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柬埔寨機場投資有限公司
Cambodia Airport Investment Co., Ltd

Cambodia Airport Investment Co., Ltd.

ESIA Addendum

Physical Environmental Impact Assessment

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ESIA Addendum

Physical Environmental Impact Assessment

0730380

Kamonthip Ma-oon
Partner

ERM-Siam Co., Ltd.
179 Bangkok City Tower 24th Floor,
South Sathorn Road, Thungmahamek,
Sathorn, Bangkok 10120, Thailand

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ACRONYMS AND ABBREVIATIONS

Acronyms	Description
AEDT	The Aviation Environmental Design Tool
ALARP	As Low As Reasonably Practicable
APU	Aircraft auxiliary power units
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
DNL	Day-Night Noise Level
DO	Dissolved oxygen
EHS	Environmental, Health, and Safety
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
GHG	Greenhouse Gases
GIIP	Good International Industry Practice
HC	Hydrocarbon
IFC	The International Finance Corporation
KBA	Key Biodiversity Areas
MOE	Ministry of Environment
MSDS	Material Safety Data Sheets

Acronyms	Description
MW	Megawatt
NGO	Non-Governmental Organizations
NPPIA	New Phnom Penh International Airport
PM	Particulate Matter
SO	Sulfur Monoxide
TN	Total Nitrogen
TP	Total Phosphorus
TSP	Total Suspended Particulate
TSS	Total Suspended Solids

1. IMPACT ASSESSMENT METHODOLOGY

1.1 INTRODUCTION

This Chapter presents the methodology used to prepare the ESIA, which follows the approach illustrated in ***Figure 1.1***. This ESIA has been undertaken following a systematic process that: evaluates the potential impacts the Project could have on aspects of the physical, biological, social/socio-economic, and cultural environment; identifies preliminary measures that the Project will take to avoid, minimize/reduce, mitigate, offset, or compensate for potential adverse impacts; and identifies measures to enhance potential positive impacts where possible.

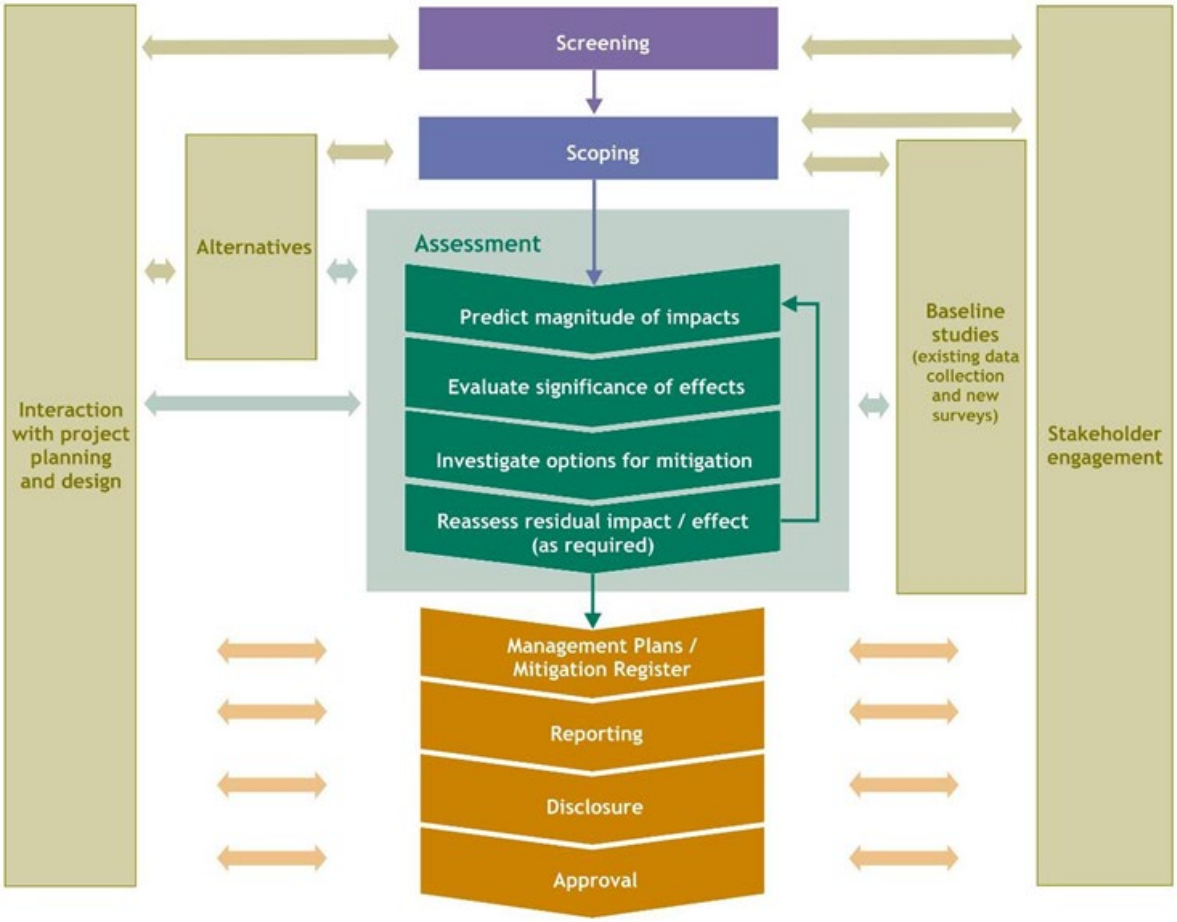

FIGURE 1.1 PROCESS OF PREPARING AN ESIA

This chapter also details the methodology used for the collection and analysis of primary and secondary data used in this report. Primary and secondary information from the Project Owner, government sources, non-governmental organizations (NGOs) and other Project-related stakeholders have been collected to support the preparation of this report.

1.2 SCOPING

At the initial stage of the ESIA, preliminary information was provided to aid in the determination of what legal and other requirements were applicable to the Project. This step was completed by utilizing a high-level description of the Project and its associated facilities.

Scoping has been undertaken to delineate the potential Area of Influence (AoI) for the Project (and thus the appropriate Project Study Area) and to identify potential interactions between the Project and resources/receptors in the Area of Influence. The scoping process is also necessary in order to develop and select alternatives to proposed actions and in the identification of the issues which are considered in this ESIA. A key element of the scoping phase is also ensuring the affected communities are informed about the Project and have an opportunity to provide input.

The content of this ESIA report has been prepared according to the output from the scoping process.

1.3 PROJECT DESCRIPTION

A Project description has been developed in order to set out the scope of this Project's features and activities, with a greater focus on the aspects which have the potential to impact the environment and social conditions. Details of the Project facilities' design characteristics are provided in EIA conducted by E&A (November 2020).

1.4 BASELINE CONDITIONS

To provide the context within which the potential environmental and social impacts of the Project can be assessed, a description of physical, biological, chemical, social, socio-economic, and cultural conditions that would be expected to prevail in the absence of the Project are presented in the EIA conducted by E&A (November 2020).

Additional information on the physical conditions is also provided in the Updated Environmental Baseline section of the ESIA Addendum. The baseline includes information on all resources/receptors that were identified during scoping as having the potential to be significantly affected by the Project.

