



Lao People's Democratic Republic  
Peace Independence Democracy Unity Prosperity  
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Ministry of Natural Resources and Environment

## **Lao Environmental and Waste Management Project (P175996)**

**Preliminary Environmental and Social Impact Assessment (Pre-ESIA) of the  
Partial Rehabilitation and Development of an Engineered Landfill at the Existing Km  
32 Landfill Site in Vientiane Capital (KM 32 Landfill Project)**

**(Executive Summary for Disclosure and Stakeholder Consultation)**

Prepared by:

Environment Protection Fund

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## Executive Summary

The Partial Rehabilitation and Development of an Engineered Landfill at the Existing Km-32 Landfill Site is among the activities being considered for funding under Component 3 of the proposed Environmental Waste Management Project (EWMP), a project being developed for World Bank financing. The rehabilitation and development works will involve:

- (a) construction of two new fenced engineered landfill cells with a total capacity of 1.15 million cubic meters;
- (b) excavation and relocation of about 156,000 cubic meters of wastes to make space for the new landfill cells;
- (c) construction of a 900 square meter floor area hazardous waste storage facility for incoming municipal waste.
- (d) construction of a leachate treatment facility comprising a combination of an Up-flow Anaerobic Sludge Blanket Reactor (UASB) and an aerobic rotary disc system and including a HDPE lined regulating pond for the leachate coming from the new landfill cells.
- (e) construction of a 3,200-sq m floor area administration building with a weighbridge, a solar power system, and about one km of 7-m wide concrete road system;
- (f) upgrading of the existing recycling facility and the Waste Management Centre to improve the working conditions and increase the value of recyclables; and,
- (g) construction of four (4) groundwater monitoring wells.

This preliminary ESIA study is part of the pre-appraisal safeguards documents being prepared for the Project as agreed with World Bank. The main objective of the preliminary ESIA is to assess the potential risks and impacts of the initial project concept and design and based on the results, to recommend design features and management measures, including as necessary, further detailed studies.

### ENVIRONMENTAL AND SOCIAL CONDITIONS OF THE PROPOSED SITE

The Km 32 Landfill facility is located in the Xaythany District, about 32 km from the Vientiane city center. It is owned and operated by the Vientiane City Office of Management Service (VCOMS). The facility has a total land area of 50 hectares and currently handles about 400 tons of unsorted garbage per day.

#### Meteorology

Meteorological data showed that the City of Vientiane is experiencing slightly increasing trend (i.e., about 0.02 degree-C increase per year) in annual mean temperature and a slightly downward trend in total annual precipitation (i.e., average of about 3.6 mm decline per year) since 1950. The city is located in the region of low seismic hazards. The prevailing wind speed is moderate at 2.0 to 2.7 m/s. The region is usually not impacted by typhoon winds but from only heavy rains and flooding.



## Hydrogeology and Water Quality

The site sits on sedimentary sandstone which is a good aquifer which is an important source of domestic water supply. Information on the groundwater level indicate an unsaturated zone of 5-7 m based on drillings near the site. There are two groundwater wells on the site, and two private wells within about 500 m of the site. Surface water from the site drains into the Nam Ngum River about 7.5 km from the landfill site. There are several ponds inside and near the sites, some of these serve as primary treatment ponds for leachates. Soil samples collected near one pond inside the landfill stands out with very high concentrations of arsenic and cadmium, which corroborates with the high concentrations of cadmium detected in the wastewater sample from the outlet of the pond. The surface water samples taken within the site have high COD and BOD concentrations, indicating impact of leachate from the waste dump. Coliform bacterial counts are also high especially inside the landfill where chloride concentration is also high. Groundwater samples taken from the wells near the landfill also showed high total dissolved solids, high bacterial counts, and unusually high concentrations of fecal coliform.

