/TT-BTNMT dated 24/6/2005 of MONRE instructing the implementation of licensing for investigation, exploitation, using water resource, discharging wastewater into receiving source. • Circular No. 12/2011/TT-BTNMT dated 14/04/2011 of MONRE on conditions to set up procedures, registration, licensing, giving code for hazardous solid waste management.
International Guidelines
<ul style="list-style-type: none"> • World Bank Group, 2007. Environmental Health and Safety Guidelines, Wash. DC. • AWWA Standard Methods for Measurement & Analysis Environmental Quality
GoV Environmental Protection Standards & Methods
<ul style="list-style-type: none"> • QCVN 08:2008/BTNMT: national regulation on surface water quality • QCVN 05:2009/BTNMT: national technical regulation on ambient air quality • QCVN 09:2008/BTNMT: national regulation on groundwater quality • QCVN 24:2009/BTNMT: national regulation on industrial wastewater quality • QCVN 14:2008/BTNMT: national technical regulation on domestic wastewater • QCVN 15:2008/BTNMT: national regulation on allowable pesticide residues in soil • QCVN 03:2008/BTNMT: national regulation heavy metals concentrations in soil • QCVN 26:2010/BTNMT: national technical standard for noise • TCVN 6962:2001: allowable vibration and shock from construction activities • TCVN / QCVN standard methods for analyzing environmental quality

1. Performance Monitoring

28. Indicators of the effectiveness of the EMP will be included in the Project Performance Monitoring System¹⁹ that the EA will develop for the entire subproject. Select indicators of major components of the environment that will be affected primarily by the construction phase are drawn from the mitigation and monitoring plans and summarized in Table 5.

¹⁹ Footnote 11

Table 4. Environmental Monitoring Plan

Environmental Indicators	Location	Means of Monitoring	Frequency	Reporting	Responsibility		Estimated ²⁰ Cost (USD)
					Supervision	Implementation	
Pre-construction Phase – Update Baseline Conditions							
Re-confirmation that no rare & endangered fauna & flora, and critical habitat exist in the finalized subproject areas.	All finalized component areas of four water supply projects	Review of existing data and information (DoNRE) supplemented by original surveys if necessary.	Once	Once	DDSC & DAKWACO	EI	\$3,000. (if survey necessary)
Re-confirmation that cultural property and values will not be affected.	All finalized component areas of four water supply projects	Interviews of DoNRE, and stakeholders at public meeting (see below)	Once	Once	DDSC & DAKWACO	PMU	See below
Updated & expanded community stakeholder comments & concerns of subproject	Public consultation sites from IEE expanded to include affected persons from all four WS developments including intake sites	Same format used in IEE for obtaining stakeholder input to subproject	At least once & in conjunction with Grievance Redress Mechanism	For each event	PPC / DAKWACO	PMU	\$5,000.
Air quality (dust, CO, NOx, SOx, noise, wind, and vibration levels) because of absence of data in IEE. Raw water quality parameters sampled during IEE	Representative sites of heavy civil & excavation works, and truck routes in four subproject cities & towns At finalized intake sites at 3 reservoirs, and Srepok river if intake locations changed from IEE.	Using field and analytical methods described in QCVN and TCVN standards for ambient air and surface water quality sampling & analysis.	One day and one night measurement	One baseline supplement report before construction phase starts	DDSC & PMU	EI	\$3,000. (AQ survey) \$2000. (supplemental WQ survey if necessary)

²⁰ Estimated field sampling and laboratory analysis costs include field and laboratory technicians. Cost for part-time national monitoring consultant to assist PMU with EMP will be part of cost estimate for project implementation consultants.