1.5 STAKEHOLDER ENGAGEMENT

An effective ESIA process requires engagement with relevant stakeholders throughout the key stages. This process assists in our understanding of the stakeholders' views; on the Project and in identifying issues that should be accounted for in the prediction and evaluation of potential impacts. The aim of this stage is to be able to fill in any identified data gaps which will be necessary when conducting a robust impact assessment.

1.6 IMPACT ASSESSMENT

Impact identification and assessment starts with scoping and continues through the remainder of the ESIA Process covering all phases of the Project from Pre-construction to Post-closure. The principal ESIA steps are summarized in ***Figure 1.2*** and comprise:

- **Impact Prediction**: to determine what could potentially happen to resources/receptors as a consequence of the Project and its associated activities;

- **Impact Evaluation**: to evaluate the significance of the predicted impacts by considering their magnitude and likelihood of occurrence, and the sensitivity, value and/or importance of the affected resource/receptor;
- **Mitigation and Enhancement**: to identify appropriate and justified measures to mitigate potential negative impacts and enhance potential positive impacts; and
- **Residual Impact Evaluation**: to evaluate the significance of potential impacts assuming effective implementation of mitigation and enhancement measures.

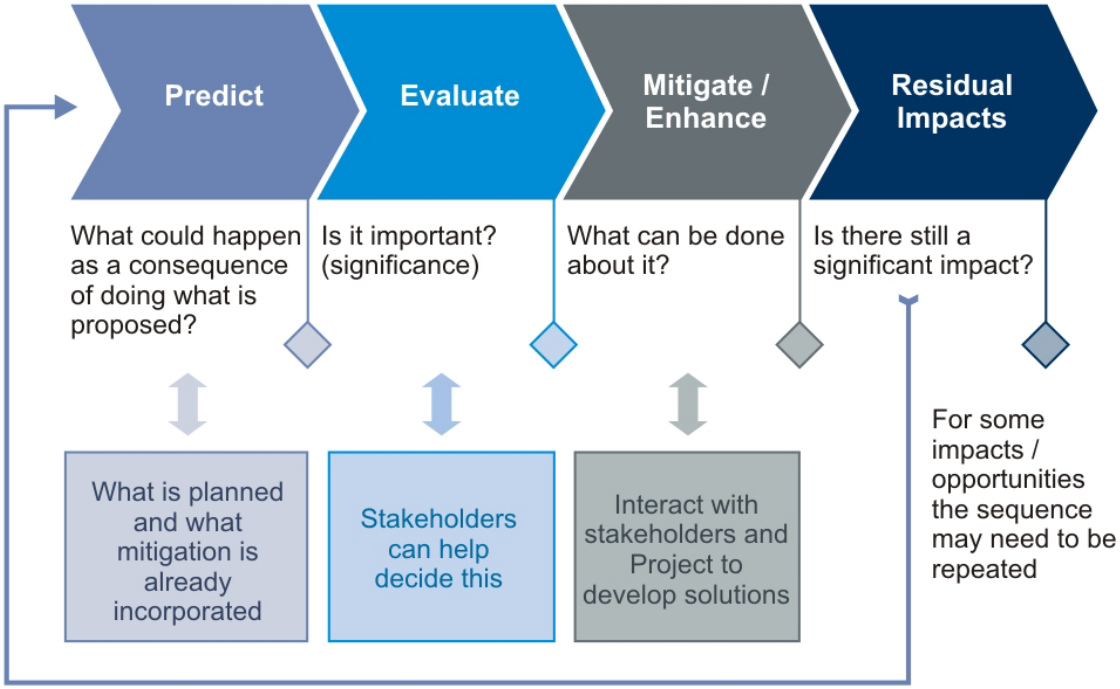

FIGURE 1.2 IMPACT ASSESSMENT PROCESS

1.6.1 PREDICTION OF IMPACTS

Prediction of impacts is essentially an objective exercise to determine what is likely to happen to the environment as a consequence of the Project and its associated activities. From the potentially significant interactions identified in Scoping, the impacts to the various resources/receptors are elaborated and evaluated. The diverse range of potential impacts considered in the ESIA process typically results in a wide range of prediction methods being used, including quantitative, semi-quantitative and qualitative techniques.

1.6.2 EVALUATION OF IMPACTS

Once the prediction of potential impacts is complete, each potential impact is described in terms of its various relevant characteristics (e.g., type, scale, duration, frequency, extent). The terminology and designations used to describe impact characteristics are shown in ***Table 1.1***.

TABLE 1.1 IMPACT CHARACTERISTICS TERMINOLOGY

Characteristic	Definition	Designations
Type	A descriptor indicating the relationship of the potential impact to the Project (in terms of cause and effect).	▪ Direct ▪ Indirect ▪ Induced
Extent	The "reach" of the potential impact (e.g., confined to a small area around the Project Footprint, projected for several kilometers, etc.).	▪ Local ▪ Regional ▪ International
Duration	The time period over which a resource / receptor is potentially affected.	▪ Temporary ▪ Short term ▪ Long term
Scale	The size of the potential impact (e.g., the size of the area with the potential to be damaged or impacted, the fraction of a resource that could potentially be lost or affected, etc.).	[no fixed designations; intended to be a numerical value or a qualitative description of "intensity"]
Frequency	A measure of the constancy or periodicity of the potential impact.	[no fixed designations; intended to be a numerical value or a qualitative description]

The definitions for the *type* designations are shown in ***Table 1.2***. Definitions for the other designations are resource/receptor-specific and are discussed in the resource/receptor-specific impact assessment chapters presented later in this report.

TABLE 1.2 IMPACT TYPE DEFINITIONS

Type	Definition
Direct	Potential impacts that result from a direct interaction between the Project and a resource/receptor (e.g., between occupation of a plot of land and the habitats which are affected).
Indirect	Potential impacts that follow on from the direct interactions between the Project and its environment as a result of subsequent interactions within the environment (e.g., viability of a species population resulting from loss of part of a habitat as a result of the Project occupying a plot of land).
Induced	Potential impacts that result from other activities (which are not part of the Project) that happen as a consequence of the Project (e.g., influx of workers resulting from the importation of a large Project workforce).

Once impact characteristics are defined, the next step in the impact assessment phase is to assign each potential impact a 'magnitude'. Magnitude is typically a function of some combination (depending on the resource/receptor in question) of the following impact characteristics:

- Extent;

- Duration;
- Scale; and
- Frequency.

Magnitude essentially describes the intensity of the change that is predicted to occur in the resource/receptor as a result of the potential impact. The magnitude designations themselves are universally consistent, but the definitions for these designations vary depending on the resource/receptor. The universal magnitude designations are:

- Positive;
- Negligible;
- Small;
- Medium; and
- Large.

In the case of a potential positive impact, no magnitude designation (aside from 'positive') is assigned. It is considered sufficient for the purpose of the ESIA to indicate that the Project is expected to result in a potential positive impact, without characterizing the exact degree of positive change likely to occur.

In addition to characterizing the magnitude of impact, the other principal impact evaluation step is definition of the sensitivity/vulnerability/importance of the impacted resource/receptor. There are a range of factors to be taken into account when defining the sensitivity/vulnerability/importance of the resource/receptor, which may be physical, biological, cultural or human. Other factors may also be considered, such as legal protection, government policy, stakeholder views and economic value. As in the case of magnitude, the sensitivity/vulnerability/importance designations themselves are universally consistent, but the definitions for these designations vary on a resource/receptor basis. The sensitivity/vulnerability/importance designations used herein for all resources/receptors are:

- Low;
- Medium; and
- High.