## Air Quality and Noise

The air quality measurements taken from monitoring stations indicate compliance with the relevant Lao ambient air quality standards for all the monitored parameters. However, PM10 concentrations were two times higher than the WHO recommended air quality guidelines. Noise measurements carried out in the same stations are all within government and IFC EHS guidelines standards.

## Flora and Fauna

The landfill site is not within or near any biodiversity conservation area. It is surrounded by rice paddies, grazing lands and patches of secondary growth forests. Domestic animals including cows, buffalos and goats roam around and inside the landfills due to broken fences in many sections. The field survey did not identify any sensitive flora, fauna, or habitats and no threatened species on the landfill site and its vicinities.

## Social Profile

The landfill is situated in unpopulated area. The nearest village is about 2.5 km south of the landfill. A new residential area is being established about 1.4 km southwest of the landfill consisting of about 20 units, but these appear to be still unoccupied. More than 90% of the people in the villages are engaged in farming, particularly paddy rice, vegetables, livestock, and fisheries. Other income sources include small businesses, wage labor, and employment in the government. A small minority derive their incomes from waste picking.

The people directly affected by the project are the waste pickers and waste collectors. As per VCOMS, there are about 264 registered waste pickers. They established their camps on leased



land immediately outside the landfill where they temporarily store collected recyclables. A few of them also live in the camp. Waste collectors numbering about 113, are employees of waste collection companies as members of the collection truck crews.

The population in the Xaythany District is composed of four main ethnic groups: LaoTai-Lao, Mon-Khmer, Sino-Tibetan, and Hmong-Iumien. Of the population in the district, 90.6%, 7.2%, and 2.2% are Buddhist, animist, or Christian, respectively. All households in the three villages near to KM32 identified themselves as Lao, which falls under the Tai-Kadai family, also being referred to as Lao-Loum. The vast majority (90%) of the population in the three villages are Buddhist, the remaining few are Animists (7.2%) and Christians (2.2%). Most of the waste pickers are Lao Tai.

### **Prevailing Environmental and Social Issues**

Based on interviews and dialogues with the villagers and waste pickers, the prevailing issues associated with the existing landfill operation include: (a) exposure of villagers from air pollution coming from burning waste at the landfill, causing respiratory problems especially the elderly; (b) broken and poorly maintained fences enable farm animals to enter and feed on the waste making them sick; (d) contamination of rice fields from leachate laden runoff during rainy season, affecting the rice crop and causing skin rashes to farmers; (e) collection trucks causing litters along the hauling routes because of overloading and absence of cover; (e) waste pickers working conditions, particularly the lack of water and sanitation facilities at the site and lack of training in handling hazardous waste; and, (f) presence of child labor among waste pickers.

### **POSITIVE ENVIRONMENTAL AND SOCIAL IMPACTS**

The project will to some extent reduce the environmental impacts associated the with disposal of the future incoming waste to the Km 32 Landfill. The waste that goes to the new landfill cells will no longer be exposed to the wind and animals, incidence of burning wastes will disappear, and their leachate will no longer be allowed to seep into the ground and contaminate the surface and groundwater. These will reduce human health risk from being exposed to polluted air from burning wastes and consumption of water and food contaminated with leachates. Nuisance from odor and waste litter will also be reduced. The project will also reduce emission of methane gas directly into the atmosphere. Finally, upon closure, the engineered landfill cells will allow a range of many other productive land uses such as raising of crops and grazing. The project will also improve the welfare and health and safety of waste pickers and workers.

### **ADVERSE ENVIRONMENTAL AND SOCIAL IMPACTS AND RISKS**

#### **Construction Phase**

The environmental and social impacts and risks during construction are assessed to be moderate, temporary, and localized and can be effectively mitigated by standard conventional methods. These include: (a) risks related to labor management and working conditions, including



occupational health and safety of construction workers and the current workers of the existing landfill operations particularly the collectors; (b) dusts and noise and potential sedimentation of downstream areas due to excavation at sites and at borrow pits; (c) community health and safety risks due to exposure of workers of the existing landfill operations, including the waste collectors, waste pickers and the communities along the construction route, to construction related hazards.

