



Muara Laboh Geothermal Power Project

Environment & Social Monitoring Report Period July - December 2021



ML

ML-RSH-RPT-IEE Rev 0

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The Supreme Energy project companies - SE Muara Laboh, SE Rajabasa and SE Rantau Dedap are independent companies developing geothermal projects in Sumatra, Indonesia. Based on the agreement of the shareholders of the individual project companies, the Supreme Energy companies are managed in an integrated way in order to maximize the synergies in terms of use of resources and organization of their core and supporting processes. Consequently, important portions of the documentation body developed and applied within each company (manuals, procedures, description of processes, guidelines etc.) are common to all project companies. The applicability of each document to one or several project companies is reflected in the reference of each document.

Any document applicable to SE Muara Laboh contains the characters "ML" in the document reference.

Any document applicable to the SE Rajabasa project company contains the characters "RB" in the document reference.

Any document applicable to the SE Rantau Dedap project company contains the characters "RD" in the document reference.

If a document applies to all three Supreme Energy companies, the term "Supreme Energy" may refer to any and all of these companies.

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Abbreviations

ADB	Asian Development Bank
EPC	Engineering, Procurement, and Construction
ERM	Environmental Resources Management
ESAP	Environmental and Social Action Plan
EBTKE	New Energy, Renewable, and Energy Conservation
ESDM	Energy and Mineral Resources
FC	Financial Close
FEED	Front End Engineering Design
ISDP	Integrated Social Development Program
JBIC	Japan Bank for International Cooperation
LAPI ITB	Lembaga Afiliasi Penelitian dan Industri Institut Teknologi Bandung
LIPI	Lembaga Ilmu Pengetahuan Indonesia (National Science Body)
LRP	Livelihood Restoration Program
OHS	Occupational Health and Safety
PLN	Perusahaan Listrik Negara (National Power Company)
PP	Pembangunan Perumahan`
PPA	Power Purchase Agreement
PRA	Plumpang Raya Anugerah
Rekind	Rekayasa Industri
RKL	Rencana Pengelolaan Lingkungan (Environmental Management Plan)
RPL	Rencana Pemantauan Lingkungan (Environmental Monitoring Plan)
ML	Muara Laboh
NEXI	Nippon Export and Investment Insurance
SCAR	Social Compliance Audit Report
SEML	Supreme Energy Muara Laboh
SEP	Stakeholder Engagement Plan
SGS	Steam Gathering System
SHE	Safety Health Environment



1. Project Information

1.1 Project participants

PT Supreme Energy Muara Laboh (SEML) is operating the Muara Laboh geothermal power plant (the Project) of approximately 88 MW gross in West Sumatra Province, Indonesia. Construction of the Project started after financial close in Q1 2017 and achieved commercial operations date (COD) in December 2019.

The Project Sponsors of SEML are Supreme Energy, Engie Energy Asia Co. Ltd, and Sumitomo Corporation. The Sponsors have secured finance for the construction and operation of the Project from commercial banks, with Mizuho Bank, Ltd. (Mizuho) as the Mandated Lead Arranger (MLA), and the following international finance organisations: Asian Development Bank (ADB), Japan Bank for International Cooperation (JBIC) and Nippon Export and Investment Insurance (NEXI) (together the Lenders).

1.2 Project Location

The Project is located in Solok Selatan regency, approximately 150 km south east of Padang the capital city of West Sumatra province, Indonesia. The Project's location and layout are presented in Figures below.

The Project area of approximately 140 hectares (ha) lies within the Liki Pinangawan Muara Laboh Geothermal Working Area (Wilayah Kerja Panas Bumi, WKP), which is situated along the trend of the Great Sumatran Fault that runs parallel to the southwestern coast of Sumatra.

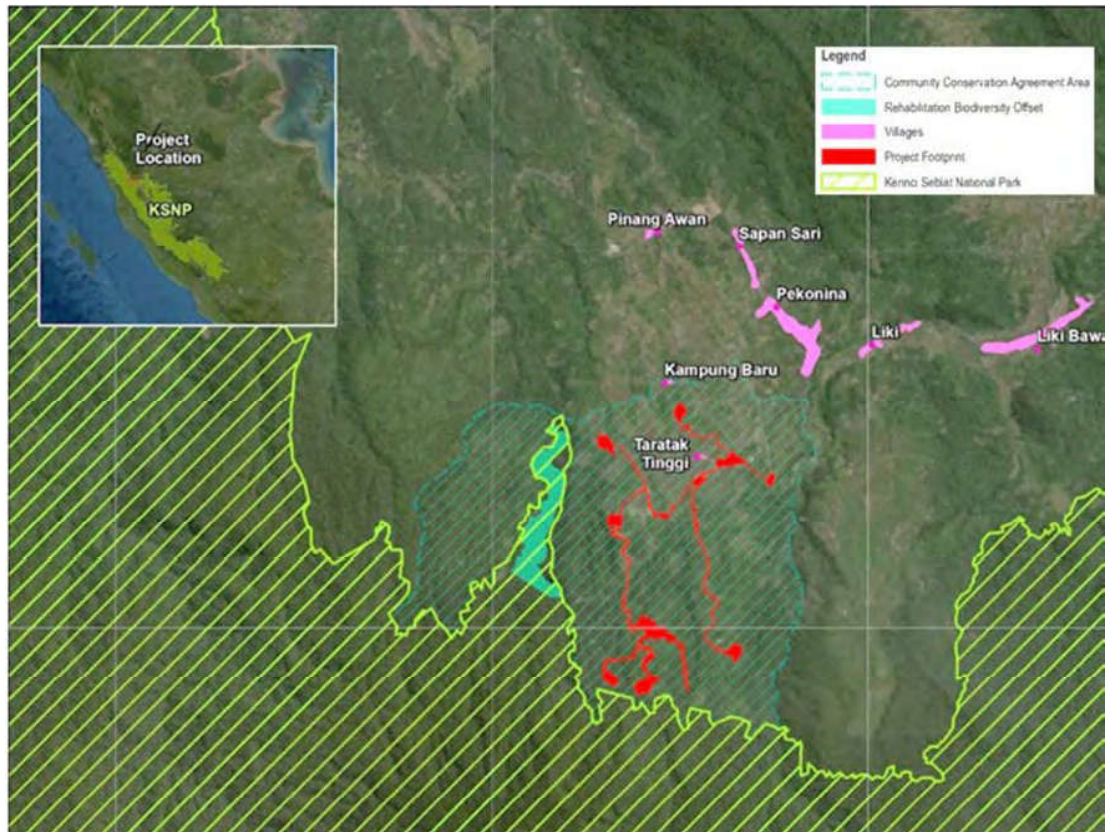
The Project is located in the Barisan Mountain range (Bukit Barisan) at an altitude of approximately 1,500 meters above sea level. The climate of this region is characterized by relatively heavy rainfall throughout the year and the local area is prone to landslides during periods of heavy rain. The Project is located in land that was previously used as a tea plantation and is adjacent to the Kerinci Seblat National Park (Taman Nasional Kerinci Seblat, TNKS) which is a UNESCO world heritage site (Tropical Rainforest Heritage of Sumatera / TRHS). Existing monitoring data for the site indicates that baseline air quality, water quality, and noise levels are good as would be expected in an area with little industry and pollution sources.

There are several small settlements (Jorong) in the vicinity of the project site: Pinang Awan, Taratak Tinggi, Kampung Baru, and Pekonina. Although residential areas are all more than 1.5 km from the power plant and production wellpad areas, other project infrastructure such as reinjection wellpads and access roads are located in close proximity to local communities.

Figure-1 : Location Map of Muara Labuh



Figure-2 : Project Layout



1.3 Project Summary

The Muara Laboh Geothermal Power Project Stage 1 Development utilizes dual flash technology to increase the generation output to approximately 80MW net. The facilities consists of a power plant (dual flash condensing steam turbine, cooling tower, switchyard, and ancillary infrastructure), a Steam Gathering System (wellpads, wells, two-phase lines, brine lines, condensate lines, separators, scrubbers, silica scaling mitigating facility) and supporting facilities i.e access roads, admin complex, staff accommodation, water intakes, water supply pipelines, yards, warehouse, workshop, and security posts.

Following the completion of the access roads and 6 wellpads (ML-A, -B, -C, -D, -E and -H) in 2012/2013, SEML started the exploration drilling which by September 2013, 6 full-diameter wells have been drilled (ML-A1, -B1, -C1, -E1, -H1, and -H2).

During development drilling, twelve new wells have been drilled across five wellpads (ML-A, -H, -D, -E and -F) using 2 drilling rigs from PT Plumpang Raya Anugerah (PRA).

Start up commisioning was initialized on 16 October 2019 and Operation & Maintenance followed immediatly following the commisionning. COD was achieved on 16 December 2019 and Substantial Completion was achieved on 23 December 2019.

During this reporting period, EPC-C as well as SEML continues to complete remaining puch list items facilities while at the same time continuing operation and maintenance of Power Station facility and electricity generation. There are no high priority items (which could affect the safe and reliable operations of the power plant) reported on the remaining punch list. SEML is taking over the “Transferred Punch List Items” from the EPC Contractor. A Second Year Inspection has been completed in October 2021.

Power Plant Area



Switchyard 150 kV



Switchyard 150 kV



Cooling Towers



Steam Blow Activity



Silica Scaling Mitigating Facility



PLN Transmission Line

PLN is responsible for building the transmission infrastructure for the Project; the interface between PLN and SEML's responsibilities is the power plant switchyard. PLN constructed a new substation (Muara Laboh substation) approximately 3.4 km from the power plant and a new 150 kV transmission line from the switchyard to this substation; the substation also provides connection for a separate local hydroelectric project and potentially other power generation facilities in the local area. The 3.4 km, 150 kV transmission line from the power plant's switchyard to the PLN Muara Laboh substation is considered as an "associated facility" and therefore forms part of the Project.