Once the magnitude of impact and sensitivity/vulnerability/importance of the resource/receptor have been characterized, the significance can be assigned to each impact. Impact significance is designated using the matrix shown in ***Table 1.3***.

TABLE 1.3 IMPACT SIGNIFICANCE

		Sensitivity/Vulnerability/Importance of Resource/Receptor		
		Low	**Medium**	**High**
Magnitude of Impact	**Negligible**	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major

The matrix applies universally to all resources/receptors, and all impacts to these resources/receptors, as the resource/receptor-specific considerations are factored into the assignment of magnitude and sensitivity/vulnerability/importance designations that enter into the matrix. The context for what the various impact significance ratings signify is presented in ***Table 1.4*** below.

It is important to note that impact prediction and evaluation take into account any embedded controls (i.e., physical or procedural controls that are already planned as part of the Project design, regardless of the results of the ESIA process). This helps avoid a situation where an impact is assigned a magnitude based on a hypothetical version of the Project that considers none of the embedded controls.

TABLE 1.4 CONTEXT OF SIGNIFICANCE DEGREES

Degree of Significance	Description
Negligible	An impact of negligible significance is one where a resource/receptor (including people) is essentially not affected in any way by a particular activity or the predicted effect is deemed "imperceptible" or is indistinguishable from natural background variations.
Minor	An impact of minor significance is one where a resource/receptor is to experience a noticeable effect, but the impact magnitude is sufficiently small and/or the resource/receptor is of low sensitivity/vulnerability/importance; and In either case, the magnitude should be well within applicable standards.

Degree of Significance	Description
Moderate	An impact of moderate significance has an impact magnitude that is within applicable standards, but falls somewhere in the range from a threshold below which the impact is minor, up to a level that might be just short of breaching a legal limit; Clearly, to design an activity so that the effects only just avoid breaking a law and/or cause an impact is not the best practice. The emphasis for moderate impacts is therefore on demonstrating that the impact has been reduced to a level that is As Low As Reasonably Practicable (ALARP); and This does not necessarily mean that impacts of moderate significance have to be reduced to minor, but that moderate impacts are being managed effectively and efficiently.
Major	An impact of major significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to majorly valued/sensitive resource/receptors; and An aim of ESIA is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long-term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e., ALARP).

1.6.3 IDENTIFICATION OF MITIGATION AND ENHANCEMENT MEASURES

One of the key objectives of an ESIA is to identify and define environmentally and socially acceptable, technically feasible and cost-effective mitigation measures. Once the significance of a given impact had been characterized using the above matrix (***Table 1.4***), the next step is to determine whether mitigation measures are necessary, and if so, what they should involve.

Mitigation measures are developed to reduce the significant negative impacts identified during the ESIA process to a point where they have no adverse effects, and to create or enhance positive impacts such as environmental and social benefits. In this context, the term "mitigation measures" includes operational controls as well as management actions. Where a significant impact is identified, a hierarchy of options for mitigation is explored, as summarized in ***Table 1.5***. It is important to note that avoiding at source through design or selection of appropriate equipment or work method should be the first consideration in the process of reducing impact significance.

The priority in mitigation is to first apply mitigation measures to the source of the potential impact (i.e., to avoid or reduce the magnitude of the potential impact from the associated Project activity). This is then followed by addressing the resultant effect to the resource/receptor via abatement or compensatory measures or offsets (i.e., to reduce the significance of the effect once all reasonably practicable mitigations are applied to reduce the impact magnitude).

TABLE 1.5 HIERARCHY OF OPTIONS FOR MITIGATION AND MANAGEMENT

Hierarchy	Description
Avoid at source; Reduce at source	Avoiding or reducing at source through the design of the Project e.g., avoiding by siting activity away from sensitive areas or reducing by restricting the working or changing the time of the activity.

Hierarchy	Description
Abate on Project Site	Add something to the design to abate the impact e.g., pollution control, equipment, traffic controls, perimeter screening and landscaping.
Abate at receptor	If an impact cannot be abated on-site, then controls measures can be implemented off-site e.g., noise barriers to reduce noise impact at a nearby residence or fencing to prevent animals straying onto the Project site.
Repair or remedy	Some impacts involve unavoidable damage to a resource e.g., agricultural land and forestry due to creating access, work camps or materials storage areas; and these impacts can be addressed through repair, restoration, or reinstatement measures.
Compensate in kind; Compensate through other means	Where other mitigation approaches are not possible or fully effective, then compensation for loss, damage and disturbance might be appropriate e.g., planting to replace damaged vegetation, financial compensation for damaged crops or providing community facilities for loss of fisheries access, recreation, and amenity space.
Offset	Offsetting refers to the consideration of measures over and above rehabilitation to compensate for the residual negative effects on biodiversity, after every effort has been made to minimise and then rehabilitate impacts.

Additional mitigation measures should not be declared for impacts rated as not significant unless the associated activity is related to conformance with an 'end of pipe' applicable requirements. Furthermore, it is important to note that it is not an absolute necessity that all impacts be mitigated to a not significant level; rather the objective is to mitigate impacts to an As Low as Reasonably Practicable (ALARP) levels.

1.6.4 RESIDUAL IMPACT EVALUATION

Once mitigation and enhancement measures are declared, the next step in the ESIA process is to assign residual impact significance. This is essentially a repeat of the impact assessment steps discussed above, considering the implementation of the proposed mitigation and enhancement measures. In the context of the ESIA, residual impacts are those remaining after the effects of all reasonable mitigation measures have been taken into account. Where possible impacts are reduced to a level that residual impacts are considered 'not significant'; the objective of an ESIA is to identify means of reducing them to ALARP levels for the circumstances of the activity under consideration.

Reporting the significance of a residual impact in this report is based on the predicted magnitude of an impact, taking into consideration all the mitigation measures and the quality/importance/sensitivity of the receptor. Constraints arising from applicable regulations and standards are also taken into account in the evaluation of residual impacts and their acceptability.

1.6.5 MANAGEMENT, MONITORING, AND AUDIT

The final stage of the ESIA process is defining the basic management and monitoring measures that are needed to identify whether: a) impacts or their associated Project components remain in conformance with applicable standards; and b) mitigation measures are effectively addressing impacts and compensatory measures and offsets are reducing effects to the extent predicted.

A Register of Commitments, which is a summary of all actions the Project Proponent has committed to executing, with respect to environmental/social/health and safety performance for the Project, is also included as part of this report. The Register of Commitments includes mitigation measures, compensatory measures and offsets, and management and monitoring activities.

2. PHYSICAL ENVIRONMENTAL IMPACT ASSESSMENT

This section aims to update the physical environmental impact assessment in the airport boundary to align with good international industry practice (GIIP) by using the secondary data obtained from the EIA conducted by E&A (November 2020). No additional environmental baseline surveys were conducted.

The section provides the impact assessment for the construction and operation phases of the Project based on impacts scoped into the assessment.

2.1 IMPACTS ON AIR QUALITY

2.1.1 CONSTRUCTION PHASE

Source of Impact

Based on the progress Project status report of NPPIA (March 2024), the Project is 68.6% completed. Therefore, the air quality impact assessment during construction is based on the EIA conducted by E&A (November 2020).