Environmental Indicators	Location	Means of Monitoring	Frequency	Reporting	Responsibility		Estimated ²⁰ Cost (USD)
					Supervision	Implementation	
Inventory of present and past land uses that could cause contaminated soil.	At all excavation sites, including borrow pits	Survey methods described in QCVN and TCVN standards for land use.	Once	Once	DDSC & PMU	EI	\$500.
Analysis of soil quality if required from above (heavy metals (As, Cd, Pb, oil & grease, hydrocarbons).	Possible contaminated lands all sites	Use field and analytical methods described in QCVN and TCVN standards for soil quality sampling & analysis.	D): Once if needed	Once	DDSC & PMU	EI	\$3,600.
Presence of UXO	Potentially located throughout project area	Military to survey and sweep affected areas of UXO	Once	Once	DAKWACO	military	tbd.
Construction Phase: of Raw Water Intakes, Mains, WTPs & Treated Distribution Networks at Buon Ma Thuot, EA Kar, Krong Nang, & Buon Don							
A) Air quality: dust, CO, NOx, SOx, noise, wind, and vibration levels B) Raw water quality parameters at finalized intake sites including heavy metals (As, Cd, Pb,) oil and grease, DO, COD, BOD ₅ , nutrients (NO ₂ , NO ₃ , TP, PO ₄). C) Analysis of soil quality (heavy metals (As, Cd, Pb, Hg, Mn), hydrocarbons. D) Domestic (worker) and construction solid waste inside & outside construction sites including worker camps. E) Public comments and complaints F) Incidence of worker or public accident or injury	A) At representative sites of civil or excavation works or traffic from pre-construction baseline above. B) At finalized intake sites in pre-construction phase C) At sites where contaminated soil is suspected at excavation areas at all subproject areas D) All construction sites and worker camps E) Using hotline number placed at all construction areas F) At all construction areas	A – C : Using field and analytical methods described in QCVN and TCVN standards for ambient air and surface water quality monitoring. Include visual observations of dust and noise from contractor & public reports . D) Visual observation E) Information transferred by telephone hotline number F) regular reporting by contractors/PMU	(A – B): Quarterly during construction periods C) Once before start of excavation D) Monthly E) Continuous public input F) Continuous	Quarterly	(A - D): DDSC / PMU EI E & F) & daily observations: PPC / DAKWACO PMU / contractor		A) \$9,600. /yr B) \$13,000. /yr C) \$3,600. /yr D) With A-C (no marginal cost) E) \$2,000. / yr F) No marginal cost

Environmental Indicators	Location	Means of Monitoring	Frequency	Reporting	Responsibility		Estimated ²⁰ Cost (USD)
					Supervision	Implementation	
Operation of all Four WTPs, Mains, & Distribution Networks							
Air quality: dust, noise and vibration levels	At four WTPs	Using field and analytical methods described in QCVN & TCVN standards for ambient air quality monitoring.	Quarterly for 5 years	Biannual	DAKWACO	\$1,200.00 / yr	
Worker & public injury associated with WTPs & pipeline networks	On properties of intakes, four WTPs, pipelines, and pump stations	Regular record keeping	Continuously	For each event	DAKWACO	No marginal cost	
Treated water quality: total & faecal coliform, pH, DO, NH ₃ , NO ₃ , NO, chlorine, alum, NaCl, and heavy metals (As, Cd, Pb.).	At four WTPs & random user locations along distribution networks	Using field and analytical methods described in QCVN & TCVN standards for water quality monitoring, and parameters of QCVN 14:2008/BTNMT	Biannually, or when public complaint arises	For each event	DAKWACO / DoNRE / MoH	\$3,500.00 / yr	
WTP sludge quality: ToC, heavy metals (As, Cd, Pb.), coliforms, pH, BOD, nutrients (N&P), alum, chlorine,	After removal from sludge drying facilities and before disposal at designated landfill.	Using field and analytical methods described in QCVN & TCVN standards for water quality monitoring	Quarterly for 5 years	Biannually	DAKWACO	\$4,500. / yr	
Public complaints of operation of WTPs, drinking water availability & quality, and malfunctions with pipelines (e.g., leaks).	At all sites	Regular record keeping	Continuously	Biannually	DAKWACO	\$1,000. / yr	

Table 5. Performance Monitoring Indicators

Major Environmental Component	Key Indicator	Performance Objective	Data Source
Pre-construction Phase			
Public Consultation & Disclosure	Affected public & stakeholders	Meeting with stakeholders contacted during IEE & new stakeholders convened for follow-up consultation & to introduce grievance mechanism	Minutes of meeting, and participants list
EMP	Updated EMP	All stakeholders contacted during IEE re-contacted for follow-up consultation	EMP
Bid Documents	Requirements of EMP (CEMP)	EMP appended to bidding documents with clear instructions to bidders	Bid documents
Training of DAKWACO / PMU	Training course(s) & schedule	By end of P-C phase, required course(s) that will be delivered are designed and scheduled	Course(s) outline, participants, and schedule
Construction Phase			
All subproject areas	Critical habitat, rare or endangered species <i>if present</i>	All critical habitat and R & E species unchanged, and unharmed	Monitoring by EI
Air quality	SOx, NOx, dust, , CO, noise, vibration	Levels never exceed QCVN standards (Table 3), or normal ambient levels. Necessary exceedances are isolated, and short in duration as possible.	EI & contractor monitoring reports,
Raw water quality	Parameters at finalized intake sites including heavy metals (As, Cd, Pb,) oil and grease, DO, COD, BOD ₅ , nutrients (NO ₂ , NO ₃ , TP, PO ₄).	Raw water never degraded preventing WTP designs to produce potable water quality	EI & contractor monitoring reports,
Soil quality	Solid & liquid waste	Rigorous program of procedures & rules to collect and store all waste from construction camps and sites practiced.	Contractor and EI monitoring reports
Hazardous materials & waste	Oil, gasoline, grease, alum, chlorine, soda	Rigorous program of procedures to manage and store all waste from construction camps and sites practiced as well as adherence to specific policy (Table 3)	Contractor and EI monitoring reports
Public & worker safety	Frequency of injuries	Adherence to specific policy (Table 3), and site-specific procedures to prevent accidents	Contractor reports

