

M1 Suspended Sediment Monitoring Plan

Aim and Objective					
<p>The purpose of M-1 Suspended Sediment Monitoring Plan (SSMP) is to implement a regular monitoring program that meets operational needs and permitting requirements for the project and to ensure that the suspended solid concentrations in water are maintained at a safe level, suitable for use by local villages. Monitoring data will be collated and used to establish, and where needed refine, performance targets for the concentration of suspended solids, assess the performance of the mitigation measures, and support adaptive management. Where monitoring data are deemed insufficient to identify the cause of elevated suspended solids in water, this plan will be revised and improved.</p> <p>The SSMP will be implemented in parallel with M-2 Water Quality Monitoring Plan (WQMP).</p>					
Summary of Impacts and Risks					
<p>Water quality of the Tina River and downstream Ngalimbiu River is a central issue for local villages. Project support and acceptance by the local villages depends on the capability of the Project to maintain high water quality downstream. A typical indicator of water quality is Total Suspended Solids (TSS), which is the quantity of suspended particles and is also correlated with turbidity.</p> <p>Project-related activities during construction that may impact TSS and turbidity includes but is not limited to: vegetation clearance; excavation and blasting of roads, the dam site other project infrastructure; road gravelling, sealing and maintenance; aggregate extraction; spoil stockpiling; inadequate erosion and sediment control; wastewater generation; and the accidental discharge of chemicals. Non-project impacts that may also impact TSS and turbidity within the Tina River includes: heavy rainfall and extreme weather events; timber harvesting in middle and upper catchment; domestic activities by local villages; algal blooms; and downstream activities such as agriculture, palm oil, and gravel extraction.</p> <p>The Tina River exhibits natural peaks in TSS and turbidity during heavy rains. During construction, the river may also be exposed to intermittent, additional sediment-laden run-off from cleared areas and works undertaken by the Project, which may affect water quality. Monitoring TSS and turbidity will enable estimation of siltation rates and provide data on TSS peaks. Monitoring may also assist with the resolution of any potential disputes that arise within the villages to determine natural versus project-related sources of suspended solids. Appropriate management largely relies on regular, comprehensive sampling of water, with comparison against international standards (thresholds and trigger values), with provision and implementation of effective and adequate mitigation measures.</p>					
Mitigation and Management Actions					
#	Issue or Risk	Action	Timing / Frequency	Responsibility	
M-1-1.	Discharge of sediment and contaminants from construction activities	Implementation of management actions specified in the other ESMPs, particularly P-12 Waste Management and Point Source Pollution Plan; P-13 Hazardous Materials Management Plan; P-14 Spill Prevention and Emergency Response Plan; C-8 Watercourse Crossing Management Plan; C-9 Spoil and Topsoil Management Plan; and C-10 Drainage, Erosion and Sediment Control Plan.	Throughout construction	HEC Construction Manager HEC EHS Manager	
Monitoring Requirements					
#	Title	Description	Target / Performance Indicator	Timing / Frequency ¹	Responsibility
M-1-A.	Surface water quality monitoring	<ul style="list-style-type: none"> Monitoring for TSS and turbidity will be undertaken at six sampling stations (A-E) along Tina River plus one site on the Toni River (F) as shown in Annex M-1-I. A single sample from a representative location in or near the middle of the river will be collected, at a depth of 10-20 cm from the water surface. At each site, measurements or samples will be taken for TSS and turbidity, as per Annexes M-1-II and M-1-III: <ul style="list-style-type: none"> Once per month, TSS samples will be collected in 500 mL plastic (PE) bottles for analysis at an approved laboratory². Once per week, turbidity will be measured <i>in situ</i> using a hand-held probe, targeting a range of flow conditions including high and low flows, rain and non-rain events. More frequent (daily) turbidity monitoring will be conducted following spill events, exceedances or complaints, in order to investigate the event and inform remedial actions to be taken. Correlation between TSS and flow (automatically measured at the gauging station A) shall be calculated and graphed. 	<p>Water quality trigger values have been set based on the results of baseline monitoring and international research.³</p> <p>Turbidity 15.0 NTU TSS 300 mg/L</p>	<p>Weekly (NTU field) Monthly (TSS lab) Daily sampling following spill events or complaints, until water quality has returned to background levels. Reported in the quarterly E&S monitoring report including photos.</p>	HEC E&S Supervisor
M-1-B.	Erosion and sediment control and water treatment devices monitoring	<ul style="list-style-type: none"> Monitoring for <i>in situ</i> turbidity will be undertaken at four sampling locations (ST1-ST4): at the outlet of three sediment ponds along the access road and at one location downstream of spoil disposal sites 2, 3, and 5 (refer Annex M-1-I). Monitoring for <i>in situ</i> turbidity will be undertaken at the discharge location for other water treatment devices on site, as applicable e.g. wheel wash bay, concrete batching plant, aggregate crusher/washing plant, dam, powerhouse, tunnel treatment plant. 	<p>Turbidity 15.0 NTU</p>	<p>Monthly throughout construction Reported in quarterly E&S monitoring report</p>	HEC E&S Supervisor
M-1-C.	Treated wastewater quality monitoring	<ul style="list-style-type: none"> Monitoring for TSS of the treated effluent from the wastewater treatment plant at the Workers Accommodation Camp. Refer to M-2 Water Quality Monitoring Plan for additional water quality parameters to be tested. 	<p>IFC EHS guidelines for treated sanitary sewage: TSS 50 mg/L</p>	<p>Monthly throughout construction Reported in quarterly E&S monitoring report</p>	HEC E&S Supervisor
M-1-D.	Sedimentation monitoring	<ul style="list-style-type: none"> Monitoring of sediment loads (TSS) in the river during normal flows and flood flows at two locations (A and B) with three replicates in accordance with Section 4.2 and Appendix 10 of the Investigation of Discharge and Sediment Load report (Annex M-1-IV). 	Monitoring completed and included in quarterly E&S reports	<p>Weekly during regular flows & floods >200m³/s Reported in quarterly E&S monitoring report</p>	HEC E&S Supervisor
Supporting Documents					
Annex	Name	Description			
M-1-I.	Water quality monitoring locations for TSS and turbidity	Locations of sampling sites on the Tina River and along the access road.			
M-1-II.	Sampling methods	Sampling methods and equipment for TSS and turbidity analysis.			
M-1-III.	SPE monitoring and reporting	Sampling parameters and reporting requirements from the subcontractor undertaking water quality sampling under M-1 and M-2.			
M-1-IV.	Investigation of Discharge and Sediment Load	Report "Investigation of Discharge and Sediment Load" prepared by HEC, dated 15 December 2022.			

¹ Water quality monitoring has been undertaken at varying frequencies to date. The contractor has found that monthly monitoring is achievable and practical, while weekly monitoring is not. Monthly is considered suitable for a long-term monitoring programme.

² Commercial laboratory to be approved by THL/OE. Note that at present there is no accredited laboratory in the Solomon Islands.

³ Default trigger values for upland and lowland rivers from the Queensland Water Quality Guidelines 2009, dated 2013 (<https://environment.des.qld.gov.au/management/water/quality-guidelines>); EPA Suspended Sediment Effects on Fish: A Literature Review (<https://www.epa.gov/sites/default/files/documents/mrsboappa.pdf>); Servizi, J.A. and Martens, J.A. (1992) Sublethal Responses of Coho Salmon (*Oncorhynchus kisutch*) to Suspended Sediments, *Canadian Journal of Fisheries and Aquatic Sciences*, Vol. 49: 1389-1395.