Land acquisition of the associated facility (3.4 km of 150 kV transmission line) have been completed by PLN based on with "willing-seller willing-buyer" and expropriation has not been necessary.

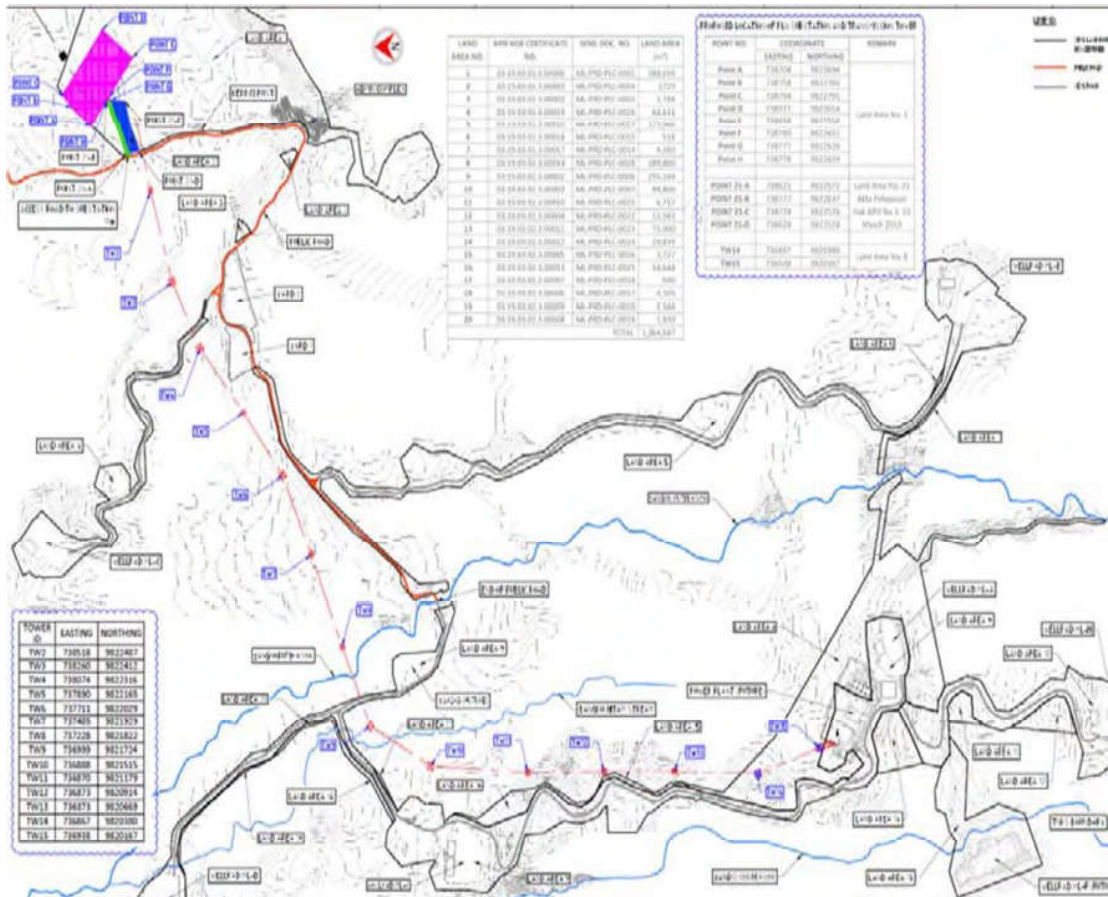
PLN Transmission Line - Associated Facility



PLN Muara Labuh Substation



PLN Transmission Line Route and Muara Labuh Substation Location



Management of Covid-19 Pandemic

The latest Covid-19 situation around the country and positive cases found in Solok Selatan caused SEML to restrict personnel mobilization with focus on maintaining safe power plant operation.

Until end of December 2021, 208 (two hundred eight) Covid-19 positive cases have been reported but all have been recovered. No active case is reported in the end of 2021. Case is closed when the contracted person has been declared negative upon 2 (two) consecutive PCR tests.

Note that in November 2021, SEML’s Business Continuity Plan Rev-4 (Attachment 1) requires all employees to follow a quarantine protocol (i.e. PCR at day-1, self-quarantine for 3 days at an assigned facility, and another Second PCR at day+3 then continue with weekly antigen swab test by Site Doctors and Paramedics for all on-duty personnels (SEML and all contractors). Person showing positive result on PCR will be escorted to hospital and prevented from entering the site. Non-affected employees will be allowed to continue working and remains at works on site during his work schedule (“Island Mode”). SEML has hired 2 site doctors and 2 paramedics to strengthen the site medical team. To do the PCR analysis, SEML also collaborates with Lab of Faculty of Medicine of University of Andalas (FK Unand is the referred Covid laboratory for West Sumatera). Proper additional safeguards such as always use face mask (considered as personal protective equipment) and physical distancing are also applied. Sharing sessions of BCP #4 have been conducted to all parties in November 2021 (Attachment 2).

Management of Covid-19 Pandemic - PCR and Antigen Tests



Management of Covid-19 Pandemic - Socialization to Workers



SEML Office Lockdown banner



Health campaign stand banner



Safety Health Environment Management System

Environmental & Social Management Plan

To integrate various requirements from AMDAL, Biodiversity Action Plans, E&S safeguards, and other adopted standards as well as its particular terms of coverage and frequency of management and monitoring, SEML has composed an Operations ESMP (Ref: ML-MSHE-ENM-PRO-0005 Rev 0, dated November 2020) which includes sections for surface water, groundwater, erosion, sedimentation, biodiversity, air, noise, social, and health.

Erosion & Landslide Management Plan

Erosion and landslide are also common throughout the Project area, particularly during the rainy season. Landslides are logged in SEML's incident reporting system and are a part of the daily site inspection carried out by SEML Site SHE personnel. A special monthly Erosion and Landslide Inspection is conducted site SHE personnel. Erosion control measures are being maintained throughout the site. Slopes and open areas are being revegetated and/or planted with trees.

SEML has developed a management plan intended to cover erosion and sediment control during the operations phase, titled "Site Specific Erosion Management Procedure" (Ref: ML-SHE-ENV-PRO-0019 Rev 1, dated March 2021)

Occupational Health, Safety, and Social Management Plan

Elements pertaining to workplace health and safety for the operation phase were included within the various SHE documents which covers the identification of common workplace hazards and risks (eg equipment operation working at heights, working in confined spaces, hot works among others) as well as management measures for the identified workplace hazards and an overall SHE training plan. Monitoring and reporting of all SHE issues are expected to be covered during daily toolbox meetings, monthly SHE Committee (P2K3) Meeting, and monthly reports.

Environmental Management System

SEML has awarded ISO 14001:2015 Environmental Management System in April 2021 (Registration Number EMS210207 by PT TSI), guided by PT Konsultindo Energi Indonesia (KEI) as the consultant.

Safety & Occupational Health Management System

SEML is planning to get certification for Safety & Occupational Health Management System (Sistem Manajemen Keselamatan dan Kesehatan Kerja / SMK3) from the Ministry of Manpower in February 2022. The preparation has been started since end of 2020, guided by CV REI Sistem Indonesia as the consultant. An interim organization for this purpose has been established.

Carbon Emission Reduction

CER certificate for 410,963 tonnes CO₂ has been received in 16 April 2021 and sold to Electrabel. No certification of carbon emission reduction and sales were made during second semester of 2021.



1.4 Date of Construction / Operation Commencement

The following items were described as the key milestones which lead to the determination of commercial operations.

- Commercial Operation Date (COD) is on 16 December 2019, which is 30 months after Notice to Proceed (NTP).

Historical Milestones	
26 January 2017	Signing of Common Terms Agreement with Lender
24 February 2017	PPA Effective Date
16 September 2019	Transmission Network ready for Energization Date
14 October 2019	Initial Synchronization Date
16 December 2019	Commercial Operation Date
23 December 2019	Substantial Completion Date
1 October 2020	Silica Scaling Mitigation Facility Operation Date
TBA	Punch List Completion

1.5 Contacts

Company : PT Supreme Energy Muara Laboh
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Attn : Nisriyanto

2. Relevant Environmental Permits or Compliance Certificates

This Chapter discusses relevant environmental permits or compliance certificates as required by SEML, including the latest permits or compliance certificates obtained from July until end of December 2021, key developments and any major changes in location and design, and findings of any environmental and OHS regular inspections audits.

2.1 New Permit or Compliance Certificates Required and Obtained

SEML has obtained PROPER award for period of 2021 with Blue Rating. PROPER is a yearly program by Ministry of Environment and Forestry to assess the company performance in environmental and social compliance (Attachment 3).