Major Environmental Component	Key Indicator	Performance Objective	Data Source
Cultural property	Incidence of damage, or complaints	No valued cultural property, or unearthed valuable relic is harmed in any way	Public input, contractor reports, public input, EI reports
Traffic	Frequency of disruptions & blocked roadways	Disruptions, stoppages, or detours are managed to absolute minimum.	Public input, contractor reports, EI reports
Operation Phase			
Raw water quality	Degraded water quality of Srepok river & three reservoirs	Raw water never degraded preventing WTP to produce potable water quality	DAKWACO / DoNRE monitoring reports
Soil & surface water quality	Contamination from discharged sludge	Sludge is to be processed on WTP sites then transported to DoNRE approved landfill.	Public input, DoNRE inspections, & DAKWACO regular reporting
Worker health & safety	Exposure to treatment chemicals such as chlorine, and hazardous activities & equipment	No spills or unprotected exposure to chlorine, or other hazardous materials will occur following procedures of O&M manual for WTP.	MoLISA reports, & DAKWACO regular reporting
Potable water supply	Sufficient potable water for users of distribution network	Safe drinking water quality produced as per design specifications of WTP	MoH inspections, & DAKWACO regular reporting

F. Reporting

29. Regular reporting on the implementation of mitigation measures, and on monitoring activities during construction phase of the project is required as indicated in Tables 3 - 5. Construction contractors are required to submit brief monthly reports on environmental issues and mitigation activities to the PMU. The PMU must prepare quarterly reports on the EMP to the EA which include input from regular meetings with public stakeholders. The EA must prepare biannual reports on activity and effectiveness of EMP to ADB²¹.

30. Environmental monitoring reports will be prepared in parallel quarterly for the PMU/EA by the EI. The reports will table all indicators measured from the monitoring plan of EMP, and will include relevant GoV environmental quality standards (i.e., QCVN & TCVN, Table 3).

G. Estimated Cost of Mitigation and Monitoring Plans

31. No marginal costs are estimated for implementing impact mitigation measures during the pre-construction phase of the project (Table 2) because mitigation costs should be included in contractor bids. Estimated costs for field sampling and laboratory analyses for the monitoring plan during pre-construction phase to supplement the baseline including an estimated

²¹ Footnote 5

\$17,100.00 excluding UXO survey & removal if necessary. Monitoring costs per year during construction phase are estimated at \$28,200.00, and \$10,200. annually for the 2-3 year period from beginning of operation phase. All estimated costs are preliminary, and based on the national cost norms for environmental sampling and analyses (Circular 83/2002/TT-BTC). All cost estimates need to be updated with the EMP at detailed design stage.

H. Emergency Response Procedures

32. Emergency response procedures must be in place during the construction and subsequent operation of all components of the four new water supply systems at Buon Ma Thuot city, and the three district towns of EA Kar, Krong Nang, and Buon Don to protect the public and workers. Potential emergencies could arise from accidents resulting from the operation of heavy equipment, excavation activities including work at borrow pits, chemical spills, electrical shock, work in/or near rivers, and from worker & public vehicle traffic. Environmental incidents could occur from pipeline failures, spills at WTPs, improper disposal of WTP sludge, and failures along distribution networks.

33. The emergency procedures of the subproject (SERP) represent the first response which must align with the second and ultimate response by the existing external emergency response procedures (EERP) of the different municipalities and districts for civil and environmental accidents. The SERP must complement workplace & public safety requirements prescribed by MoLISA (Table 3). The SERP essentially sounds the alarm and initiates emergency measures which are subsequently assumed and completed by the EERP.

Response Teams

34. The SERP requires emergency response teams (SERT) which consists primarily of the contractors during construction phase of the four water supply systems. When the completed water supply systems become operational DAKWACO assumes the role of the SERT.

