

P-12 Waste Management and Point Source Pollution Plan

Aim and Objective				
<p>The purpose of P-12 Waste Management Plan and Point Source Pollution Plan (WMPSP) is to address the environmental, health and safety risks associated with the generation, storage, and disposal of <u>non-hazardous</u> wastes plus wastewater and sludge during the construction phase. This includes solid and liquid wastes generated from the Workers Accommodation Camp (WAC), Site Office and construction sites within Core Land. It is applicable to all Project facilities and staff including THL, HEC and subcontractors. The plan applies the waste minimisation hierarchy (avoid, reduce, reuse, recycle, recover, dispose) to addresses the generation and management of wastes.</p> <p>The definition of hazardous waste used for the purposes of this management plan complies with the Basel Convention and associated amendments (effective from 01 January 2021). The Solomon Islands is the 190th party to the Basel Convention, with entry into force on 23 November 2022.</p>				
Summary of Impacts and Risks				
<p>If incorrectly managed, waste materials have the potential to cause harm to workers, the community, and pollute the environment. The potential impacts and risks associated with construction waste are:</p> <ul style="list-style-type: none"> Over-ordering of materials leading to increased costs and waste generation. Incorrectly stored or stockpiled solid waste which can rot, catch fire, leach into water and soil, smell, and attract vermin. Incorrectly sorted solid waste can reduce volumes otherwise available for recycling. Incorrectly stored or treated wastewater discharges, leading to health risks and pollution of the environment. Large volumes of solid and liquid waste to be delivered to the Ranadi landfill (subject to necessary agreement or permit). <p>The storage and disposal of hazardous waste is addressed in P-13 Hazardous Materials Management Plan (HMMP). The storage and/or disposal of aggregate, topsoil, spoil, and related bulk materials is addressed in C-5 Quarry Management Plan (QMP) and C-9 Spoil and Topsoil Management Plan (STMP).</p>				
Mitigation and Management Actions				
#	Issue or Risk	Action	Timing / Frequency	Responsibility
P-12-1.	General waste management	<ul style="list-style-type: none"> Waste minimization and reduction practices will be adopted, including awareness on the 3Rs (Reduce, Reuse, Recycle) Waste storage and collection areas will be constructed ensuring that: <ul style="list-style-type: none"> Sufficient space is allocated according to expected volumes of the waste type (as per Annex P-12-1) Recyclable and non-recyclable material is stored separately Hazardous and non-hazardous waste is stored separately Waste is contained, covered and stored on an impervious surface (concrete or similar) to prevent leaching, and to protect from vermin, rainfall and wind. Waste storage areas will be located at least 50 m from any sensitive receptors (villages, streams, tambu sites etc.). Waste removal and recycling will be undertaken fortnightly, or more frequently as required, in accordance with applicable regulations and good practice. Any necessary approval for the disposal of waste at the Ranadi landfill will be obtained from the relevant authority prior to the commencement of any waste disposal at the facility. Disposal to Ranadi landfill will be minimised by diverting wastes where possible. The burning or dumping of wastes is strictly prohibited. 	Throughout construction	HEC Administration Manager HEC Construction Manager HEC Camp Manager
P-12-2.	Reuse and Recycling	<ul style="list-style-type: none"> Every effort will be made to sort and sell material for recycling, where local facilities exist. Waste concrete will be crushed and reused on site as non-structural aggregate for road ballasting or surfacing works yards. Metal and plastic waste will be segregated and collected by a third party for recycling. HEC will investigate opportunities to recycle other waste streams if facilities exist in the Solomon Islands. 	Throughout construction	HEC Construction Manager HEC Camp Manager
P-12-3.	Wastewater and sludge	<ul style="list-style-type: none"> The Worker's Accommodation Camp (WAC) Sewage Treatment Plant (STP) is sized to treat wastewater generated from all Project sites throughout construction. The WAC STP will be operated and maintained in accordance with good industry practice and engineering requirements (as per the STP ESIA in Annex P-12-II and the Operation and Maintenance Manual for STP Annex P-12-III). Discharge water quality standards are specified in M-2 Water Quality Management Plan. Wastewater from Core Land will be collected via vacuum truck and transported to the WAC STP for treatment. Portable toilets and septic tanks at the Site Office, powerhouse, dam and other construction sites will be inspected weekly to assess function and capacity, with tanks to be emptied before capacity is reached. Treated wastewater will be used for dust suppression on roads during dry weather, or for concrete batching, or otherwise stored on site for later reuse. Low pressure application is to be used and no spraying is to be done near houses, schools or pedestrians. Local communities shall be made aware to avoid contact with the spray. Treated wastewater will be stored in tank(s), or pond(s) lined with UV stabilized PVC, for discharge during dry weather. UV and/or chlorine disinfection will be employed. Treated and untreated wastewater will not be discharged to surface water or roadside drains due to the health and safety risk to residents and groundwater supplies. Sewage sludge will be disposed of to Ranadi landfill (subject to appropriate licences being in place). It is recommended that impervious cells are constructed in the landfill by the Project to prevent leaching (subject to agreement by the landfill). The sludge is too liquid and unsuitable to supply to third parties for use as fertiliser. 	Throughout construction	HEC Construction Manager HEC Camp Manager
P-12-4.	Cement and concrete wash water	<ul style="list-style-type: none"> All runoff or other water contaminated with cement or uncured concrete will be collected, contained and treated for suspended sediments and elevated pH. It must not be released untreated into surface water, due to high pH which is toxic to fish and humans. Washing of concrete trucks, pumps etc. will take place in a dedicated, bunded, hard stand area at the Office Site, with drainage and subsequent treatment in ponds and drying beds. The capacity of each pond will be greater than a full day supply of wash water and will consider that the area often receives considerable rain. Implementation of the following good practice measures: <ul style="list-style-type: none"> Collect and treat cement-contaminated water and wash water, whilst ensuring that no direct releases occur to water bodies or wetlands. pH dosing, coagulants and flocculants can be added before discharging the water, to ensure circum-neutral pH (6-8) and low sediment load (≤ 15 NTU or ≤ 300 mg/L). Concrete washout area(s) will be inspected daily and after heavy rains to check for leaks and to identify if any plastic linings and sidewalls have been damaged by construction activities and determine whether they have been filled to over 75 percent capacity Before heavy rains, the washout pond's liquid level will be lowered, or the pond will be covered to avoid an overflow during the storm. 	Throughout construction	HEC Construction Manager