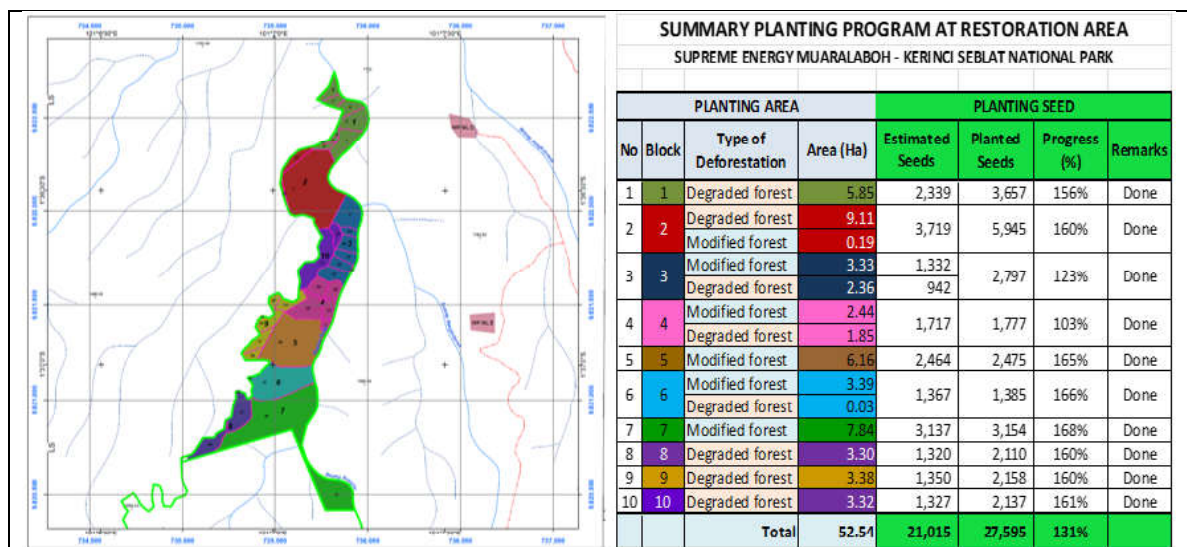
2.2 Key Developments and Major Changes in Location and Design

No new key development or major changes were happened during second semester of 2021.

Regular monitoring of erosion has been conducted and necessary repair or mitigation is immediately conducted. Site Specific Erosion Management Plan has been revised in March 2021. See Section 8.4.

Offset Restoration

After TNKS released all 52ha restoration site from farmers in September 2020, SEML established Main Nursery (by PT UAP, a local contractor), purchased endemic seeds (from Pagar Alam South Sumatera), collected local endemic seeds (using local labours), and conducted the plantings (by KPKM Bangunrejo, a local conservationist group). The construction of Main Nursery has been completed during this semester. The planting also has been completed with approx. 27,000 endemic seedlings have been planted. (Attachment 4 BOMP Chronology Update and Attachment 5 Year-1 Offset Maintenance Report).



Activities for Restoration Site

**RENCANA KERJA TAHUNAN (RKT)
(TAHUN KE TIGA)
TAHUN 2021**

TENTANG
KERJA SAMA DALAM RANGKA Penguatan Fungsi Berupa
KEGIATAN PEMULIHAN EKOSISTEM
DI TAMAN NASIONAL KERINCI SEBLAT

Sebagai Tindak Lanjut dari Perjanjian Kerja Sama:
NOMOR: PKS.326/T.1/RTU/REN/4/2018
NOMOR: ML-MGT-LTR.BJ6.IV.2018
Tanggal 13 April 2018

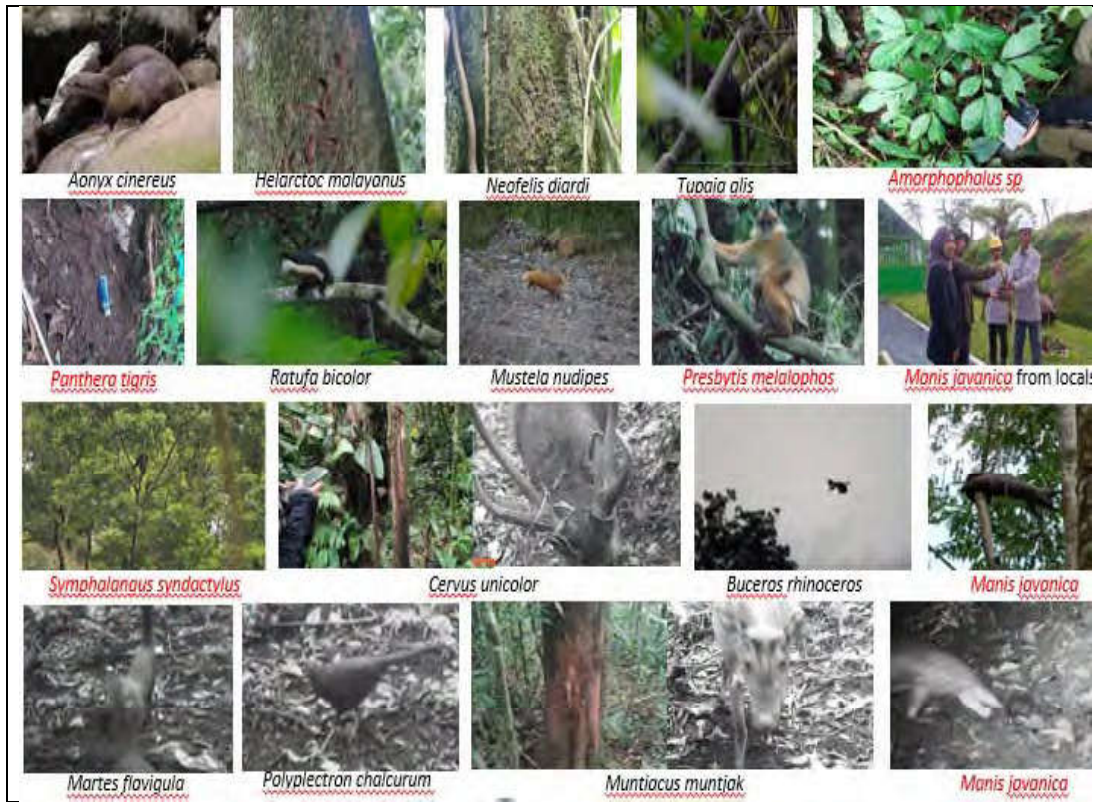


Serbah teruna transilina dan KPRM ke TNKS

Main Nursery



Flora and Fauna Around Project and Offset Areas



2.3 Findings of Environmental and OHS Regulatory Inspections or Audits

Several awards in Environment and Safety & Health from government have been received by SEML.

PT BMT (a licensed RKL/RPL consultant and laboratory) has completed a site visit for 2nd semester 2021 RKL/RPL monitoring. The report has been completed and issued to authorities.

No	Inspection Date	By	Purpose Findings	Action	Current Status
1	28 September 2021	Ministry of Energy & Mineral	Soebroto Award : Environmental Management	Complete	Awarded Aditama Prize (highest level) Attachment 11
2	28 September 2021	Ministry of Energy & Mineral	Soebroto Award : Safety & Health Management	Complete	Awarded Aditama Prize (highest level) Attachment 12
3	9 to 21 November 2021	PT BMT	6-monthly environmental monitoring	Complete	RKL-RPL Report for 2 nd semester of 2021 has been issued to authorities on 26 January 2022. Attachment 13. No occurrence of exceeding TLVs.
4	24 December 2021 (Through online meetings and online data submission)	Ministry of Environment & Forestry Provincial Environmental Office	Environmental Ranking (Proper Evaluation)	Complete	Awarded "Blue Rank" / fulfil all basic requirements. Attachment 3

2.4 Monitoring Table Permit / Consultation

- List of Permits

No.	Permit	Issuing Authority	Date of Issue	Validity/Expiry Date
1.	WKP Relinquishment (WKP size is now 22,110 hectares) (Attachment 6)	Minister of ESDM	14 Dec'21	N/A

- **List of Consultations**

See Attachment 4 BOP Chronology Update for more detail

No.	Consultation	Authority/Agency/ Consultancy/ Community	Date of Consultation	Remarks
1.	Consolidation Meeting with the new Head of BBTNKS	BBTNKS	23 Aug'21	Introduction of SEML and its restoration programs to the new Head of BBTNKS
2.	Discussion on Smart Patrol and Biodiversity Observation activities	TNKS Section 4	5 Oct'21	Smart Patrol has been conducted on 28 to 30 Oct'21 Biodiversity Monitoring has been conducted on 28 to 30 Oct'21
3.	Evaluation of Restoration Activities	BBTNKS	10 Nov'21	Discussion to expedite the actual implementation of 2021 restoration programs
4.	Radio Talk Show on conservation (sharing session)	TNKS Section 4 Radio Teman Sejati, Muara Labuh	9 Dec'21	To reach broader public around Muara Labuh regency
5.	Discussion with PT Mitra Kerinci as the holders of Belangir Restoration Site	PT Mitra Kerinci (tea plantation)	10 Dec'21	Benchmark of rehabilitation of TNKS area

3. Incidents of Environmental Safeguards Violations or Non-compliance

This Chapter discusses relevant incidents of environmental safeguards violations based on applicable environmental standards and regulations along with the correctives actions, deadlines, identification of responsible parties, and status of implementation of corrective action plan.

3.1 Summary of Incidents

There had been no issues found related to incidents of environmental safeguards, violations or non-compliance, and hence no corrective actions were required.

Date / Time	Responsible Agency	Nature of Non-compliance	Standards and Regulations Violated	Date & Authorities Recorded	Corrective Actions	Status of Corrective Action Implementation
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3.2 Summary Table of Incidents

Activity	YTD	Description
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4. Incidents of Environmental, OHS Accidents

This Chapter discusses incident recorded dates and responsible agencies, the scale of damage and injury, authorities in charge of investigation/ recording, media or community reactions and corrective actions, deadlines, identification of responsible parties.

4.1 Environmental Incidents

No major environment incident occurred during the period of 2nd Semester 2021.

4.2 Occupational/Community Health Incidents

There were no Fatality Accident and Lost Time Accident recorded during July up to end of December 2021.

4.3 Safety Incidents

For the period of July up to end of December 2021, there were: 0 (zero) fatalities; 0 (zero) lost time incidents; 1 (one) medical treatment; 2 (two) first aid incidents; 0 (zero) minor material damage/loss, 1 (one) vehicular incident.