**Labor and working conditions.** Labor related risks during construction include: (i) employment discrimination, (ii) denial of basic workers' rights; (iii) unresolved labor disputes, (iv) sexual exploitation and abuse and sexual harassment (SEA/SH), (v) child labor; (vi) accidents and injuries involving excavation and heavy equipment; and (vii) injuries and illnesses due to exposure to wastes which may contain toxic agents, sharp objects, and pathogens as well as exposure to contaminated soils and dusts at construction site. These risks however are considered moderate.

**Pollution and sedimentation.** Construction activities may generate dusts and other air emissions that will affect the air quality downwind of the site. There may be sedimentation of downstream due to earthmoving activities at construction sites and at borrow pits, if any would be required. Domestic wastes will be generated at the labor camps. These risks and impacts are considered moderate, temporary, and highly localized.

**Community health and safety.** Waste pickers, waste collectors and other workers of current landfill operations will be exposed to construction site hazards such as the movement of heavy equipment, deep excavations, construction dusts, and noise. Nearby residents and farmers working downwind will be potentially exposed to dusts while those along the construction routes may be impacted by the construction traffic. The temporary influx of construction workers could affect nearby villages, potentially increasing incidence of substance abuse and gender-based violence and spread of communicable diseases. Finally, while the landfill areas are outside the UXO danger zone, there may be risk of encountering UXO in the borrow pit. These risks are rated moderate.

**Impacts on flora and fauna.** Impacts on flora and fauna from construction activities are considered negligible because the landfill site is already a disturbed area with waste dumped on most part to the site and there are no flora or fauna of conservation value at or near the site. However, establishing new borrow pits or spoil disposal sites may generate impacts on flora and fauna. These risk however is of low significance can be avoided through proper siting of borrow pits and disposal areas.

**Indigenous people and minorities.** The site is fully owned by VCOMS and there are no marginalized ethnic minorities claiming collective ownership or cultural connection to the landfill site and surrounding areas.

### Operation Phase

The commissioning and operation of the new and rehabilitated facilities albeit only a percentage of the overall landfill operation, will generally improve the environmental impacts of the facility. The environmental and social risks will include: (a) potential risk on labor management and working conditions, particularly exposure of workers to hazardous wastes and materials; (b) water



pollution and potential risk on rice crop and common aquatic flora/fauna due to contamination of surface water and groundwater from the leachate; (c) air pollution due to burning of wastes, dusts from daily traffic, odor emissions and GHG emissions; (c) community health and safety risk due to exposure of the waste pickers at site and communities nearby and along the hauling route to daily waste truck traffic, accidents causing wastes spills, accidental release of leachates and other hazardous materials into the environment; and (d) impacts to property values and aesthetics of nearby areas.

***Labor and working conditions.*** The operations of the new landfill facilities will involve hiring of few workers. Applicants and workers in the new landfill facilities will be at risk of (i) employment discrimination, (ii) denial of basic workers' rights; (iii) unresolved labor disputes, (iv) sexual exploitation and abuse and sexual harassment (SEA/SH), (v) accidents involving fire and explosion of landfill gas and accidental spills of hazardous waste and leachate; (vi) health risks from exposure to flies and other vermin attracted by the existing waste and relocated waste which as per design will not be capped.

***Air and water pollution.*** The risks of surface water and groundwater contamination from leachate and air pollution from open burning of waste and from odor emissions of decaying organic wastes will be substantially lower than the risk currently being posed and likely to continue to be posed by the rest of the landfills cells that are not part of the project. Nevertheless, there is still a significant risk of leakage if the HDPE liner will fail and if standing waste uncovered waste spontaneously ignites. Also, the design of relocated waste cells does not have provision for soil cover which means it will still emit odor. Despite the lower risk of pollution from the new cells, any cases of water contamination or air pollution will always be attributed or linked to the project by the public. For these reasons, the risk of air and water pollution are still considered high.