The following activities cause dust particles (PM2.5 and PM10) and emit various pollutants (nitrogen oxides, sulfur oxide, carbon monoxide) due to site preparation, vehicle movement and operating of construction equipment to air quality during the construction phase of the Project:

- Machinery mobilization;
- Site preparation activities;
- Transportation of workers and staff;
- Transportation of earth materials, backfilling, and compacting soil;
- Construction activities for airport runway, passenger terminals, and other supporting infrastructures.

Significance of Impacts

According to EIA conducted by E&A (November 2020), dust dispersion was generated from transportation, the airport boundary, and concrete mixing plant.

The potential negative impact of air quality was rated as 'Moderate' due to the predicted values showed that the highest total suspended particulate (TSP) level during construction phase was 0.095 mg/m^3, which is lower than the maximum level allowed (0.33 mg/m^3), as prescribed in the Sub-Decree on Air Quality and Noise Disturbance Control.

The air quality baseline was conducted by Ministry of Environment's Laboratory; 1 location in the airport boundary and 3 locations in the villages. The air quality result showed that most parameters were in low concentrations. Except O_3 in the airport boundary exceeded national standard (200 µg/m^3) and PM2.5 and PM10 in the Potsor village and Peam Sala village levels were exceeded both national (PM10: 50 µg/m^3 and PM2.5: 25 µg/m^3) and international standards (PM10: 45 µg/m^3 and PM2.5: 15 µg/m^3).

There were demining activities (clearing vegetation by explosive disposal experts) occurring during the air quality monitoring period. As a result, these activities elevated levels of some air pollutants.

The receptor sensitivity is considered as **Medium** given that some parameters (PM2.5 and PM10) monitored in the nearest villages exceeds the national and international standard. In addition, construction activities can also generate emissions from mobile sources such as vehicle and construction equipment.

The air quality during construction will be considered as **Medium** magnitude given there are villages close the airport (south-west. Therefore, the impact significance has been assessed as **Moderate.**

Additional Mitigation, Management, and Monitoring Procedures

The following mitigation and management measures included in the EIA conducted by E&A (November 2020) will be implemented to manage the potential impacts identified:

- Cover soil or sand during transport to prevent dispersion;
- Spray water and regularly monitor where dust is observed, such as watering the runway, terminal area, and other access road to minimize any dust;
- Dampen the pile of soil or sand reserved for backfilling and concrete mixing, particularly during the period of strong wind blow;
- Maintain vehicle and equipment according to manufacturers' specifications. In particular, maintenance of vehicles and other machinery, such as oil changes or repairs, will be made according to the schedule of manufacturers' specifications;
- Ensure engines or machinery are not run unnecessarily;
- Whilst infill material is being transported the Project team will not allow higher loads than the height of the cage or the connecting cage of the vehicle, with regular checks to prevent dust on the local population near the Project site; and

- Prepare and implement regular maintenance for all vehicles and machinery to ensure fuel efficiency.

2.1.2 OPERATION PHASE

Source of Impact

Based on the EIA conducted by E&A (November 2020), the significant sources of air emission during the operation were aircraft take-off and landing and passenger commuting via taxis, buses, or private cars.

Significance of Impacts

Criteria for Assessing Impact Significance

The impact magnitude and receptor sensitivity criteria for ambient air quality has been provided in ***Table* 2.1** and ***Table 2.2***, respectively.

TABLE 2.1 IMPACT MAGNITUDE CRITERIA FOR ASSESSMENT OF IMPACT TO AIR QUALITY

Magnitude	Criteria
Negligible	▪ Low levels of emissions/ dust generation due to Project activity ▪ Impact extent is local ▪ Temporary dust generation and emission from Projects
Small	▪ Soil type with large grain size (e.g. sand) ▪ Impact extent is local ▪ Dust generation and emissions from Projects for short duration
Medium	▪ Moderately dusty soil type (e.g. silt) ▪ Impact extent is local to regional ▪ Dust generation and emission from Projects for long duration
Large	▪ Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) ▪ Impact extent is local to international ▪ Significant process emissions from Project for the entire Project cycle

TABLE 2.2 SENSITIVITY ASSESSMENT CRITERIA FOR AIR QUALITY

Sensitivity Criteria	Contributing Criteria	
	Human Receptors	Ecological Receptors
Low	Locations where human exposure is transient.	Locally designated sites; and / or areas of specific ecological interest, not subject to statutory protection (for example, as defined by the Project ecology team).
Medium	Few Receptors (settlements) within 1 km of Project activity area	Nationally designated sites.

Sensitivity Criteria	Contributing Criteria	
	Human Receptors	**Ecological Receptors**
High	Densely populated receptors (settlements) within 1 km of Project activity area	Internationally designated sites

Receptor Sensitivity and Impact Magnitude

The annual GHG Emission for all aircraft operations would be 3,385.67 kt CO_2eq and 8,148.62 kt CO_2eq in 2030 and 2050, respectively. Long-distance flights (3,500 km) account for the largest share of GHG emissions at 67%, followed by domestic, long-distance flights (>1,500 km) at 25%, and domestic, short-distance flights (<350 km) at 8%.

There are no national protected areas and Key Biodiversity Areas (KBAs) within 1 km of the Project. The nearest national protected areas (Toul Pon Taley Boeung Sna) and Key Biodiversity Areas (Bassac Marsh) are 46 and 7.5 km away from the Project, respectively. However, the receptor sensitivity is considered as **Medium**. Given that there are a many residential areas within 1 km of the Project.

Air emission and dust will be generated from operation of airport in a long term such as aircraft maintenance and repair and the movement of vehicles on the airport grounds, such as taxis, buses, service vehicles. Aircraft emissions can contribute to regional air quality issues and can contribute greenhouse gas and global warming. In addition, according to EIA conducted by E&A (November 2020), the operation of airport will result in an increase in vehicular traffic on National Road No. 2 and Samdech Hun Sen Boulevard. However, the increase in vehicular traffic from the Project will remain relatively small compared to the total traffic volume in the Phnom Penh metropolitan area. As a result, impact magnitude will be considered as **Medium**.

Impact Significance

The impact significance for air quality has been assessed as **Moderate**.

Additional Mitigation, Management, and Monitoring Procedures

The following mitigation and management measures included in the EIA conducted by E&A (November 2020) will be implemented to manage the potential impacts identified:

- The Project has a plan to utilize solar power as a supplementary power source (75 MW);
- Switch off unnecessary machinery;
- Aircraft emissions from combustion are unavoidable, but the Project will ensure that fuel suppliers provide the best quality fuel possible;
  Airport access road will be built in accordance with international standards to reduce potential traffic congestion;

<u>Airport Operations</u>

- In fire-fighting drills, selecting cleaner fuels such as liquefied petroleum gas, avoiding the use of waste oil or jet fuel (jet kerosene) where possible, and selecting firefighting drill locations

and atmospheric conditions that best avoid short-term impacts to the air quality of nearby populated areas;
- Optimizing ground service infrastructure to reduce aircraft and ground vehicle movements on taxiways and idling at the gate;
- Operating on-site small combustion plants within the applicable performance levels described in the General EHS Guidelines;
- In airports operating in degraded airsheds, supplying electrical power and preconditioned air through ground-based equipment to minimize the use of aircraft APUs;
- Minimizing fugitive air emissions from jet kerosene and other fuel storage and handling activities, as presented in the General EHS Guidelines;
- Improving ground service vehicle fleets as described in the General EHS Guidelines;