4.4 Summary Table of Incidents

Safe Working Hours	Safe MH YTD (to end December 21)	Safe MH since Last LTA (since 12 Jun'18)*
Employee and Temporary Workers	183,311	738,792
Contractors	606,365	9,191,921

*: Last LTA = Fatality of a contractor worker during well test of ML-F2 on 12 June 2018

Activity	YTD	Description	Corrective Action	Status
Number of Occupational Fatality Incident (Company and Contractor)	0	None	N/A	
Number of Occupational Lost Time Incident (Company and Contractor)	0	None	N/A	
Number of Medically Treated Incident (Company and Contractor)	1	ML-IR-0282-0001: 13 Sept 2021 - MTC IP (SEML Junior Field Operator) performed initial check for AHU B Engine, When he tried to rotate a pulley manually, his ring finger of right hand was wounded and received some stitches due to pinched by AHU's pulley	1) Conducted refresh training regarding first level maintenance definition and training program for new joiner/ apprentice	CLOSED
			2) Conducted refresh training for work order management	CLOSED
			3) Replaced and install additional light bulb inside of AHU	CLOSED
			4) Conducted refresher training for hazard Identification	CLOSED
Number of First Aid Treatment (Company and Contractor)	2	ML-IR-0283-0001: 10 Oct 21 - Stung by wasps 2 (two) of craftsmen were stung by wasps at the vent station location, close with HP & LP CDP#1 area when they	1) Reported to Medical team	CLOSED
			2) Rentokil removed the wasp net on 10 Oct 21 (09:00 PM)	CLOSED
			3) SHE team posted and shared bee sting prevention bulletin and	CLOSED

		<p>relocated all tools and materials required for SYI activities.</p> <p>Both of victims are in good condition, no first aid measures are required, they can continue their work without have any allergic</p>	discussed it with all SYI Contractors by Contract Owner and Contractor SHE Officers	
		<p>ML-IR-0284-0001: 13 Oct 21 - eye injury</p> <p>The incident occurred when the injured person (UAP Maintenance team/S.S) was using a high-pressure water jet pump to remove sulfur deposits inside a condenser.</p> <p>At approximately 09:30 AM, IP stopped the jet pump and began removing his safety goggles due to foggy condition (invisible vision). While removing IP safety goggles, some sulfur debris that was trapped on top of the safety goggles lip fell onto his eyes. IP immediately went to the nearest toilet and the nearest eyewash station (chemical building area) and flushed his eyes thoroughly.</p> <p>IP reported his condition to UAP SHE and UAP SHE accompanied him proceed to SEML clinic for further assessment.</p> <p>After a medical observation, the Paramedic has given consumable medicines and declared there was no problem with his eyes and can return to work.</p>	<p>1) Purchased antifogging goggles to avoid invisible vision</p> <p>2) Shared and raised this incident during daily SYI coordination meeting</p>	<p>CLOSED</p> <p>CLOSED</p>
Number of High Potential Serious Incidents or High Potential Near Misses/Near Hits (Company and Contractor)	0	None	N/A	
Number of Near Misses / Near Hits (Company and Contractor)	0	None	N/A	
Number of Incident / Accident (Company and Contractor)	1	<p>ML-IR-0281-0001 : 14 Feb 2021 - Vehicular Incident</p> <p>KSU light vehicle (BA 9906 YC) driven by Gardener hit side of clift in front of Admin Complex.</p>	<p>1) Issued disciplinary letter to KSU staff due to driving vehicle without Company (SEML) driving licence</p> <p>2) KSU Management appointed dedicated driver for food delivery.</p> <p>3) KSU management shall comply with vehicle contract requirement (provide new vehicle)</p> <p>4) SEML conducted driving/ SIMPER training session for new drivers</p>	<p>CLOSED</p> <p>CLOSED</p> <p>CLOSED</p> <p>CLOSED</p>
Number of Non-Work Related Illness		None	N/A	
Number of Non-Work Related Accident		None		

5. Social Safeguards Monitoring

This chapter discusses progress in the implementation of social safeguard compliance audit report and corrective action plan, summary of activities carried out, implementation of grievance mechanisms, resources for implementation of social safeguards, forward plan of social safeguards, as well as labour hiring and management.

5.1 Social Safeguards Monitoring General Overview

Based on the Livelihood Recovery Program Report (Attachment 7), **SEML has conducted several activities to comply with all of the requirements.** The activities were as follow:

1. During July - December 2021, several engagement activities have been conducted. No grievance has been received by SEML. In regards with the approved Livelihood Restoration Plan (LRP) to the 59 (fifty nine) Project Affected People (PAP), the consultant continues the implementation the plan with various activities, such as:
 - a. Based on the results of the third-year implementation of the LRP-SEML program carried out by Social Consultant, all outputs that contribute to the planned outcomes had been achieved. SEML, through the LRP program, restored the livelihoods of 57 PAPs (96.62%) with welfare status based on the standard of the 2020 BPS Solok Selatan Regency, while 2 PAPs (3.38%) were not able to improve their welfare due to various things beyond the program's intervention capabilities, including PAP's habit of leaving their business and PAP's health vulnerability due to age.
 - b. To support the economic circular of the PAP product, SEML initiates the development of Cooperative Producer in June 2021. During 2nd semester 2021, the Cooperative serves as the agent of change for the coffee marketing channel. This initiatives has lifted up the coffee bean price significantly.
 - c. The demonstration plot (Integrated Farming Area) has been used by surrounding villagers as a learning centre.
 - d. Support Government and Community Program in terms of in-kind support and involve in speeding up of the Covid-19 vaccination program in Solok Selatan and West Sumatra.
2. **During 2nd Semester 2021, one grievance was received a regarding the land acquisition process raised by the Kerapatan Adat Nagari (KAN) Pauh Duo. The grievance has been solved by explaining again the land acquisition process adopted by SEML.**

Monitoring on the progress of livelihood of PAP





Supporting assistance of 6,000 packages of basic foods for the acceleration of COVID-19 vaccination in South Solok under the coordination of FP-TJSLP Solok Selatan

3. During July - December 2021, several programs have been deployed, such as:

1. Community relations to surrounding project stakeholders,
2. Support surrounding district and villages on Covid 19 prevention events
3. Support Assistance 6,000 food packages (basic foods) to accelerate COVID-19 vaccination in Solok Selatan under the coordination of FP-TJSLP Solok Selatan.
4. Prepare improvement of Pasar Kampung Baru – CSR Program 2021 – 2022.
5. Support Solok Selatan Government collaboration with Andalas University to support Nagari Tageh Program (Community Economic Recovery Post Covid -19 Pandemic).
6. Conduct Stakeholder Meeting for preparation of PT SEML 2022 CSR program at Gelora Energy.
7. Support 2021 Regents Cup Football Competition at Gelora Energy and GOR Rimbo Tengah as main sponsor.
8. Support Sport Tournament (table tennis, volley ball, basket ball and football) around SEML GPP site.
9. Support Cultural and Arts Festival including traditional martial arts
10. Provide scholarship donation to Two Students to study in Cairo, Egypt.
11. Support Cooperative Group as the business group for Project Affected People livelihood improvement.



Various Stakeholder Engagement in Supreme Energy Muara Laboh : Welcoming Local Journalist, Local Parliament, West Sumatra Vice Governor and Regent's Team ; Stakeholder Meeting ; District Attorney Greening Program

5.2 Status of Corrective actions

SEML has completed the assessment of 3rd year of the implementation of Livelihood Recovery Program (Attachment 7).

5.3 Summary of Activities Carried Out, Issues and Challenge

During the second-half of 2021, Relations Team continuously performed and participated in several activities, e.g. engagement with all related key stakeholders; implementation of several community development programs; coordination with the EPC contractor with regards to the stakeholders engagement plan, recruitment process, local suppliers management, grievance, etc. All activities carried out were intend to comply with the national law & regulation and International standard.

During this period, there is no land procurement activity conducted.

Land Acquisition/Change in land ownership and land tenure	1. Do changes in land ownership and land tenure (if any) for the project purpose cause conflict in communities? If yes, please describe the details and the measures.	<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	No
	2. Please describe on the land acquisition process during the monitoring period (if any). (e.g. land certification process)	No land acquisition is required and conducted during this monitoring period.	
Livelihood Restoration	1. Please describe integrated Social Development Program, including CSR activities, which are conducted during the monitoring period.	See Sections 5.1, 5.4, and 5.5	
	2. Please provide with the monitoring report of Livelihood Opportunity and Skill Development Programs for Affected Households. Especially, please describe in case any household whose livelihood has been worse than pre-project level. Discuss impacts on the vulnerable households, in a separate section.	The LRP has been implemented as per schedule. And shows good progress in each PAP. See Attachment 7.	
Grievances	1. Please provide us with the grievance log, if any receiving/on-going/closing grievances during the monitoring period, which includes the contents, receiving date, closing date, current situation, etc. of the grievance.		
		Only one grievance raised by KAN Pauh Duo regarding land acquisition process. This grievance has been closed within 2 months by mentioning again the land acquisition process adopted by SEML.	
Employment Opportunities	1. Please describe number and proportion of local workforce employed for the project. Please include the numbers of affected persons who have been engaged in the workforce.	Recruitment process was conducted based on the number and specification required by the Company. Most of the employees came from local people.	
Community Income	1. Please describe if any changes can be quantitatively observed in the community income due to the project. (e.g. increasing income by working as local labor, doing small business, etc.)	There are several multiplier effects due to existence of the project: many street vendors open, small restaurants, many local people become suppliers for the project, better infrastructures in the area surrounding the project, etc.	
Community Perception	1. Are there any negative perceptions towards the Project activities? If yes, please describe the details and mitigation measures.	<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	In general, there was no major negative perception towards the project activity
Community Health	1. Are there any negative impacts on community health caused by the project? (e.g. increasing of infectious disease, problems at sanitation facilities, etc.) If yes, please describe the details and mitigation measures.	<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	No significant impact on community health caused by the project as described in the RKL-RPL report for 2 nd semester 2021.