P-12-5.	Tunnel spoil / slurry ¹	<ul style="list-style-type: none"> Waste rock and spoil will be re-used on site as aggregate (if suitable) or disposed of at approved spoil disposal sites. Wastewater slurry shall be treated in a dedicated treatment plant on site. Settled and treated water shall be reused in concrete batching, dust suppression, or discharged to land (ground soakage). Dewatered slurry (cake) shall be disposed of at approved spoil disposal sites. 	Tunnelling	HEC Construction Manager	
P-12-6.	Workers Accommodation Camp	<ul style="list-style-type: none"> Grease trap(s) will be installed and maintained to limit the flow of grease from the kitchen to the sewage treatment plant (STP). 	Throughout construction	HEC Camp Manager	
P-12-7.	Spill Prevention and Response	<ul style="list-style-type: none"> Responses to emergencies and spills will be conducted in accordance with P-14 Spill Prevention and Emergency Response Plan. 	Throughout construction	HEC Construction Manager HEC HSE Manager	
Monitoring Requirements					
#	Title	Description	Target / Performance Indicator	Timing / Frequency	Responsibility
P-12-A.	Waste and recycling volumes	<ul style="list-style-type: none"> A record shall be kept of all solid and liquid waste volumes and reported in monthly and quarterly reports. This shall include all wastes disposed of or stored on-site, reused, recycled or disposed of off-site. 	Waste volumes recorded monthly No unauthorised disposal of waste	Monthly waste records included in HEC quarterly E&S reporting	HEC E&S Manager HEC Construction Manager HEC Camp Manager
P-12-B.	Waste disposal license(s)	<ul style="list-style-type: none"> Required permits and approvals will be obtained for all waste streams, such as a Licence for the Discharge of Waste from MECDM. Operate the Project in compliance with the conditions of the Licence(s). 	Waste disposal licence(s) appended as Annex P-12-IV . No pollution abatement notices issued	Prior to construction	HEC E&S Manager
P-12-C.	Training records	<ul style="list-style-type: none"> 'Waste and Hazardous Substance Management' induction training and annual refreshers will be conducted as per P-1 CESMP. Training will include the handling, storage and transport of hazardous substances, and the principals of waste minimisation, segregation, storage and disposal. 	Training records kept	Training records reported in HEC three monthly E&S reports	HEC Training Supervisor
Supporting Documents					
Annex	Name	Description			
P-12-I.	Waste Storage and Disposal	Waste types, estimated volumes and methods of reuse/disposal; Location plans of on-site facilities for waste storage and disposal			
P-12-II.	STP ESIA	OE comments on revised STP ESIA. Sewage Treatment Plant Environmental and Social Impact Assessment prepared by Inogen and dated 23 March 2022.			
P-12-III.	Installation, Operation and Maintenance Manual for STP	Manual to guide the Supervisors, and Operators to follow during installation and operation of the WAC Sewage Treatment Plant			
P-12-IV.	License for the Discharge of Waste	Waste Discharge License(s) issued by MECDM			