Flight Operations

- Fuel consumption should be optimized through careful planning of the flight route (including selection of flight altitude and speed), expected demand from passenger and cargo services (maximizing occupancy and load), and type of flight equipment available. Wherever possible, operators should select the combination that results in the lowest specific fuel consumption;
- During individual pre-flight planning, loads should be distributed to reduce aerodynamic drag, loading the appropriate amount of fuel to reduce unnecessary weight;
- During idling and taxing activities, operators should consider opportunities for reduced engine operation (e.g. towing of aircrafts to runways, last minute start-up, taxing and idling with the minimum number of engines, minimizing or avoiding the use of APUs during engine startup and pushback, and minimizing holding times). Use of GPUs should be considered where they are provided by airports;
- Airframe and engines should be kept clean and aerodynamically efficient. Examples of maintenance opportunities include the correction of surface mismatches along doors and windows, correcting misrigging of flight control surfaces, identifying and removing dents, blisters or other sources of increased roughness of the airframe surface, in addition to following the aircraft manufacturer's maintenance recommendations applicable to fuel conservation;
- Aircraft modifications to improve aerodynamic and fuel efficiency should be considered, including the installation of winglets, engine retrofits or upgrades, and polishing rather than painting exterior surfaces;
- Operators should consider fleet upgrades in favor of newer, more fuel efficient aircraft which comply with applicable international certification requirements for their year of manufacture;
- Intentional release of non-combusted fuel should be avoided, and this practice limited to emergency situations;
- Use of non-essential or non-revenue generating flights should be limited (e.g. by using flight simulators instead of aircraft for flight crew training activities);

Airplane Maintenance

- Collection of dust emissions from blasting, grinding, and peening operations though extraction and ventilation systems, removing dust with bag filters or other dust control techniques. Recovered cadmium-containing dust should be managed as a hazardous or non-hazardous waste, depending on its characteristics, as described in the General EHS Guidelines;
- Prevention or minimizing the generation of acid emissions, particularly acid-containing aerosols, and aerosols with entrained heavy metals such as chromium. These types of emissions, which can be generated from pickling and some electrolytic plating processes, should be prevented or minimized through the use of surfactants and, if required, wet scrubbers. Removed chromic acid from the exhaust gas should be returned to the plating baths or else managed as required by local regulations;
- Emission of VOCs should be minimized in cleaning and painting processes. Cleaning agents containing VOCs should be replaced with water-based, alkaline, cleansing agents. Use of VOC containing paints, solvents, and pigments should be avoided in airplane painting operations or operators should select airplane exterior designs that favor polishing, rather than painting, to minimize the amount of paints used. Use of water-based paints should be encouraged, whenever possible, avoiding the use of paint strippers based on methylene chloride or the use of chromate primers; and
- Potential impacts of exhaust gases from engine test runs should be minimized by locating the testing area away from urban areas, limiting testing times depending on seasonal ambient air quality, or other management actions necessary to address potential impact to ambient air quality. Additional guidance on ambient air quality considerations is presented in the General EHS Guidelines.

Residual Impacts

Based on the above additional measures, the residual impact significance is expected to remain at **Moderate** for operation (***Table 2.3***)

Impacts Overview

The below table presents an overview of the impacts as described in this section:

TABLE 2.3 IMPACT ASSESSMENT FOR AIR QUALITY: OPERATION PHASE

Impact Significance				
Impact Nature	**Negative**	Positive	Neutral	
	Elevated non-GHG emissions (CO, HC, NO_x, SO_x) and GHG emissions from take-off and landing, operation of aircraft engine, and ground support equipment.			
Impact Type	**Direct**	Indirect	Induced	
Impact Duration	Temporary	Short-term	**Long-term**	Permanent

Impact Significance					
Impact Extent	Local	**Regional**	International		
Impact Scale	The scale of the impact is likely to be up to 500 m from the operation site boundary.				
Frequency	Impacts will arise continuously from operation related activities.				
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
Resource Sensitivity	Low	**Medium**	High		
Impact Significance	Negligible	Minor	**Moderate**	Major	
Residual Magnitude	Negligible	Small	**Medium**	Large	
Residual Impact significance	Negligible	Minor	**Moderate**	Major	

2.2 IMPACTS ON NOISE

2.2.1 CONSTRUCTION PHASE

Source of Impact

Based on the progress Project status report of NPPIA (March 2024), the Project is 68.6% completed. Therefore, the noise impact assessment during construction is based on the EIA conducted by E&A (November 2020).

The following activities generate noise impact during the construction phase due to movement of heavy trucks and the equipment and machinery used during construction:

- Site preparation activities;
- Infrastructure construction activities;
- Project's transportation activities; and
- Construction activities of passenger terminal and runway.

Significance of Impacts

Based on the survey (the EIA conducted by E&A (November 2020)), there are receptors within 3 km radius from the airport boundary in the following.

- Among the seven schools, the nearest one to the Project border is Sok An Chambok Bet Meas Secondary School, located 1 km to the south-west.
- Among the 13 cultural heritage sites, the nearest one to the Project border is Botum Sorya Pagoda, located 0.3 km to the south.
- Among the 32 villages, the nearest villages are Kroch, Potsor, Khla Kon, Tropeang Trav , located to the south-west.

The receptor sensitivity is considered as **Medium** given that the noise baseline result monitored in the nearest villages exceeds the national standard especially at nighttime.

The noise during construction will be considered as **Small** magnitude given there is some villages close the airport (south-west) although the impact of noise during construction will occur in short-term. Therefore, the impact significance has been assessed as **Minor.**

In addition, the Project has implemented the mitigation measures in the EIA conducted by E&A (November 2020) and shall be implemented continuously during the construction in as follows:

- Change engine oil in accordance with manufacturer's specifications;
- Equipment to be operated will be maintained in accordance with manufacturer specifications;
- Equipment used shall be in good condition and use mufflers. Generators shall sit inside a sound-proof room;
- Use quiet/silenced equipment; and
- The construction activities that produce high noise and vibration emission level shall be conducted during daytime (from 7 am-6 pm) only. In case of nighttime work, Project will inform the local authority and local people before commencing work.

2.2.2 OPERATION PHASE

According to the IFC Environmental, Health, and Safety Guidelines for Airports (2007), the most significant source of noise during operation is the take-off and landing noise. Other sources of noise are listed as in the following.

- A variety of ground operations equipment including aircraft taxiing;
- Operation of ground support vehicles (e.g. passenger buses, mobile lounges, fuel trucks, aircraft tugs, aircraft and baggage tractors, and dolly carts);
- Aircraft auxiliary power units (APUs);
- Aircraft engine testing activities in airports with aircraft maintenance activities; and
- Other indirect sources of noise include ground vehicle traffic from access roads leading to the airport.

The Aviation Environmental Design Tool (AEDT 2d, Sept 2017) was used for modelling of aircraft take-off and landing. Records for a seven-day period in 17-23 August 2019 of the existing Phnom Penh International Airport were used to estimate the annual flight operation and predict the fleet mix for the future year (2030) as details below.