35. During construction each water supply system should have its own SERT for a total of four SERTs for the entire subproject. Each SERT will have an emergency response coordinator (ERC) to oversee sub-teams assigned to the water supply components (intake, raw water pipeline, WTP, treated water distribution network). Representatives of the SERT will be present at construction sites at all times. Each ERC will have (or share) a counterpart in the PMU which will assign 1-2 staffers as necessary as external support officers of the SERTs. The PMU will assist by providing a coordinating role.

36. The EERP also has an emergency response team (EERT) which is comprised of local ambulance services, hospitals, clinics, police department, Department of Health, Department of Natural Resources & Environment, and the Department of Labour, Invalids, & Social Assistance. Before construction begins the four SERTs and PMU must meet with the different members of the EERT to ensure that the planned SERP and executive SERTs are sufficient and align with the procedures of the different components of the EERP.

37. Contractors will need to identify their draft SERP and SERT in the CEMP of their bid documents, and describe how they will coordinate with the EERT to finalize the SERP. Construction tender documents will need to specify the requirements for a SERP and roles of the SERT.

Example Emergencies

38. Example emergencies, and emergency scenarios that the SERP must be able to provide the first response are summarized below. The list of possible emergencies will be finalized with the PMU.

Human Injury

- all worker injuries requiring on-site first aid, or immediate hospital care
- all public injuries caused from construction-related activities requiring immediate first aid, or hospital care

Environmental emergencies

- pipeline, coffer dam, or reservoir intake failures causing local flooding
- spills of hazardous substances (e.g., gasoline, oil, chlorine, soda, PAC, paint) on land into surface waters (rivers, lakes, reservoirs), or into drinking water source

Emergency scenarios

- traffic accidents
- truck load or tanker spills, or ruptures
- excavation cave-ins
- landslides
- building collapse
- heavy equipment accident or malfunction
- near drownings
- gas or UXO explosions
- fire
- hazardous chemical or gas exposure

Emergency Response Procedures

39. Described briefly below are general emergency response procedures that the SERT must be able to initiate ahead of the complete response of the EERT. The procedures will be finalized in coordination with the EERT and PMU, and will form part of the CEMP, and O&M manual for DAKWACO.

Alert & Communication & Initial Response

- Immediate recognition of emergency situation by sub teams of SERT;
- Immediate notification of ERC & PMU of nature of emergency
- ERC alerts required authorities & expertise of EERT (e.g., fire department, ambulance & hospitals, DoNRE, DoT, DoH, DoLISA, PPC);
- SERT under direction of ERC & PMU begin to stabilize situation where possible (e.g., first aid to injured worker/public, environmental clean-up, fire containment) while waiting for expertise of EERT to arrive

Evacuation

- Move people out quickly as a group, and avoid panic
- Evacuate through pre-defined evacuation route
- Move people away until safely away from the emergency site and area of influence
- Report missing persons to EERT immediately
- Assist the injured & transfer to medical component of EERT

- Only move seriously injured persons under direction of EERT

Medical

- Administer appropriate first aid immediately regardless of severity of injury
- Alert ERC & PMU
- Call the EERT (emergency medical services and/or nearest hospital)
- Direct EERT to the emergency site by escort if necessary
- If necessary vacate and close site immediately, or restrict access to site

Fire

- Alert immediate area and ERC & PMU of fire situation
- Contact EERT if fire considered too large to extinguish
- Contact EERT if medical assistance is required
- Stop all activities or operations
- Begin to contain fire and keep from spreading
- Evacuate site if deemed necessary
- Direct EERT to site by escort if necessary

Explosion

- Expect further explosions & take shelter or leave area
- Alert ERC & PMU
- Call EERT (fire dept, ambulance, hospitals) if necessary
- Evacuate area
- Direct EERT to site by escort if necessary

Hazardous Material Spill

- Alert all persons in area, and ERC & PMU
- Stop all work in area
- Notify EERT (DoNRE, DoH, ambulance, hospitals)
- Begin to stop spill and contain contaminated area if it can be done safely
- Direct EERT to site by escort if necessary
- All exposed persons to be taken to hospital to assess exposure damage

Drinking Water Contamination

- Assess potential eventual exposure (# of affected people) to contaminated water
- Contact EERT (DoNRE & MoH)
- Initiate notification of affected community
- Stop source of contamination
- Begin identifying alternate clean water supply to affected persons

40. The SERT in conjunction with the EERT will conduct follow-up measures to ensure that the emergency is over or under remediation. The specific follow-up measures of the SERP for the different emergency types and scenarios will be finalized with the EERT and PMU.