***Community health and safety.*** The exposure of animals and humans to the waste will be minimal as far as the operation of the new cells is concerned, as they be secured with fences and the wastes will be regularly covered with soil. The risk of community being exposed from accidental spills or releases due to malfunction of leachate collection and treatment system is low because of the distance of the villages from the site. However, the overall community health and safety risk coming from the rest of the landfill operations will still be significant. Downwind villages are expected to continue to experience odor and air pollutants from open burning of wastes. Farmers in nearby fields will still be exposed to leachate-laden runoff coming from the landfill cells not part of the project. The risk of spread of infectious diseases from flies and vermin and through stray animals will still be high. Public health impacts from consumption of polluted groundwater used for drinking water. The waste-pickers will continue to be the group most exposed to these hazards. Domestic and farm animals may continue to be exposed to wastes in other landfill cells being used by other waste concessionaires if fences in their areas are not properly maintained.

***Potential restriction or loss of access to livelihood sources.*** Wastes in the new landfill cells will be regularly covered with soil. Hence, the waste pickers will now have restricted access to wastes in the new landfill cells. A focus group discussion with seasonal and registered waste-pickers indicates that many of them expect a reduction in recyclables arriving at Km 32 because of the



operation of the integrated waste management facilities in Naxaythong District and Km 16 also being proposed under Component 3.

### Closure Phase

Most of the environmental and social risks during operations phase continue to be relevant in the closure phase. The risk of groundwater and surface water contamination due to failure of the liner and the leachate collection and treatment system of the new landfill cells will be the same as during operations. However, the possibility of failure of final cell cap to prevent water from seeping into waste layers would add to this risk through the "bathtub effect" wherein infiltrated water will build up and flows out or seeps through the embankment.

The landfills cells that are not part of the project will continue to pose greater risk of groundwater and surface water pollution. Leachate runoff at the fields and streams during rainy season will continue to be significant. So is the risk of spread of diseases by vectors and vermin, truck and windblow litters, and stray animals.

Surface water contamination will affect the productivity and quality of rice production and other agricultural production in the surrounding fields; and may also pose a risk to the health of farmers, domestic animals, and wildlife; and may in general render the water resources in the affected streams unusable.

### RISK MANAGEMENT AND IMPACT MITIGATION PLAN

#### Design Measure

The following design measures are recommended:

- (a) Adding a compacted clay underlay of sufficient thickness to the HDPE liner for all landfill cells, including the cell for the relocated waste, and the leachate pond. This should reduce the risk of leachate infiltration in case of leakage in the HDPE liner.
- (b) Adoption of a simple pond and wetland system to treat leachate instead of the proposed UASB and rotating disc technology which requires power and could easily breakdown.
- (c) To avoid outflow (bathtub effect) of contaminated water during the closure phase, the final cap consisting of 2 m of soil layer should be improved to include (i) a 150-mm topsoil layer, (ii) a 150 to 300-mm intermediate layer, (iii) a 600 mm-barrier layer and a 150 to 300-mm gas collection layer. The same should be done in cell holding the relocated waste.
- (e) Inclusion of a leachate recirculation system to minimize discharge of treated leachate to the environment and to accelerate waste decomposition and reach the stabilization phase earlier.
- (f) To minimize the volume of leachate that goes into the leachate treatment system, the leachate collection system should be designed such that rainwater from the inactive parts



of a cell are collected and discharged separately as clean stormwater and only waste-leachate are conveyed into the leachate treatment unit. Each section of a cell should be equipped with an interchangeable pipe system that can switch between discharge to stormwater and the leachate transport system.