¹ The generation of waste material from the tunnel will be determined by the tunnelling method (which is yet to be determined) and geology.

ANNEX P-12-I WASTE STORAGE AND DISPOSAL

WASTE STORAGE AND DISPOSAL

Summary of waste streams and disposal methods

Waste Stream	Volume (approx.) ¹	Storage	Reuse/Recycling	Disposal site	Notes
HAZARDOUS WASTE					
Batteries	Unknown	WAC Hazardous Waste Store	N/A	N/A	No hazardous waste disposal facility in SI
Concrete washwater	Unknown	On-site treatment	Reuse for concrete batching	Once treated, disposal to land	pH dosing and settlement required
E-Waste	Unknown	WAC Hazardous Waste Store	N/A	N/A	No hazardous waste disposal facility in SI
Hydrocarbons (used oil, lubricants)	250 litres/month	Used oil storage shelter (bunded) at WAC	Recycled via South Pacific Oil	N/A	No disposal
Hydrocarbon contaminated soils	Unknown	WAC Hazardous Waste Store	On-site storage and remediation		Prevention of spills is key and rapid clean up with spill kits
Medical waste	Unknown	Site Clinic	N/A	Ranadi landfill	Medical waste is burnt at Ranadi landfill (non-incinerated)
Paints and solvents	Unknown	WAC Hazardous Waste Store	N/A	N/A	No hazardous waste disposal facility in SI
Sewage sludge	Up to 7.5 m ³ /month	WAC Sewage Treatment Plant	N/A. Biohazard.	Ranadi landfill	Disposal in existing or new cells within Ranadi landfill to prevent leaching. ²
Treated wastewater	Up to 60 m ³ /day	WAC Sewage Treatment Plant	Reuse for dust suppression	N/A	All wastewater to be treated at the WAC Sewage Treatment Plant. Storage during dry weather at the STP, tank(s) or lined pond(s).
Tunnelling spoil and slurry	Unknown	Rock at spoil disposal sites Wastewater slurry treated in on-site treatment system	Rock reuse for aggregate Water for concrete batching or dust control	Rock at spoil disposal sites Dry 'cake' to spoil disposal, treated water to land	Treatment and storage will depend upon the geology and tunnelling method
NON-HAZARDOUS					
Aluminium	Unknown	On site: 200 L plastic wheely bins	Collected for recycling	Ranadi Landfill	Recycling facilities available for aluminium cans

¹ Figures provided by HEC in P-12 CESMP approved for Lots 2 and 3. Waste volumes were for main works.