I. Institutional Capacity Review and Needs

41. The capacity of the DAKWACO and assigned PMU for environmental management is expectedly weak, and likely will need to be strengthened. Full-time staff in water supply companies dedicated to environmental management normally does not exist other than engineers who monitor raw and treated water quality, and quality of WTP sludge.

42. The environmental subunit created for PMU will need to understand and be able to effectively oversee implementation of the EMP. Understanding of potential project environmental impacts and their management will be required by the PMU. The PMU will need to understand and be able to oversee compliance of subproject with ADB and GoV pursuant to environmental safeguards of the LEP (2005) and SPS (2009).

43. As part of the institutional capacity development plan for the entire sub-project, the environmental subunit of the PMU should receive training on the development and implementation of an EMP. Two approaches to training should be: 1) classroom coursework; and 2) “learning by doing” from work on the implementation of the subproject EMP with coaching assistance provided by the environmental specialist of the DDSC. On the job training begins with updating of the EMP to meet the detailed subproject designs as assisted by the DDSC.

44. Classroom training should be given by the environmental specialist of the DDSC, and focus on two thematic areas defined by: 1) principles environmental assessment & management focused on the potential impacts of infrastructure development on the natural and social environments; and 2) environmental safeguard requirements of the ADB and GoV with specific focus on the Buon Ma Thuot & Districts subproject.

IV. INFORMATION DISCLOSURE & GRIEVANCE REDRESS MECHANISM

45. As part of the information disclosure requirements of the subproject²² all safeguard documents will be made available to the public and stakeholders affected by the water supply developments. The IEE and upgraded EMP will be available for review at the beginning of the detailed design stage on ADB’s web site and at commune offices for public access. Public comment on the EMP should be included in the update and finalization of the EMP at detailed design stage.

46. A grievance mechanism is included here because it was not specified in the report on the IEE. Grievances related to any aspect of the water supply systems will be handled through negotiation aimed at reaching consensus. Complaints and grievances will pass through three stages before they can be elevated to a court of law as last resort. The DAKWACO through the PMU will shoulder all administrative and legal fees that might be incurred in the resolution of such grievances and complaints. This mechanism will be integrated with that which will be used to settle grievances related to resettlement and compensation.

47. The first stage venue for raising and resolving complaints and grievances is at the Commune People’s Councils (CPC). An aggrieved party may bring its complaint or petition before any member of the council in writing or verbally. Grievances may also be raised during scheduled subproject consultations with local residents. The council first investigates the complaint and, if warranting project management action, notifies the PMU. The PMU will then meet with the complainant. The PMU will have 15 days after the lodging of the complaint to resolve the grievance, say, for example by requiring contractors to remedy the complaint or submit a plan of action. The PMU may get assistance from the DoNRE in evaluating the technical basis of complaints related to environment-related impacts (e.g., vehicle emissions, dust, noise, vibration). The council will be responsible for documenting and keeping a record of all complaints that are lodged with the local committees.

²² Footnote 5.

48. The aim is for community grievances to be resolved at the first level. However, if not resolved at that level, the second venue for grievances is the City or District People's Committee (DPC). That is, if after 15 days the aggrieved party or complainant does not hear from the PMU, or if the complainant is not satisfied with the decision taken on the complaint, the affected party may bring the case, either in writing or verbally, to any member of the DPC. The DPC in turn will have 15 days following the lodging of the complaint to resolve the case. The DPC secretariat is responsible for documenting and keeping a record of all complaints that are lodged with the district committee.

49. The third stage is the Provincial People's Committee (PPC). If after 15 days the aggrieved affected party does not hear from the District People's Committee, or if the complainant is not satisfied with the decision taken with regard to the complaint, the case may then be brought, either in writing or verbally, to any member of the PPC. The PPC has 15 days within which to resolve the complaint to the satisfaction of the concerned parties. The PPC secretariat is responsible for documenting and keeping a record of all complaints lodged with the committee.

50. In the event that the grievance remains unresolved even after being raised at the level of the Provincial People's Committee, the final resort is a court of law. Specifically, if after 15 days following the lodging of the complaint with the PPC, the aggrieved party does not get a response, or if the complainant is not satisfied with the decision taken on the complaint, the case may then be brought to a court of law for adjudication.

51. In support of the grievance redress mechanism the PMUs/contractors need to establish a telephone HOTLINE to provide easy and instant contact with the CPC by the public. A clearly marked phone number for a responsive PMU/CPC officer office should be placed at all construction sites of the road components (see Mitigation Plan). The purpose of the HOTLINE is to enable affected persons to convey to PMU/CPC at any time their concerns or issues of the project during the construction and operation phases with the construction phase being most important.