- (g) Installation of stormwater drains system throughout the entire site to divert stormwater away from roads, landfill cells, buildings, and facilities, and to avoid mixing with leachate. This will prevent contamination of stormwater with leachate.
- (h) Upgrading of the access road into at least a proper gravel road to reduce excessive dust and mud, minimize accidents, and reduce maintenance costs.
- (i) Upgrading of perimeter fences throughout the site to prevent stray animals from venturing into the landfill areas.

These design measures should be evaluated by the engineering team to determine if they are feasible.

### Mitigation Measures

**Pre-Construction Phase.** The PMU shall update this Preliminary ESIA with more details and focused assessment based on the final design specifications. The ESIA report shall be reviewed and approved by the MPWT, World Bank and finally by MONRE for issuance of an Environmental Compliance Certificate. The final ESIA shall also cover Km 16 and Naxaythong sites. The local communities and other stakeholders shall be informed and consulted regarding the findings of ESIA study.

**Construction Phase.** The contractor shall be required to prepare a Construction Environmental Management Plan (CEMP) based on the recommended measures in the final ESIA. The CEMP shall address environmental impacts of construction activities such as localized erosion and sedimentation, generation of noise and vibration, generation of dusts, generation of construction wastes, and domestic wastes at labor camps. The CEMP shall also include the contractor's plan for sourcing of construction material, and acquisition of sites and easements and the required government clearances (including UXO clearance) for its temporary facilities such as labor camp, borrow pits, and spoil disposal sites.

To address labor management-related risks, the PMU shall require the contractor a labor management plan (LMP) that addresses potential issues of employment discrimination, lack of access of grievance mechanism, sexual exploitation and abuse and sexual harassment (SEA/SH) in the workplace, child labor, and other requirements in compliance with the World Bank ESS 2 and fundamental ILO conventions. To ensure occupational health and safety, including prevention of spread of communicable diseases among workers, the contractor shall also be required to develop and adopt an Occupational Health and Safety Plan (OSHP).

To manage potential social impact of labor influx to local communities such as increase in substance abuse, increase incidence of sexual harassment, gender-based violence, and spread of diseases, the PMU should promote local recruitment of workforce and require the contractor to adopt a Workers' Code of Conduct. PMU shall also provide awareness training through third party





service providers, on SEA/SH, substance abuse, gender-based violence, and disease transmission prevention.

The PMU shall enforce speed limits on all project vehicles especially in populated sections of the construction routes. Throughout the construction period, the contractor shall be required to undertake regular repair and maintenance works on roads it frequently used.

To minimize the risk of damage to ecologically sensitive areas and damage to cultural properties and chance finds of artifacts at borrow pits and quarry sites, the contractor shall be required to apply the Negative List, undertake ES Screening on all prospective sites based on the ESMF and develop and monitor the implementation of borrow pits and quarry management plan as part of the CEMP. The contractor shall also adopt a chance find procedure for archaeological artifacts based on country regulations.

To mitigate possible disruption or restrictions of recycling activities of waste pickers due to relocation of wastes, the PMU will encourage contractors to hire the waste pickers as laborers in the construction.

**Operations Phase.** An Operations and Maintenance Manual shall be developed and approved by the PMU. The operations manual should at the minimum contain the following guidelines and procedures: (a) Procedures for compacting waste; (b) Controlling and minimizing windblown waste (c) procedures for handling of non-hazardous waste; (d) Procedures for controlling and recording waste disposed of at the landfill, including origin, quantity, type of waste, collector; (e) Operational procedures for leachate management (f) Procedures for handling of hazardous waste including determining if the waste is acceptable for temporary storage in the hazardous waste storage facility, transportation, labelling, temporary storage, separation according to their type and risks, and permanent disposal - in line with local and international regulations; (g) Pest management procedures (h) Occupational health and safety hazards and use of PPEs; (i) Community relations and health and safety plan; and (j) Emergency response plan.

The PMU and the landfill managing entity should conduct on-the-job training on this Operations and Maintenance Manual.