- The average flights were about 140.86 flights per day. This number was used to estimate the annual flight operations of year 2019; therefore, the total flight movements should be about 140.86 * 365 = 51,414 flights.
- The operation time of aircraft can be separated into Day: 07.00-22.00 and Night 22.00-07.00.
- The top three aircraft type for landing and take-off flights (Avg. Annual Day) were A320-211 (83.6 flights), 737800 (19.3 flights) and DO328(11.1flights) respectively.
- There were two type of aircraft category (92.1 % C and 7.9 % E)

Input data for AEDT Model for Phase 1 (2030) as details in ***Table 2.4***. However, no clear justification and explanation on the assumption for the annual forecasted flight, flight path, aircraft fleet mix.

TABLE 2.4 INPUT DATA FOR AEDT MODEL FOR PHASE 1 (2030)

Input for AEDT	Detail
Airport location	Table 103: Runway and Elevation Runway / Location / Elevation (m AMSL) 23R / 11.372243423843875N, 104.93475359109877E / +/-5m 05L / 11.347762555506119N, 104.90776305032787E / +/-5m 23L / 11.358866085601612N, 104.94721340919574E / +/-5m 05R / 11.334386328360878N, 104.92022305644859E / +/-5m Airport elevation datum (ARP) / To be defined by relevant authorities Source: CAIC (2019)
Forecast Annual Flight	• The forecast Annual flight operations of Phase 1 (2030) was 80,087 flights • The average annual day was 80,087/365 = 219.4 flights per day.
Future Aircraft Category	There were three type of aircraft category: • C for 71.1% • E for 26.3% • F for 2.6% Aircraft code F was added to the future flight records. A380-861 was the aircraft type to add in the record for running the noise contour in AEDT for Phase1 (2030)
Future Aircraft Fleet Mix	The fleet mix data in the flight records during August 17-23, 2019, were used to forecast the future aircraft fleet mix in 2030.
Flight tracks	The default tracks were used for landing and departure
Preferential Runway Use	In this case, there are two scenarios of runway use. Scenario 1: South western wind • landing: runway 23L and 23R • Departure: runway 23L and 23R Scenario 2: North eastern wind • landing: runway 05L and 05R • Departure: runway 05L and 05R For the percentage of runway use between Left and right. 50% was assigned for this operation.

Source: the EIA conducted by E&A (November 2020).

Based on the result of the AEDT model, Noise contour for Average Day-Night Noise Level (DNL) of two scenarios were plotted.

Based on the maps of the noise disturbance, the area disturbed by noise is in the following.

- The noise contour (70-75) potentially affects only area inside the airport boundary for both scenarios.
- The noise contour (65-70 dB) potentially affects an area of both inside and outside the airport boundary for both scenarios. For Scenario 1 (***Table 2.4***), the potentially affected area outside the airport boundary covers some parts of are that is floodplain and no household in this area. For Scenario 2 (***Table 2.4***), the potentially affected area outside the airport boundary covers some parts of Pot Sor commune's Tropeang Trav and Potsor which are residential area.
- The noise contour (<65 dB) potentially affects an area outside the airport boundary. The potentially affected area outside the airport boundary covers residential area to south-west of the airport.

Source of Impact

Based on the EIA conducted by E&A (November 2020)), the significant sources of noise during the operation are aircraft during the landing and takeoff. However, other sources of noise such as road traffic and ground operation equipment have not included in the noise impact assessment in the EIA conducted by E&A (November 2020).

In addition, the Environmental, Health, and Safety Guidelines for Airlines (2007) also note the importance of noise from engine testing as the main source of noise during maintenance. The potential need for mitigation is also highlighted for example engine test runs should be conducted in designed areas preferably located away from urban areas or in locations equipped with noise suppression or deflection equipment.

However, the Project shall be implemented continuously on the mitigation measures in the EIA conducted by E&A.

Significance of Impacts

Criteria for Assessing Impact Significance

The impact magnitude and receptor sensitivity for noise quality has been provided in ***Table 2.5*** and ***Table 2.6***.

TABLE 2.5 CRITERIA FOR IMPACT MAGNITUDE OF NOISE

Magnitude	Criteria
Negligible	▪ Predicted noise levels are at or less than 3 dB (A) above the relevant limits / thresholds ▪ Human exposure is transient within 500 m of Project site ▪ Impact extent is local ▪ Temporary exposure

Magnitude	Criteria
Small	▪ Predicted noise levels are 3 to less than 5 dB (A) above the relevant limits / thresholds ▪ Human exposure is transient within 500 m of Project site ▪ Impact extent is local ▪ Short-term exposure
Medium	▪ Predicted noise levels are between 5 and 10 dB (A) above the relevant limits / thresholds ▪ Impact extent is local to regional ▪ Long-term exposure
Large	▪ Predicted noise levels are at or more than 10 dB (A) above the relevant limits / thresholds ▪ Impact extent is local to international ▪ Permanent exposure

TABLE 2.6 SENSITIVITY ASSESSMENT CRITERIA FOR NOISE

Category	Designation / Importance / Vulnerability
Low	▪ Existing noise quality condition is good and the ecological resources that it supports are not sensitive to a change in noise quality. ▪ Receptors include industrial, retail, or transient receptors within 500 m of Project site ▪ Locally designated sites and/or areas of specific ecological interest, not subject to statutory protection (for example, as defined by the Project ecology team) within 500 m of Project site.
Medium	▪ Existing noise quality conditions already shows some signs of stress and/ or supports ecological resources that could be sensitive to change in noise quality (protected species, migratory birds, protected areas). ▪ Receptors include residential and recreational space within 500 m of Project site ▪ Nationally designated sites and/or areas of specific ecological interest within 500 m of Project site
High	▪ Existing ambient noise is already under stress and/ or public health is very sensitive to change (children, schools). ▪ Receptors include educational/ religious/ medical facilities within 500 m of Project site ▪ Internationally designated sites and/or areas of specific ecological interest within 500 m of Project site

Receptor Sensitivity and Impact Magnitude

The receptor sensitivity is considered as **Medium** given that the presence of nearby residential area, the nearest village located to south-west of the airport. The noise during operation will be considered as **Medium** magnitude given the impact of noise during operation will occur in long-term. In addition, there is the nearest households located to south-west of the airport that located within noise contour of 65 dB.

Impact Significance

The impact significance has been assessed as **Moderate**.

Additional Mitigation, Management, and Monitoring Procedures

The noise contour of DNL were plotted but the result has not compared with the the national standard (for residential area, institutional, educational: 60 dB for daytime, 50 dB for evening, and 45 dB for nighttime, for commercial area, service, and mixed area: 70 dB for daytime, 65 dB for evening, and 50 dB for nighttime) and international standard (Commercial area, service, and mixed area 55 dB for daytime, and 45 dB for nighttime and for industrial and commercial: 70 dB for daytime and nighttime).

Based on the result of noise modelling, additional mitigation measures should be adopted in the following.