5.4 Summary of Stakeholder Engagement Plan

Summary of the stakeholder engagement activities carried out during the reporting period, in line with the project's commitments in the stakeholder engagement plan is summarized in the following table.

Stakeholder Engagement Log

Date	Location	Theme	Participants	Information Disseminated	Followup
23-Jul-21	Admin Building	FGD	Yuharnel cs (DPMPTSP Solok Selatan Team) BJ	Evaluation of investment realization in 2021 by 3 officers from DPM-PTSP Solok Selatan	Done. Filled up data requested by the South Solok DPMPTSP
22-Aug-21	SEML Power Plant	FGD	Vice Governor of West Sumatra, Solok Selatan Regent and Vice Regent	Update the status of the Power Plant	Done. Positive feedback from stakeholders
16-Sep-21	Admin Building	FGD	Imigration officials	- Joint operation team for PORA (Foreigner Supervision) Solok Selatan	Done. Explain the status of 2 expatriates currently work at SEML Site
28-Oct-21	Padang Aro (Bupati's Office)	FGD	Regent and Vice Regent of Solok Selatan, Forkopimda and local government officials	- Vaccine Awareness at the South Solok regent's office on 30 October 2021 - All stakeholders were asked to support this activity by bringing vaccine participants if any from family or relatives and employees who have not vaccinated	Done. Requested SHE team to proceed to contactors who have not been vaccinated dose 1 or 2. SEML provides vaccination to workers.
24-Nov-21	Office of Bupati Solok Selatan	FGD	Regent and Vice Regent of Solok Selatan, Forkopimda and local government officials	- Bupati request to companies within the TJSJP forum to Accelerate the Covid-19 vaccination in South Solok by providing gimmick for participants in the form of basic foods. - Company will help according to the financial capabilities of each company	Done. Provide donation for gimmick to speed up Covid-19 vaccine program
29-Dec-21	Office of Bupati Solok Selatan		Zuardi (Kabag Kesra Solok Selatan)	- Data on scholarship recipients - 36 scholarship recipients were proposed by the Regional Government	Done. Provide donation for Scholarship

5.5 Forward Plan / Next Steps (for the next 6 months)

SEML has set a forward plan for the next 6 (six) months that consists of the following programs, i.e:

- Implement the process of the Proposal Form Application using electronic database.
- Improve stakeholder database management thru Darzin application.
- Continue implementation of Integrated Social Development Programs as part of CSR Programs
- Continue to engage and communicate with all related key stakeholders, and strengthen of recordkeeping of stakeholder engagement process.
- Continue to disseminate the grievance mechanism and improve Grievance Log recordkeeping.
- Monitoring and reporting activities

5.6 Labour Hiring and Management

SEML has involved Manpower Office of Solok Selatan regency and a Committee to do local recruitment who then screen the applicants according to the skill required, competencies, and localities. The Committee consists of 5 Heads of Village, Head of Subdistrict, Head of Local Army (Danramil), Head of Precinct Police (Kapolsek) and Community KAN Leader.

The project construction has been completed and most of the workers have been released without grievances. Prior to the end of contract, workers are given sufficient notification and relevant trainings for entrepreneurship have been provided.

In average, during 2021, 80.2% of workers comes from local villages.

Manpower Data 2021

No	Company	Origin (person)		Number (person)	Remarks
		Local ^{*)}	Non-local		
A	Supreme Energy (Site)	42	28	70	Source : HR. SEML site pronsoonnel only.
B Main Contractor					
	PT Rekayasa Industri	0	2	2	Warranty Engineer & Closing Punchlist Works
	FUJI/ABB	0	1	1	Warranty Coordinator
C Supporting Contractor					
1	Securindo	41	1	42	Security Services
2	Dinamika Karya Bersama	30	3	33	Transportation Services
3	Koperasi Serba Usaha	60	2	62	Camp Accommodation and Catering Services
4	Usaha Anugerah Pratama	113	7	120	General Construction (Civil and Mechanical Works)
5	Tiga Putri Bariang	31	2	33	General Construction (Civil and Mechanical Works)
6	KEI	0	1	1	EMS Consultant
7	Geonusa Utama	3	23	26	Soil Nailing Works
8	Ecolab	1	1	2	Laboratory Company
9	PGK	8	0	8	Local Business Development (Cutting grass)
10	Matahari Terbit	11	13	24	Civil Works (Retaining Wall)
	Total	340	84	424	
	Percentage (%)	80.2	19.8		

^{*)} local = manpower from West Sumatera

6. Environmental Capacity

This Chapter discusses staff capacities in environmental management, degree of awareness, training conducted, needs assessment of environmental management capacity and awareness level of contractors' staff trained.

6.1 Staff Capacities in Environmental Management

- SEML Site SHE & Biodiversity Team

No	Name	Position / Title	Years of Experience
1	Asharry Sofyan	Site SHE Manager	10+
2	Fikry Rhidany	SHE Coordinator	10+
3	Taufik Lukman Hakim	Safety Supervisor	10+
4	Dwi Rahayu	Environment Engineer	4
5	Tony Hidayat	Site Medical Doctor	10+
6	Talsi Trasino	Site Medical Doctor	2
7	Aris Januar	Paramedic	4
8	Vandi Deviko	Paramedic	2
9	Ryski Darma Busta	Biodiversity Officer	2
10	Hans Primananda	Biodiversity Admin	2
11	Elsa Rifka	SHE Admin	2
12	Annisa Gabriella Syamsu	OHS Management Support	1

- SEML Corporate SHE Team

No	Name	Title	Years of Experience
1	M. Arief Tarunaprawira	Senior Manager SHE	10+
2	Bima Yudhistiranto	Environment Engineer	8
3	Akhmad Wahyudi	Safety Engineer	10+

- Contractor SHE Team

No	Name	Position/Title	Company Name	Years of Experience
1	Ahmadi Chandra	SHE Coordinator	Usaha Anugerah Pratama	2
2	Donny Indra Putra	Senior SHE Officer	Usaha Anugerah Pratama	2
3	Nadya Eka Putri	SHE Officer	Usaha Anugerah Pratama	1
4	Chandra Prima Yoga	SHE Officer	Usaha Anugerah Pratama	1
5	Redo Andika	SHE Officer	Geonusa	3
6	Yelvini Wilda Ningsih	SHE Officer/Food Nutritionists	KSU	2
7	Ade Revoliza	SHE Officer	Tiga Putri Bariang	3

6.2 Degree of Awareness

The current personnel responsible for SHE management have sufficient knowledge of environmental management, health and safety requirements, including environmental laws and regulations.

6.3 Training Conducted

SHE induction is conducted to all new workers and visitors. Various SHE trainings are conducted to SEML employees and long-term contractor workers.

External trainings also have been conducted through online.

No	Date	Title	By	Persons
1	02 to 07 August 2021	Basic First Aid (certification)	BNSP	16
2	27 to 30 August 2021	Fire Extinguisher Maintenance (certification)	BNSP	1
3	09 to 17 July 2021	Electrician (Teknisi K3 Listrik) (certification)	Dept of Manpower	2
4	11 October 2021	Electrical Expert (Ahli K3 Listrik) (certification)	Dept of Manpower	1
5	30 Aug to 01 Sept 2021	Operational Supervisor – OHS Level Basic (certification)	BNSP	4
6	24 August 2021	Confined Space Training	Int	22
7	05 Oct 2021	Confined Space Training	Int	53
8	07 Oct 2021	Confined Space Training	Int	15
9	28 September 2021	Working at Height	Int	32
10	03 October 2021	Working at Height	Int	32
11	05 October 2021	Working at Height	Int	24
12	03 October 2021	Environment Training	Int	25
13	20 November 2021	Environment Training	Int	5
14	04 to 12 September 2021	Permit to Work Training (3 Batches)	Int	60
15	08 October 2021	Hot Work Training	Int	14
16	20 November 2021	Oil Spill Prevention	Int	5

6.4 Needs Assessment of Environmental Management Capacity

- SEML currently employs consultants (PT BMT Asia Indonesia, PT Kartaraharja, and experts from University of Andalas Padang as well as local NGO ICS and local conservationist from KPKM Bangun Rejo) to support for biodiversity assessment and environmental advices.
- When needed External supports are available through existing consultants, as well as experts from local universities, National Park, local Forestry, and NGOs.
- No additional need is required at this stage. If there is a need to improve the capacity, it will be done accordingly.

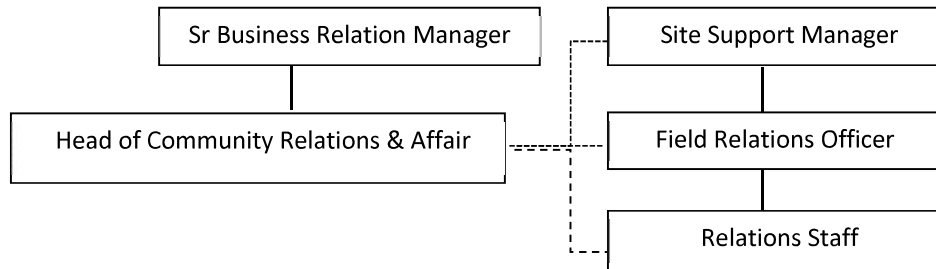
6.5 Awareness Level of Contractors' Field Personnel

- On the job training has been conducted in the form of direct coaching, pre-job meeting, use of display boards, and banners.
- Contractor workers have SHE induction and training courses conducted by their internal SHE personnel.