To mitigate any impacts of the operation of the new engineered landfill cells to the livelihood of waste by waste-pickers and seasonal recyclers whose access to the recyclable waste may be reduced, the project will: (a) provide opportunities to waste pickers to work at the new waste management facilities at km 32, and at km 16 and Naxaythong sites; (b) offer waste pickers skills and vocational training on literacy, numeracy, entrepreneurship among others to improve their livelihoods and prevent job loss; (c) improve their working conditions by upgrading of the existing recycling facility and the Waste Management Centre, providing training in waste handling, hazardous waste and providing PPE.

To address community health and safety, such as risk of accidents involving vendors and children close to the access roads, and community exposure to dusts, noise, smells, litters, water pollution



and road safety issues, the project will rehabilitate/pave the access road to the landfill. The road shall be provided road safety measures such as adequate sidewalks and road signs.

**Closure Phase.** VCOMS shall develop a Closure Plan six (6) months before expected closure of the first landfill cell for approval by the PMU. The preparation of the closure plan shall include consultations with landfill staff, waste pickers, local authorities and MONRE. The closure plan shall include, among others: (a) the detailed design of the final cap including the materials to be used and where these will be sourced (b) construction methods and the timeframe; (c) post-closure management and monitoring measures (aftercare) for leachate, stormwater, landfill gas, odour, dust, litter and final cap integrity; (d) identify feasible future use of the site; (e) record of consultations with neighbouring residents, businesses and local authorities and MONRE; (f) measures to ensure that waste is not received for disposal at the site/cell after landfill operations cease; (g) plan for inspection of the closed cell; (h) maintenance and aftercare of the landform, vegetation, drainage systems and gas ventilation system; (i) plan on supporting any staff that may become redundant as a result of the closure; and, (j) the overall timeframe for the entire closure phase.

The Project will implement comprehensive environmental quality and social monitoring programmes over the course of the project development and implementation phases from pre-construction, through construction, operation and closure of the landfill cells. The environmental quality monitoring at the site and its immediate surroundings aims at obtaining reliable data to determine and assess project related impacts and the need for any corrective actions. The environmental quality monitoring will include groundwater, surface water, effluents from leachate treatment facilities, odour, landfill gas and noise.

The social monitoring will focus on income, livelihoods and wellbeing of the project affected people to determine and assess the effectiveness of the social and livelihood improvement programmes to be carried out by the Project, and thereby help to ensure that their income and livelihoods are restored.