- Households or sensitive receptors located within noise contour of 65 dB (scenario 2 North eastern wind) should be monitored for noise level. Given this is expected to be impacted by noise from the airport. If the noise level is higher than the national and international standard, the Project should provide specific mitigation measures for the households/sensitive receptors affected by noise (e.g., provide noise barriers/insulation to reduce noise, support conversion of the land to non-residential uses, acquire the land).
- Preah Ream Potsa Pagoda is also located within the noise contour of 65 dB (scenario 2 North eastern wind) and should be monitored for noise level. If it is determined that the noise is significantly adversely affecting the purpose and function of the pagoda, then CAIC should either agree to conduct a feasibility study to evaluate whether noise mitigation could be applied (e.g., provide noise barriers/insulation to reduce noise) or work with the local village to relocate it.
- Provide and display the Grievance Redress Mechanism to ensure that the community grievances are received and addressed appropriately.
- Limit the schedule of take-off and landing especially during nighttime.
- Implement a noise management program consistent with the International Civil Aviation Organization's *Balanced Approach to Aircraft Noise Management* (ICAO, 2008). The principle of the Balanced Approach entails identifying noise mitigation measures through four pillars, and then analyzing them with the goal of addressing the noise problem in a cost-effective manner. The four pillars are:
    - Reduction of Noise at Source;
    - Land-use Planning and Management;
    - Noise Abatement Operational Procedures; and
    - As a last resort, Operating Restrictions;

<u>Airport Operations</u>

- Planning of site for airport location (new developments and expansion of existing facilities), and orientation of routes for arriving and departing aircraft relative to actual and projected residential development and other noise sensitive receptors in the surrounding area. This may

include coordination with local authorities with influence over land use planning and overall transportation planning activities;

- In areas where significant impacts are anticipated, implementation of preferred procedures and routes for landing and take-off (LTO) to minimize potential noise from approaching and departing aircraft for noise-sensitive areas. These procedures may include instructions on the use of descent profiles or "noise preferential" routes (NPRs), such as the "continuous descent approach" to avoid noise-sensitive areas, the use of "Low Power / Low Drag" (LPLD) procedure to fly the aircraft in a 'clean' condition (e.g. no flap or wheels deployed) as long as possible to minimize airframe noise, and instructions on minimizing reverse thrust on landing. An alternative approach may include the dispersion of noise through equal use of multiple flight tracks as opposed to a preferential flight track;
- Use of nighttime or other operating restrictions;
- If necessary, working with local authorities to identify and implement noise prevention and control strategies in noise abatement zones (e.g. sound insulation of buildings that are exposed to aircraft noise above levels stipulated by local authorities or limitations on nighttime operation of certain landing routes);
- Reducing noise of ground operations at the source or through the use of sound barriers and deflectors, as described in the General EHS Guidelines;
- Provision of power supply to the aircraft to reduce or eliminate the need for use of APUs;

Flight Operations

- Modification of aircraft operation though the use of descent profiles which may include use of "continuous descent approach" and "Low Power / Low Drag" (LPLD) procedures to fly the aircraft in a "clean" condition (e.g with no flap or wheels deployed) as long as possible to minimize airframe noise, and instructions on minimizing reverse thrust on landing;
- Use of departure procedures that allow the aircraft to reduce power after reaching an altitude of 800 feet, gradually resuming full thrust after reaching 3,000 feet;
- In coordination with airport and air traffic control authorities, avoidance of noise-sensitive areas through the use of "noise preferential routes" achievable through Standard Instrument Departure (SID) procedures, or alternatively using multiple flight tracks to spread and reduce the frequency of noise impacts;
- Minimizing use of APUs during idling and taxing operations, and using Ground Power Units (GPUs), where available;
- Fleet upgrades in favor of newer, quieter aircraft which comply with applicable international certification requirements for their year of manufacture; and

Airplane Maintenance

- Noise levels at the nearest point of reception should not exceed the guideline values provided in the General EHS Guidelines.

Residual Impacts

Based on the above additional measures, the residual impact significance is expected to remain at **Moderate** (***Table 2.7***).

Impacts Overview

The below table presents an overview of the impacts as described in this section:

TABLE 2.7 IMPACT ASSESSMENT FOR NOISE: OPERATION PHASE

Impact Significance					
Impact Nature	**Negative**	Positive	Neutral		
	Potential impacts from take-off and landing to ambient noise would be considered to be negative.				
Impact Type	**Direct**	Indirect	Induced		
Impact Duration	Temporary	Short-term	**Long-term**	Permanent	
Impact Extent	**Local**	Regional	International		
Impact Scale	Impact scale is considered localized.				
Frequency	Impacts to ambient noise would occur continuously during the operation phase especially take-off and landing.				
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
Resource Sensitivity	Low	**Medium**	High		
Impact Significance	Negligible	Minor	**Moderate**	Major	
Residual Magnitude	Negligible	Small	**Medium**	Large	
Residual Impact significance	Negligible	Minor	**Moderate**	Major	

2.3 IMPACTS ON SURFACE WATER QUALITY

2.3.1 CONSTRUCTION PHASE

Source of Impact

Based on the progress Project status report of NPPIA (March 2024), the Project is 68.6% completed. Therefore, the surface water quality impact assessment during construction is based on the EIA conducted by E&A (November 2020).

The following activities can impact the physical and chemical properties of local surface water and water bodies due to soil erosion and fuel runoff during rainfall in the construction phase of the Project:

- Land clearance and preparation activities;
- Soil and construction material transportation;
- Construction activities for runway and other airport infrastructure;
- Solid, liquid, and hazardous waste management; and Another runoff.

Significance of Impacts

According to the EIA conducted by E&A (November 2020), clearance activities, land preparation, soil transportation, soil backfilling and other construction works can cause soil erosion and other debris that can contribute to polluted runoff during rainfall events. Debris runoff from the Project site, including Boueng Cheung Loung and Tonle Bati, can elevate total suspended solids (TSS) levels in the water bodies.

The maximum amount of water required is approximately 150 l/person/day. (2,000 workers). Therefore, the maximum water consumption of staff, worker and other uses in the construction site would be 300 m^3/day. Wastewater will be stored in the existing reservoir at the airport.

The receptor sensitivity is considered as **Medium** given that surface water baseline showed some parameters exceed the standard.

However, the airport will use different sources of water used in the airport given that the nearby villages mainly use groundwater. The surface water quality during construction will be considered as **Small** magnitude given there will be installed septic tank to managed wastewater properly and the construction will occur in short-term. Therefore, the impact significance has been assessed as **Minor**.

The reason that can cause the surface water quality results to exceed the standards may include the following factors:

- There are fishing activities by local fisherman, agricultural activities, and runoff through rainfall from the flooded forest at Boeung Chernglong lake.
- Degradation of decay of a variety of leaves or plants growing on the banks of the lake, streams, and canals, and the discharge of contaminated water or kitchen waste from dwellings on rivers and streams at downstream of Tonle Bati stream.

- Various runoffs caused by the rainfall, the discharge of contaminated water from business areas, and gray water from residential areas along the stream or river into these water, nearby stream, or canals as well as runoff through rainfall from the agricultural areas at upper stream of Preak Taho and Canal No 57.

Additional Mitigation, Management, and Monitoring Procedures

The following mitigation and management measures included in the EIA conducted by E&A (November 2020) will be implemented to manage the potential impacts identified:

- The Project will construct a dike to prevent accidental leakage of wastewater into water bodies;
- The Project will construct a sedimentation pond;
- The Project will have a secondary container to prevent accidental leakage of engine oil into water bodies;
- The Project will maintain sanitation and construct a septic tank;
- The Project will conduct regular inspections of waste and sanitation areas to ensure there are no leakages, especially forbidding the construction of waste disposal sites, hazardous substances or latrines located adjacent to the existing waterway near the Project site without adequate containment measures;
- The Project will segregate and store waste in appropriate, secure, and properly labelled containers. Organic waste will be composted. Other solid waste will be dumped in the Project's landfill;
- For hazardous waste and other hazardous material, the Project will properly manage hazardous waste storage and handling, and ensure that it is properly labelled;
- The Project will minimise the need to leave construction materials upon completion of construction;
- The Project will maintain spill kits/equipment, and post spill procedures on site, especially spill or leak response plans;
- The Project will keep a register of all hazardous substances on site and ensure that relevant Material Safety Data Sheets (MSDS) are readily accessible for reference;
- Refuelling and machinery maintenance is to be undertaken in a designated, sealed, bunded area with appropriate closed drainage and oil traps;
- The Project will maintain the vegetation presence around the Project site where feasible, particularly the vegetation around the backfilling area to prevent erosion; and
- The Project will prepare a wash area at the entrance point.