7. Social Management Capacity

This Chapter discusses staff capacities in social management, degree of awareness, training conducted, needs assessment of social management capacity and awareness level of contractors' staff trained.

7.1 SEML's Relation Team



7.2 Number and Adequacy of Staff to Monitor Labour and Working Conditions

To monitor labour and working conditions, SEML employs 1 (one) experienced managerial levels (Site Support Manager), 2 (two) Site Representatives and 1 (one) female administrator.

7.3 Designation and Signature of Person Responsible

Head of Community Relations & Affairs is responsible for preparing the social safeguards monitoring reports. Sr. Business Relations Manager is the responsible person for reviewing the reports.

8. Issues, Status of Implementation of Mitigating Measures in the Environmental Management Plan

This Chapter discusses status of implementation of mitigating measures in the environmental management plan, and if such issues arise, corrective actions and recommendations, would be act upon.

All environmental monitoring activities follow (the most current) environmental and social management plan and RKL-RPL document as guide to adhere to both national and international standards.

8.1 Pollution monitoring

- Summary of Air Quality Monitoring (ambient, odor, noise, emission from cooling tower stacks and emergency generators) is as follow:

Measurement Period	<p>A. [Construction Phase] Two Times for:</p> <ul style="list-style-type: none"> • Noise • Ambient Air Quality <p>B. Operation Phase</p> <ol style="list-style-type: none"> 1. Every 6 months for: <ul style="list-style-type: none"> • Noise • Ambient air quality • Odor • Emission from cooling tower stacks 2. Yearly (Every One Year) for: <ul style="list-style-type: none"> • Emission from emergency generators 	<p>Excess of standard for Contract (Yes/No) If yes, please describe the outline of planned mitigation measures.</p>																														
Measurement Method	<p>Indonesian National Standards (SNI) guidelines or other standards as follows:</p> <ul style="list-style-type: none"> • Noise : Measurement method and equipment used are based on Decree of MoE No. 48/1996 • Ambient Air Quality: Measurement method and equipment used are based on Government Regulation PP No. 22/2021 Attachment VII <table border="1" data-bbox="539 1391 1142 1675"> <thead> <tr> <th>Parameter</th> <th>Analysis Method</th> <th>Equipment</th> </tr> </thead> <tbody> <tr> <td>SO₂ (Sulphur Dioxide)</td> <td>Pararosanalin</td> <td>Spectrophotometer</td> </tr> <tr> <td>CO (Carbon monoxide)</td> <td>NDIR</td> <td>NDIR Analyzer</td> </tr> <tr> <td>NO₂ (nitrogen Dioxide)</td> <td>Saltzman</td> <td>Spectrophotometer</td> </tr> <tr> <td>O₃ (oxide)</td> <td>Chemiluminescent</td> <td>Spectrophotometer</td> </tr> <tr> <td>HC (hydro Carbon)</td> <td>Flamed Ionization</td> <td>Chromatography Gas</td> </tr> <tr> <td>PM₁₀ (Particle < 10 µm)</td> <td>Gravimetric</td> <td>Hi-Vol.</td> </tr> <tr> <td>PM_{2,5} (Particle < 2.5 µm)</td> <td>Gravimetric</td> <td>Hi-Vol.</td> </tr> <tr> <td>TSP (Dust)</td> <td>Gravimetric</td> <td>Hi-Vol.</td> </tr> <tr> <td>Pb (Lead)</td> <td>Gravimetric</td> <td>Hi-Vol.</td> </tr> </tbody> </table>	Parameter	Analysis Method	Equipment	SO ₂ (Sulphur Dioxide)	Pararosanalin	Spectrophotometer	CO (Carbon monoxide)	NDIR	NDIR Analyzer	NO ₂ (nitrogen Dioxide)	Saltzman	Spectrophotometer	O ₃ (oxide)	Chemiluminescent	Spectrophotometer	HC (hydro Carbon)	Flamed Ionization	Chromatography Gas	PM ₁₀ (Particle < 10 µm)	Gravimetric	Hi-Vol.	PM _{2,5} (Particle < 2.5 µm)	Gravimetric	Hi-Vol.	TSP (Dust)	Gravimetric	Hi-Vol.	Pb (Lead)	Gravimetric	Hi-Vol.	
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Dust Emmission Mitigation by Road Pavement

- Ambient Air and Odour

No	Parameter	Unit	Threshold	AQ-1	AQ-2	AQ-3	AQ-4	AQ-5	AQ-6	AQ-7	AQ-8
Ambient Air Quality											
1	Sulfur dioxide, SO ₂	ug/m ³	150/1H	42.2	32.3	38.5	31.6	23.3	22.8	27.9	37.5
2	Carbon monoxide, CO	ug/m ³	10,000/1H	<1,145.2	<1,145.2	<1,145.2	<1,145.2	<1,145.2	<1,145.2	<1,145.2	<1,145.2
3	Nitrogen dioxide, NO ₂	ug/m ³	200/1H	15.4	13.8	17.0	11.0	12.4	10,9	11.9	15.4
4	Oksidant O ₃	ug/m ³	150/1H	7.3	7.3	7.3	7.1	6.7	6.3	6.9	7.5
5	Hydrocarbon, HC	ug/m ³	160/3H	<0.65	<0.65	<0.65	<0.65	<0.65	<0.65	<0.65	<0.65
6	Particulate <10 µm, PM ₁₀	ug/m ³	75/24H	24.0	19.0	20.0	22.0	24.0	26.0	26.0	25.0
7	Particulate <2,5 µm, PM _{2.5}	ug/m ³	55/24H	18.0	14.0	15.0	17.0	18.0	19.0	20.0	18.0
8	TSP (Total suspended particles)	ug/m ³	230/24H	74.0	59.0	64.0	69.0	74.0	81.0	83.0	77.0
9	Lead, Pb	ug/m ³	2/24H	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Odour											
10	Hydrogen sulfide, H ₂ S	ppm	0.02	0.003	0.002	0.002	0.001	0,001	<0.001	<0.001	0.002
11	Ammonia, NH ₃	ppm	2.0	0.05	0.05	0.04	<0.03	<0,03	<0.03	<0.03	0.04
12	Stryene	ppm	0.1	<0.1	<0.1	<0,1	<0.1	<0,1	<0.1	<0.1	<0.1
13	Methyl Mercaptan	ppm	0.002	<0.0004	<0.0004	<0.0004	<0.0004	<0,0004	<0.0004	<0.0004	<0.0004
14	Methyl Sulfide	ppm	0.01	<0.01	<0.01	<0.01	<0.01	<0,01	<0.01	<0.01	<0.01

TLV for Ambient Air : PP No. 22/2021 Attachment VII

TLV for Odour : Decree of MoE No. 50/1996

- Noise Quality

Parameter	Unit	Threshold	AQ-1	AQ-2	AQ-3	AQ-4	AQ-5	AQ-6	AQ-7	AQ-8
Noise level, L _{SM}	dB(A)	70 (+3)	51.7	49.5	54.6	53.8	51.0	53.3	55.0	54.0

TLV for Noise : Decree of MoE No. 48/1996

Parameter	Unit	Threshold	NOS-1	NOS-2	NOS-3
Noise level (day-night), L _{SM}	dB(A)	55/ 70 (+3)	54.7	54.6	54.9
Noise level (day), L _S			54.5	54.7	54.4
Noise level (night), L _M			49.2	49.4	48.2

- Emissions From Cooling Tower Stacks

Measurement Point	Parameter	Unit	Measured Result	National Standard ^{*1}
Power Plant Cooling Tower Stack ECT-1A	Hydrogen Sulfide (H ₂ S)	mg/Nm ³	0.17	30
	Ammonia (NH ₃)	mg/Nm ³	<0.10	0.4
Power Plant Cooling Tower Stack ECT-1B	Hydrogen Sulfide (H ₂ S)	mg/Nm ³	0.17	30
	Ammonia (NH ₃)	mg/Nm ³	<0.10	0.4
Power Plant Cooling Tower Stack ECT-1C	Hydrogen Sulfide (H ₂ S)	mg/Nm ³	0.17	30
	Ammonia (NH ₃)	mg/Nm ³	<0.10	0.4
Power Plant Cooling Tower Stack ECT-1D	Hydrogen Sulfide (H ₂ S)	mg/Nm ³	0.16	30
	Ammonia (NH ₃)	mg/Nm ³	<0.10	0.4
Power Plant Cooling Tower Stack ECT-1E	Hydrogen Sulfide (H ₂ S)	mg/Nm ³	0.16	30
	Ammonia (NH ₃)	mg/Nm ³	<0.10	0.4
Power Plant Cooling Tower Stack ECT-1F	Hydrogen Sulfide (H ₂ S)	mg/Nm ³	0.16	30
	Ammonia (NH ₃)	mg/Nm ³	<0.10	0.4
Power Plant Cooling Tower Stack ECT-1G	Hydrogen Sulfide (H ₂ S)	mg/Nm ³	0.17	30
	Ammonia (NH ₃)	mg/Nm ³	<0.10	0.4
Power Plant Cooling Tower Stack ECT-1H	Hydrogen Sulfide (H ₂ S)	mg/Nm ³	0.17	30
	Ammonia (NH ₃)	mg/Nm ³	<0.10	0.4