# ANNEX

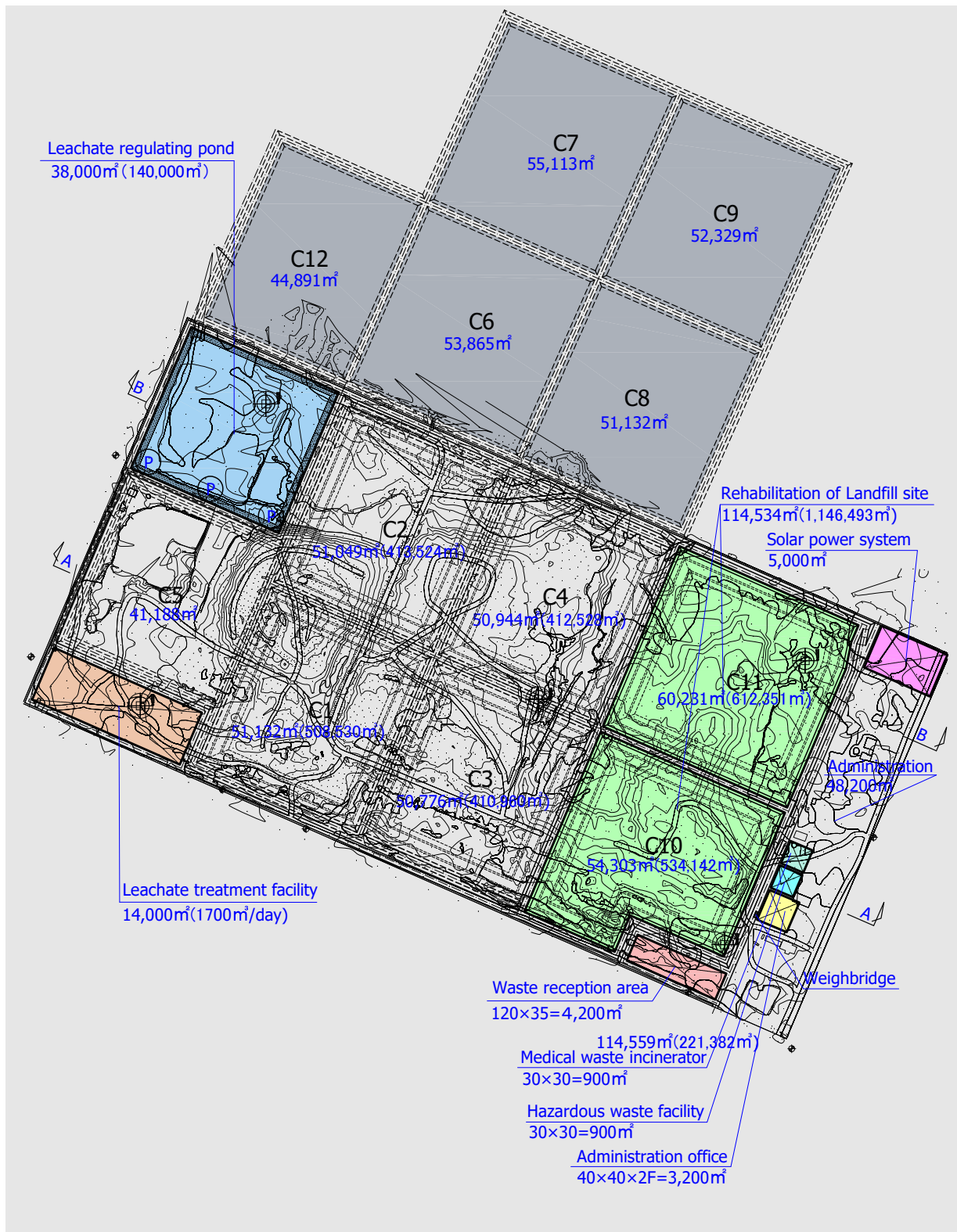
## Project Location and Conceptual Design