² According to the ADB SI Country Snapshot, in 2013, new cells were created in Ranadi landfill and a simple drainage system to capture leachate and a small settling and digestion pond have been installed.

Waste Stream	Volume (approx.) ¹	Storage	Reuse/Recycling	Disposal site	Notes
		Camp: WAC waste store (segregated)			
Concrete and aggregate	Unknown	On site at source	Crushed for aggregate	Spoil disposal sites	Non-hazardous fill
Domestic waste	53.8 kg/day	On site: 200 L plastic wheely bins Camp: WAC waste store	Food waste can be collected and fed to stock	Ranadi Landfill	General waste including food waste, office waste, packaging and general rubbish. No commercial composting facilities available.
Glass	13.2 kg/day	On site: 200 L plastic wheely bins Camp: WAC waste store (segregated)	Collected for recycling	Ranadi Landfill	Recycling facilities available for Solomon Islands Brewing beer bottles.
Machinery and vehicles	Unknown	On site and at WAC	On-sold or reuse as parts	Shipped offshore	Oil to be drained
Metal	22.7 kg/day	On site: 200 L plastic wheely bins Camp: WAC waste store (segregated)	Collected for recycling	Ranadi Landfill	
Paper and cardboard	47.1 kg/day	On site: 200 L plastic wheely bins Camp: WAC waste store	N/A	Ranadi Landfill	No known recycling of paper or cardboard in Honiara
Plastic	23.9 kg/day	On site: 200 L plastic wheely bins Camp: WAC waste store (segregated)	Collected for recycling	Ranadi Landfill	Recycling facilities available for plastic bottles.
Trees and logs	Unknown	Saleable logs stored at Marava village	Saleable logs sold by TCLC Reuse by the local community Other material chipped for use as mulch	Spoil disposal sites	Refer C-3 Forest Clearance Plan
Tanalised wood	7.4 kg/day	On site: 200 L plastic wheely bins Camp: WAC waste store	Reuse by the local community	Ranadi Landfill	
Tyres	Unknown	Camp: WAC waste store	Reuse by the local community	Ranadi Landfill	No burning of tyres
Wire, cables, hose	Unknown	On site: 200 L plastic wheely bins Camp: WAC waste store	Reuse by the local community	Ranadi Landfill	

Location of On-Site Waste Storage and Disposal Facilities

Workers Accommodation Camp:

- WAC Waste Store (segregation, storage and collection of waste)
- WAC Sewage Treatment Plant (treated wastewater and sludge)
- WAC Hazardous Waste Store
- WAC Oil Storage Shelter

Site

- Office, Dam and Powerhouse (200 L wheely bins for segregated waste)
- Clinic (medical waste)



ANNEX P-12-II STP ESIA

INDEPENDENT TECHNICAL REVIEW RECORD

Environmental and Social Safeguards (ESS)

This cover sheet records the details of an independent technical review undertaken by Stantec personnel for the Tina River Hydropower Project.

The purpose of the review is to confirm that:

- The action items from Lenders in the letters dated 14 June 2021 and 16 November 2021 have been completed
- The action items identified by OE in previous review(s) have been completed
- The ESMPs approved for Lot 1 (road upgrade) have been updated to cover access road Lots 2 and 3 (new road construction) and temporary facilities

Document Details:

Document name:	Sewage Treatment Plan Impact Assessment		
File name (in full):	Sewage Treatment Plants ESIA_18.04.22.docx		
Reviewer:	K. Harrison; C. Wang	Date:	09-Feb-2023
Report in tracked changes:	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N <input type="checkbox"/> Other		
Report coverage:			
a) Lot 1 (road upgrade)	<input type="checkbox"/> Y <input type="checkbox"/> N <input checked="" type="checkbox"/> Other	N/A	
b) Lot 2&3 (new road)	<input type="checkbox"/> Y <input type="checkbox"/> N <input checked="" type="checkbox"/> Other	N/A	
c) Temporary facilities	<input type="checkbox"/> Y <input type="checkbox"/> N <input checked="" type="checkbox"/> Other	Covers the STP at the workers camp only	
d) Main works	<input type="checkbox"/> Y <input type="checkbox"/> N <input checked="" type="checkbox"/> Other	N/A	

Review and Recommendations:

The ESIA has been revised but there still is limited assessment and management of the impacts and risks of the activity on the community or environment. Limited consultation has been completed.