* Minister of KLHK Regulation No 15/MENLHK/SETJEN/KUM.1/4/2019 Attachment V

Parameter	Unit	TLV ^{*)}	ECT-1A	ECT-1B	ECT-1C	ECT-1D	ECT-1E	ECT-1F	ECT-1G	ECT-1H
Flow Rate	m/s	-	366.72	366.72	432.34	366.72	366.72	449.23	356.10	440.54

- Emission From Emergency Generators

No	Parameter	Unit	TLV-1 (101 - 500 kW)	TLV-2 (501 - 1,000 kW)	EEG-1 (100 kVA / 80 kW)	EEG-2 (800 kVA / 640 kW)
1	Nitrogen Oxide, (NO _x)	mg/Nm ³	3,400	1,850	281.2	465.6
2	Carbon Monoxide, (CO)	mg/Nm ³	170	77	168.9	75.1
3	Oxygen, O ₂	%	-	-	17.9	17,3
4	Carbon Dioxide, (CO ₂)	mg/Nm ³	-	160	81,405	79,631
5	Temperature	°C	-	-	130.4	100.1
6	Flow	m ³ /s	-	-	0.32	0.26
6	Sulphur Dioxide	mg/Nm ³	-	160	-	< 2.6
6	Total Particulate (PM)	mg/Nm ³	-	95	-	30.0

* Minister of KLHK Regulation Permen No 11 Year 2021 regarding TLV for Emission from Internal Engine

- Additional 24-hours H₂S Monitoring (Ambient Air for Odor)

Parameter	Unit	TLV*)	H2S-1	H2S-2	H2S-3
H ₂ S	ppm	0.02	0.003	0.001	0.002

Concentration (ppm)	Symptoms/Effects
0.00011-0.00033	Typical background concentrations
0.01-1.5	Odor threshold (when rotten egg smell is first noticeable to some). Odor becomes more offensive at 3-5 ppm. Above 30 ppm, odor described as sweet or sickeningly sweet.
2-5	Prolonged exposure may cause nausea, tearing of the eyes, headaches or loss of sleep. Airway problems (bronchial constriction) in some asthma patients.
20	Possible fatigue, loss of appetite, headache, irritability, poor memory, dizziness.
50-100	Slight conjunctivitis ("gas eye") and respiratory tract irritation after 1 hour. May cause digestive upset and loss of appetite.
100	Coughing, eye irritation, loss of smell after 2-15 minutes (olfactory fatigue). Altered breathing, drowsiness after 15-30 minutes. Throat irritation after 1 hour. Gradual increase in severity of symptoms over several hours.

8.2 Water Quality

- Summary of Water Quality Monitoring as follow:

Measurement Period	<p>A. Construction Phase: Two Times for:</p> <ul style="list-style-type: none"> Surface Water Quality Domestic Waste <p>B. Operation & Post Operation Phase] Every 6 months for:</p> <ul style="list-style-type: none"> Surface Water Quality Active Water Pond (Produced Water) Community Shallow Ground Water Domestic Waste 	<p>Excess of national standard (Yes/No) If yes, please describe the outline of planned mitigation measures.</p> <p>Surface Water:</p> <ul style="list-style-type: none"> No parameters were exceeded at all locations <p>Ground Water:</p> <ul style="list-style-type: none"> No parameters were exceeded at all locations 																																																
Measurement Method	<p>Indonesian National Standards (SNI) guidelines or other standards for:</p> <ul style="list-style-type: none"> Surface Water : Measurement method and equipment used are based on GOI Regulation PP No 22 / 2021 regarding Environmental Management – Attachment VI Class II Ground Water : Measurement method and equipment used are based on Ministry of Health Regulation Permenkes No. 492/2010 Domestic Water : Measurement method and equipment used are based on Ministry of Health Regulation Permenkes No. 32/2017 Attachment I Chapter IIA. 	<ul style="list-style-type: none"> GW-C1 and GW-C2 are voluntarily monitored being the outmost location. Wellpad C contains well C-1 which is a non-producing well. 																																																
Measurement Points	<ul style="list-style-type: none"> Surface Water <table border="1" data-bbox="512 936 1067 1137"> <thead> <tr> <th>No</th> <th>Location Code</th> <th>Reference</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>SW-1</td> <td>Upstream Bangko Karuah River</td> </tr> <tr> <td>2</td> <td>SW-2</td> <td>Downstream Bangko Karuah River</td> </tr> <tr> <td>3</td> <td>SW-3</td> <td>Upstream Bangko Putih River</td> </tr> <tr> <td>4</td> <td>SW-4</td> <td>Downstream Bangko Putih River</td> </tr> <tr> <td>5</td> <td>SW-5</td> <td>Downstream Bangko Hitam River</td> </tr> <tr> <td>6</td> <td>SW-6</td> <td>Batang Liki River</td> </tr> <tr> <td>9</td> <td>SW-9</td> <td>Upstream Bangko Hitam River</td> </tr> </tbody> </table> Ground Water <table border="1" data-bbox="512 1189 1067 1317"> <thead> <tr> <th>No</th> <th>Location Code</th> <th>Reference</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>GW-C1</td> <td>Wellpad C : Upstream</td> </tr> <tr> <td>2</td> <td>GW-C2</td> <td>Wellpad C : Downstream</td> </tr> <tr> <td>3</td> <td>GW-E1</td> <td>Wellpad E : Upstream</td> </tr> <tr> <td>4</td> <td>GW-E2</td> <td>Wellpad E : Downstream</td> </tr> </tbody> </table> Domestic Water Supply <table border="1" data-bbox="512 1368 1067 1442"> <thead> <tr> <th>No</th> <th>Location Code</th> <th>Reference</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>WTY-In</td> <td>Water Treatment Plant : Upstream</td> </tr> <tr> <td>2</td> <td>WTY-Out</td> <td>Water Treatment Plant : Downstream</td> </tr> </tbody> </table> 	No	Location Code	Reference	1	SW-1	Upstream Bangko Karuah River	2	SW-2	Downstream Bangko Karuah River	3	SW-3	Upstream Bangko Putih River	4	SW-4	Downstream Bangko Putih River	5	SW-5	Downstream Bangko Hitam River	6	SW-6	Batang Liki River	9	SW-9	Upstream Bangko Hitam River	No	Location Code	Reference	1	GW-C1	Wellpad C : Upstream	2	GW-C2	Wellpad C : Downstream	3	GW-E1	Wellpad E : Upstream	4	GW-E2	Wellpad E : Downstream	No	Location Code	Reference	1	WTY-In	Water Treatment Plant : Upstream	2	WTY-Out	Water Treatment Plant : Downstream	
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• Surface Water Quality Result

No.	Parameter	Unit	TLV*)	Result						
				SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-9
A. Physical										
1	Temperature	oC	Ambient + 3 °C	19.1	20.1	17.4	23.3	24.5	21.4	27.4
2	TDS	mg/L	1,000	30	51	102	122	144	242	56
3	TSS	mg/L	50	<1	<1	<1	<1	<1	<1	<1
B. Chemical										
1	pH	-	6 - 9	7.2	6.9	7.4	7.1	6.5	7.2	7.3
2	BOD	mg/L	3	<2	<2	<2	<2	<2	<2	<2
3	COD	mg/L	25	<4	<4	<4	<4	<4	<4	<4
4	DO	mg/L	≥4	6.7	7.8	7.1	6.1	7.2	6.5	6.2
5	Sulphate, SO ₄	mg/L	300	9	9	38	11	51	<3	17
6	Chloride, Cl ⁻	mg/L	300	17.6	11.0	8.4	6.4	4.4	6.0	3.6
7	Nitrate asN, NO ₃ -N	mg/L	10	0.45	0.47	0.43	0.56	0.36	0.54	0.65
8	Nitrite as N, NO ₂ -N	mg/L	0.06	0.02	0.02	0.02	0.02	0.02	0.02	0.02
9	Ammonia, NH ₃ -N	mg/L	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
10	Total Nitrogen	mg/L	15	0.6	0.6	0.6	0.7	0.5	0.7	0.8
11	Total Phosphate as P	mg/L	0.2	<0.02	<0.02	<0.02	<0.02	<0.02	0.022	<0.02
12	Fluoride, F ^{- a)}	mg/L	1.5	0.21	<0.06	<0.06	<0.06	<0.06	0.16	<0.06
13	Suphur as H ₂ S	mg/L	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
14	Cyanide, CN ⁻	mg/L	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
15	Free Chlorine, Cl ₂	mg/L	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
16	Boron, B	mg/L	1	0.045	0.051	0.042	0.063	0.052	0.042	0.040
17	Mercury, Hg	mg/L	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
18	Arsen, As	mg/L	0.05	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
19	Selenium, Se	mg/L	0.05	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
20	Cadmium, Cd	mg/L	0.01	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
21	Cobalt, Co	mg/L	0.2	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
22	Nickel, Ni	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
23	Zinc, Zn	mg/L	0.05	<0.008	<0.008	0.038	0.049	0.043	0.023	0.045
24	Copper, Cu	mg/L	0.02	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
25	Lead, Pb	mg/L	0.03	<0.02	<0.02	<0.02	0.011	<0.02	<0.02	<0.02
26	Chromium Hexavalent, Cr(VI)	mg/L	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
27	Oil and Grease	mg/L	1	<1	<1	<1	<1	<1	<1	<1
28	Detergen, as MBAS	mg/L	0.2	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
29	Phenol	mg/L	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C. Microbiology										
1	Fecal coliform	MPN/100 ml	1,000	194	89	11	11	42	8	29
2	Total coliform	MPN/100 ml	5,000	254	198	35	35	330	25	219