### Project Location



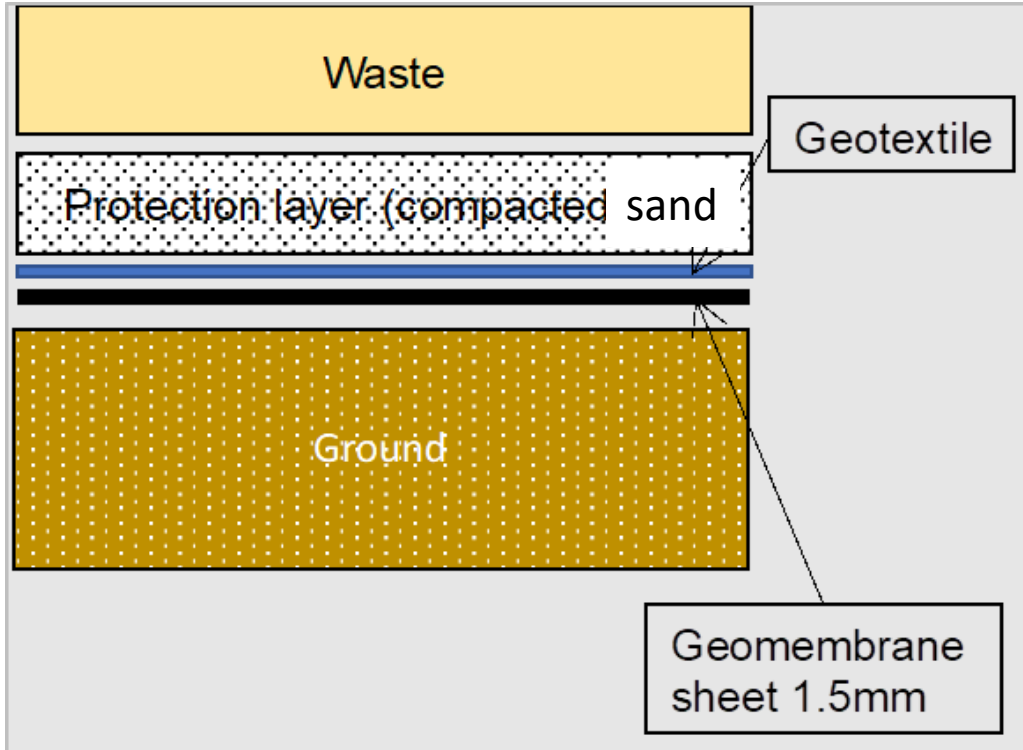


### CONCEPTUAL LAYOUT DESIGN OF THE KM 32 LANDFILL PROJECT

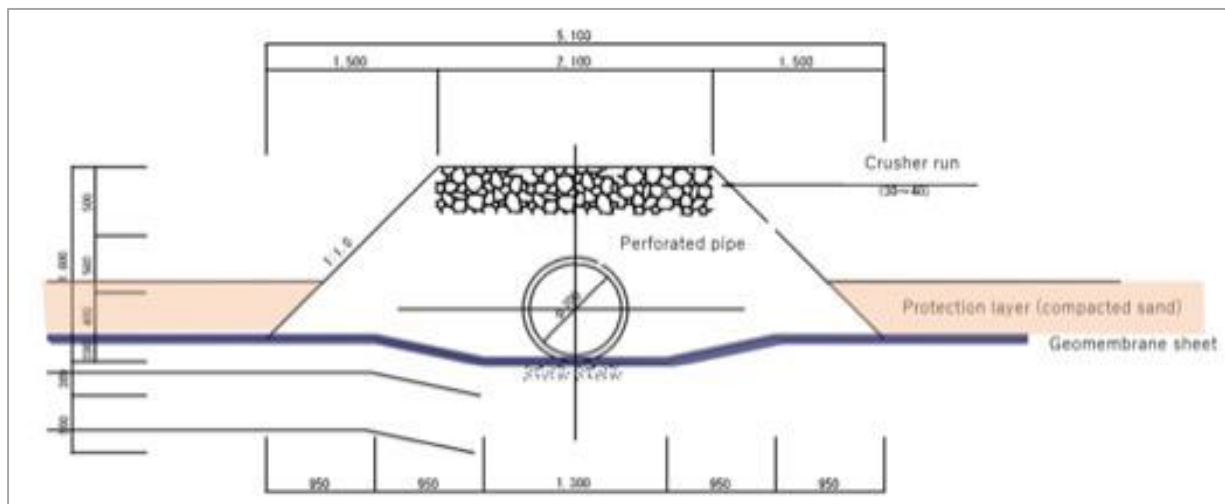




### CONCEPTUAL DESIGN OF THE LANDFILL LINER



### CONCEPTUAL DESIGN OF THE LEACHATE COLLECTION PIPES





## EXISTING CONDITIONS

### LOCAL HYDROLOGY



LEACHATE DRAINAGE FROM THE NORTHERN PART OF THE KM 32 LANDFILL



## Leachate and Surface Runoff



### LEACHATE DRAINAGE FROM THE KM 32 LANDFILL





**THE WASTE PICKERS' CAMP**







PONDS ON THE KM 32 LANDFILL, 06 SEPTEMBER 2022