- **Wastewater Treatment System:** No change to the treatment system. The use of MBR technology is accepted so long as it is operated and maintained correctly.
- **Treated Wastewater Disposal (dry weather):** During dry weather, HEC propose to use the treated wastewater for dust suppression on roads.
There is limited assessment of the activity, such as when and where spraying will occur, nature or type of truck or boom spray to be used, intensity of spray, or health and safety to protect workers or the community. Given the highly treated nature of the MBR treated wastewater, spray irrigation is appropriate, so long as there is no spraying near villages, houses, schools or people walking on the road.
Low pressure application is preferable to reduce the risk of spray drift.
By OE's calculations, the Lot 1, 2 and 3 access roads provide more than sufficient area to dispose of the treated effluent (in fact, more irrigation will likely be required to suppress dust to be generated by vehicles). 60 m³/day treated effluent irrigated at 1L/m²/hr¹ over a width of 7 metres equates to 8.5 km length of road. If 7,500L trucks are used, this equates to 16 truck movements per day (2 per hour over an eight hour day), more or less if the trucks are smaller or larger respectively.
Limited consultation regarding spray irrigation along roads appears to have been undertaken, and feedback that has been received has been hesitant. Awareness raising needs to be done to ensure that communities know that treated wastewater is being sprayed, and that operators must not spray near people.
- **Treated Wastewater Disposal (wet weather):** During wet weather, HEC propose to dispose of wastewater to an existing drain along Black Post Road.
There is limited assessment of the activity or impacts, including on people, water sources, and ecology, and no information on how the wastewater will be transported to the drain (e.g. via truck, pipe or new drain). The ESIA states that the existing drain has insufficient capacity to take the volume of water required. OE is aware of a number of houses along this section of road, and a reliance on shallow groundwater for water sources by the community. There is no natural drainage from the camp to this drain, or discharge point from this drain (meaning that the road and land is flooded during heavy rain).
OE therefore does not support disposal along Black Post Road and instead recommends temporary storage of treated wastewater in tank(s) or pond(s) lined with UV stabilized PVC with for disposal during dry weather. Tanks can be dosed with chlorine to avoid bacterial proliferation.

¹ MfE. 2016. *Good Practice Guide for Assessing and Managing Dust*. Ministry for the Environment, Wellington.

- **Sludge Disposal:** A sludge volume of 7.5 m³ per month is predicted. HEC has been discussing the use of sludge by organizations for fertilizer and food production. HEC do not appreciate that this is highly liquid sludge and is a biohazard, in the absence of further treatment. OE recommends disposal at Ranadi landfill, ideally in clay-lined cells to be constructed within the landfill to contain the sludge and minimize leaching.
 - **Monitoring:** Limited monitoring proposed. Monitoring of wastewater quality, wastewater volumes and sludge volumes will be recorded as required in M-1 Suspended Sediment Monitoring Plan, M-2 Water Quality Monitoring Plan and P-12 Waste Management and Point Source Pollution Plan.
- OE points HEC to relevant public health-based guidance from the World Health Organization (2006) Guidelines for the Safe Use of Wastewater, Excreta and Greywater.

Lenders Comments – 14 June 2021:

N/A. Document had not been written yet.

Lenders Comments – 16 November 2021:

N/A. No specific comments on the STP IA although related comments made to CESMPs P15, M1 and the Camp Impact Assessment (not repeated here).

Lenders Comments – 08 July 2022:

N/A. No specific comments on the STP IA.

Lenders Comments – 22 December 2022:

N/A. No specific comments on the STP IA.

ANNEX P-□□□□ INSTALLATION, OPERATION AND MAINTENANCE □

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ANNEX P-12-IV LICENSE FOR THE DISCHARGE OF WASTE