• Ground Water Quality Result

No.	Parameter	Unit	TLV ^{*)}	Result			
				GW-C1	GW-C2	GW-E1	GW-E2
I	Mandatory Parameter						
	Parameter that directly related with the health						
A	Parameter Microbiology						
1	E. Coli	Jml/100 ml	0	0	0	0	0
2	Total Bakteri Koliform	Jml/100 ml	0	0	0	0	0
B	Chemical An-organik						
1	Arsenic	mg/L	0.01	<0.002	<0.002	<0.002	<0.002
2	Fluoride (F)	mg/L	1.5	0.47	<0.06	0.65	0.15
3	Total Chromium (Cr)	mg/L	0.05	<0.02	<0.02	0.02	<0.02
4	Cadmium (Cd)	mg/L	0.003	<0.002	<0.002	<0.002	<0.002
5	Nitrite (as NO ₂)	mg/L	3	0.02	0.03	0.03	0.03
6	Nitrate (as NO ₃)	mg/L	50	0.90	0.88	0.96	0.94
7	Cyanide (CN)	mg/L	0.07	<0.01	<0.01	<0.01	<0.01
8	Selenium (Se)	mg/L	0.01	<0.002	<0.002	<0.002	<0.002
	Parameter that indirectly related with the health						
A	Physical						
1	Odor	-	Odorless	Odorless	Odorless	Odorless	Odorless
2	Color	Pt-Co	15	4	6	4	3
3	TDS	mg/L	500	106	118	292	52
4	Turbidity	NTU	5	1.23	0.93	1.16	2.53
5	Taste	-	Tasteless	Tasteless	Tasteless	Tasteless	Tasteless
6	Temperature	°C	Deviation 3	28.6	26.8	29.1	30.6
B	Chemical						
1	Aluminum (Al)	mg/L	0.2	< 0.1	0.2	< 0.1	<0.1
2	Iron (Fe)	mg/L	0.3	< 0.03	<0.03	0.29	0.04
3	Hardness	mg/L	500	81	77	34	46
4	Chloride (Cl)	mg/L	250	4.0	5.3	5.0	5.0
5	Manganese (Mn)	mg/L	0.4	<0.01	0.01	0.05	0.09
6	pH	-	6.5 - 8.5	7.0	7.0	6.6	7.4
7	Zinc (Zn)	mg/L	3	0.026	0.028	0.579	0.124
8	Sulphate	mg/L	250	21	42	<3	<3
9	Cuprum (Cu)	mg/L	2	0.007	<0.007	<0.007	<0.007
10	Ammonia	mg/L	1.5	0.1	0.1	0.1	0.1

• Domestic Water Supply Result

No.	Parameter	Unit	TLV ^{a)}	Result	
				WTY-In	WTY-Out
Table 1					
1	Turbidity ^{a)}	NTU	25	0.95	0.96
2	Color	TCU	50	6	5
3	Total Dissolved Solid, TDS ^{a)}	mg/L	1,000	102	122
4	Temperature ^{a)}	°C	± 3	29.2	26.2
5	Taste	-	Tasteless	Tasteless	Tasteless
6	Odor	-	Odorless	Odorless	Odorless
Table 2					
7	Total Coliform	No /100 mL	50	11	12
8	E. Coli	No /100 mL	0	0	0
Table 3					
9	pH ^{a)}	-	6.5 - 8.5	6.5	7.2
10	Iron, Fe ^{a)}	mg/L	1.0	<0.03	<0.03
11	Fluoride, F ⁻ ^{a)}	mg/L	1.5	0.41	0.37
12	Hardness, as CaCO ₃ ^{a)}	mg/L	500	109	93
13	Manganese, Mn ^{a)}	mg/L	0.5	<0.01	<0.01
14	Nitrate, NO ₃ -N ^{a)}	mg/L	10	0.56	0.65
15	Nitrite, NO ₂ -N ^{a)}	mg/L	1.0	<0.01	<0.01
16	Cyanide, CN ⁻	mg/L	0.1	<0.01	<0.01
17	Detergent, as MBAS ^{a)}	mg/L	0.05	<0.025	<0.025
18	Total Pesticide	mg/L	0.1	<0.0004	<0.0004

Note:

^{a)} Threshold limit value refer to the Indonesian Regulation of Ministry of Health No. 32, 2017 Attachment I Chapter II A, Tables 1 to 3

8.3 Wastes

Summary of Waste monitoring as follow:

Measurement Period	Construction Phase: Two times Operation & Post Operation Phase: Every 6 months	Any concerns and measures taken: <ul style="list-style-type: none"> • LDW is voluntary monitored • pH of LDW-2 was 9.5 or slightly above TLV (9). Reason for this occurrence is being investigated. • Biofil is emptied from sludge. • Sludge is treated at a government facility in Padang • Maintenance of biofil is continuing (Attachment 19) 								
Measurement Method	Calculation of Waste quantity: Liquid Domestic Waste <ul style="list-style-type: none"> • Based on Ministry of Environment and Forestry Regulation No. P68/2016 Attachment I Solid Waste <ul style="list-style-type: none"> • Solid Industrial Waste quantity • Solid Domestic Waste quantity • Hazardous Waste sent to Licensed Hazardous Waste Treatment Facility Company 									
Measurement Points	1. Effluents of Domestic Waste Water Treatment Plant (Biofil) from accommodation area <table border="1" data-bbox="448 1646 1007 1722"> <thead> <tr> <th>No</th> <th>Location Code</th> <th>Reference</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>LDW-1</td> <td>WWTP Accommodation Camp</td> </tr> <tr> <td>2</td> <td>LDW-2</td> <td>WWTP Power Plant</td> </tr> </tbody> </table> 2. Solid Waste <ul style="list-style-type: none"> • Solid Industrial Waste Collection Area • Solid Domestic Waste Collection Area 3. Temporary Storage of Hazardous Waste		No	Location Code	Reference	1	LDW-1	WWTP Accommodation Camp	2	LDW-2
No	Location Code	Reference								
1	LDW-1	WWTP Accommodation Camp								
2	LDW-2	WWTP Power Plant								

- Summary of Effluents from Domestic WWTP (Biofill) is as follow:

Parameter	Unit	TLV*)	Result	
			LDW-1	LDW-2 PP
pH	-	6 - 9	6,8	8,4
Biological Oxygen Demand, BOD	mg/L	30	15	5
Chemical Oxygen Demand, COD	mg/L	100	29	9
Total Suspended Solid, TSS	mg/L	30	<1	<1
Oil and Grease	mg/L	5	<3	<3
Ammonia, NH ₃ -N	mg/L	10	0.7	0.9
Total Coliform	Jumlah/100 mL	3,000	130	120
Total Nitrogen, N-total	mg/L	-	1.6	1.7
Total Phosphate as P	mg/L	-	0.51	<0.02

Note : * Threshold value based on PERMENLHK RI No. P.68/Menlhk/Setjen/Kum.1/8/2016 Attachment I

- Summary of Solid Waste Monitoring for period of July - December 2021 as follow:

Location	Type	Parameter	Unit	Measurement Result	Remarks
Solid Industrial Waste Collecting Area	Metal Industrial Waste	Weight	Tones	N/A	No production
	Non Metal Industrial Waste	Weight	Tones	N/A	No production
Solid Domestic Waste Collecting Area	Domestic Waste	Sent to Government Facility	Container or Trip	33	Sent to Government Facility

- Summary of Hazardous Waste Monitoring as follow:

Type	Parameter	Unit	Measurement Result
Waste Oil	Quantity	Ton	12.6
Used Containers	Quantity	Ton	0.566
Used / Oily Spill Kit	Quantity	Ton	---
Contaminated Waste	Quantity	Ton	4.1
User Rags	Quantity	Ton	0.357
Ex Oil Filter	Quantity	Ton	0.093
Ex Toner	Quantity	Ton	0.008
Ex-laboratory	Quantity	Ton	0.1017

8.4 Erosions

The Owner Engineers have reviewed all geotechnical aspects at project area and additional civil works have been completed to improve slope stability and erosion control. **Regular monitoring of erosion has been conducted.** Site Specific Erosion Management Plan (procedure no. ML-SHE-ENV-PRO-0019) has been issued in March 2021 to accommodate current condition and adopted mitigation measures.

- Summary of Erosions Monitoring as follow:

Measurement Period	Construction Phase: Two Times Operation Phase: Every 6 months	Any concerns and measures taken: N/A Erosion and Landslide monitoring is conducted on a regular basis by Site personnel and every 6 months by the RKL-RPL consultants.
Measurement Method	<ul style="list-style-type: none"> • Land erosion measurement using small square method • Rainfall measurement 	
Measurement Points	Areas prone to erosion along access road, wellpad, and geothermal power plant area	

- Erosion and landslide during 2nd Semester 2021

Location	Coordinate	Type	Erosion		Landslide		Remarks / Intensity
			Depth (cm)	Interval Distance Between Locations (m)	Spread Length (m)	Interval Distance Between Locations (m)	
Temporary office cliff near Wellpad A	01°37'39,11" LS 101° 07' 48,97" BT	Landslide	-	-	< 10	> 150	Low, sealed by tarpaulin
Access to Wellpad B	01°37'17,1" LS 101° 08' 16,1" BT	Landslide	-	-	< 10	> 150	Low
	01°36'59,8" LS 101° 08' 12,9" BT	Landslide			< 10	> 150	Low
Wellpad E - Wellpad A	01°37'06,8" LS 101° 07'40,6" BT	Landslide			25 - <50	50 - 100	Medium
Around Camp - PLTP	01°37'0 LS 101° 07'52 BT	Landslide			< 10	> 150	Low, sealed by plastic
Around Camp - PLTP	01°37'39 LS 101° 07'48 BT	Landslide			< 10	> 150	Low, sealed by plastic

Source : RKL/RPL report for 2nd semester 2021

Erosion Control



Slope Protection