2.3.2 OPERATION PHASE

Source of Impact

Based on the EIA conducted by E&A (November 2020), the surface water quality would be potentially affected by fuel runoff, wastewater runoff from the airport during rainfall due to there is water bodies near the Project such as Boueng Cheung Loung lake (southeast of the airport) and Boueng Rean lake (northeast of the airport).

Additional Mitigation, Management, and Monitoring Procedures

The following mitigation and management measures included in the EIA conducted by E&A (November 2020) will be implemented to manage the potential impacts identified:

- The Project will segregate and store waste in appropriate, secure, and properly labelled containers;
- For hazardous waste and other hazardous material, the Project will properly manage hazardous waste storage and handling, and ensure that it is properly labelled and undertaken in a designated, sealed, bunded area with appropriate closed drainage and oil traps;
- The Project will conduct regular inspections of waste and sanitation areas to ensure there are no harms to the groundwater quality;
- The Project will clean up immediately if there are any spills/leakages, and properly pack and store contaminated materials; and
- The Project will keep a register of all hazardous substances on site and ensure that relevant Material Safety Data Sheets (MSDS) are readily accessible for reference.
- The airport will have separate wastewater and rainwater management systems;
- The airport will regularly monitor all waste, particularly treated wastewater, which is required to meet the MOE's wastewater standards before being released into public water bodies or the sewage system;
- The airport will segregate and store waste in an appropriate, secure, and properly labelled containers. Organic waste will be composted. Other solid waste will be placed in an appropriate approved landfill;
- For hazardous waste storage site, the Project will be appropriately managed and sign posted;
- Fuel and hazardous substance tank will be stored in a bunded wall;
- The airport will maintain spill kits/equipment, and post spill procedure notices, on site;
- The drainage system will be built to accommodate rainwater runoff from the runway and passenger terminal before being released into the airport's retention ponds.

<u>Airport Operations</u>

- Diverting and treating stormwater drainage from areas of potentially frequent leaks and spills of chemicals and fuels through use of an oil / water separator prior to discharge to surface water bodies. Examples of areas where this type of runoff treatment is applicable include fuel

and chemical storage, transport and dispensing facilities, fire training areas, airplane maintenance hangars, and ground service vehicle maintenance facilities;

- Collection systems for aircraft and airport facility sanitary sewage should be provided. Collected sanitary wastewater effluents should be managed according to the recommendations for wastewater management in the General EHS Guidelines;
- Monitoring of effluents prior to discharge to surface water bodies;
- In cold climates, runoff of aircraft ADF should be prevented and controlled by:
  - Limiting aircraft deicing to small areas such as graded deicing pads, designed to facilitate the collection and recycling of ADF;
  - Increasing the storage of multi-strength glycol solutions to allow blending according to ambient temperatures, and avoiding the use of maximum glycol concentrations designed for the coldest expected weather under all weather conditions;
  - Use of ice detection systems such as ultrasonic devices to detect ice thickness, or computerized spraying systems that can accurately and selectively apply ADF on airplane surfaces;
- In cold climates, runoff airfield (runways and aprons) antiicing and de-icing fluids should be managed by:
  - Primary use of mechanical de-icing methods such as sweepers and plows complemented by chemical means. Pre-treating pavement surfaces with such means prior to the onset of ice to allow for easy removal
  - Substituting urea or glycol deicers with less toxic, more biodegradable, and lower biochemical oxygen demand (BOD) alternatives, such as potassium acetate, sodium acetate, sodium formate, potassium formate, or calcium magnesium acetate;
  - Following manufacturers' recommended application rates and avoiding application of glycol-based deicers near storm drains that lead directly to surface water bodies;
  - Providing a stormwater management system to collect and treat surface runoff containing aircraft and airfield anti-icing and de-icing fluids, including water originating from heaps of snow cleared from aprons and runways. Examples of effective treatment systems include discharge into centralized sanitary wastewater treatment systems (if allowed by the local wastewater treatment plant operator) or use of detention basins or constructed wetlands to reduce the oxygen demand and suspended solids of the runoff prior to discharge to surface water;
  - If centralized collection and treatment of stormwater runoff is not feasible, use of vacuum sweeper trucks to recover anti-icing and de-icing fluids for transport to appropriate treatment locations should be considered;
  - Additional stormwater and wastewater management recommendations are described in the General EHS Guidelines;

<u>Airplane Maintenance</u>

Segregating highly toxic waste streams, principally those containing cyanide, hexavalent chromium (Cr^{6+}), cadmium and other toxic metals. Other examples of wastewater streams that should be segregated include concentrated pre-treatment and plating solutions; degreasing baths; pickling baths; electroless plating baths (from chemical coating); electroplating baths (electrolytes); rinsing waters containing cyanide, hexavalent chromium (Cr^{6+}), hypophosphite (from electroless nickel plating), and airplane washing and paint stripping operations; and

Selected or combined wastewater streams should be pre-treated prior to discharge to local sewer systems including use of coagulation, flocculation, and precipitation methods and other relevant industrial process wastewater management guidance. Additional guidance on the management of wastewater streams, such as those generated from metal finishing operations, is presented in the EHS Guidelines for Metal, Plastic, and Rubber Products Manufacturing.

Significance of Impacts

Criteria for Assessing Impact Significance

The impact magnitude and receptor sensitivity criteria for surface water quality has been provided in ***Table 2.8*** and ***Table 2.9***, respectively.

TABLE 2.8 CRITERIA FOR IMPACT MAGNITUDE FOR ASSESSMENT OF IMPACT TO WATER

	Extent / Duration / Scale / Frequency
Negligible	Immeasurable, undetectable or within the range of normal natural variation.
Small	Slight change in water quality expected over a limited area with water quality returning to background levels within a few metres and/or discharges are well within benchmark effluent discharge limits.
Medium	Temporary or localized change in water quality with water quality returning to background levels thereafter and/or occasional exceedance of benchmark effluent discharge limits.
Large	Change in water quality over a large area that lasts over the course of several months with quality likely to cause secondary impacts on marine ecology; and/or routine exceedance of benchmark effluent discharge limits.

TABLE 2.9 CRITERIA FOR WATER RECEPTOR SENSITIVITY

Category	**Designation / Importance / Vulnerability**
Low	Existing water quality is good and the ecological resources that it supports are not sensitive to a change in water quality.
Medium	Existing water quality already shows some signs of stress and/ or supports ecological resources that could be sensitive to change in water quality.
High	Existing water quality is already under stress and/ or the ecological resources it supports are very sensitive to change (secondary ecological or health impacts are likely).

Receptor Sensitivity and Impact Magnitude

The receptor sensitivity is considered **Medium**, given that the baseline results showed that most parameters for each station were within national standard. Except TSS, oil and grease, COD, TN, TP, and Coliform at Boeung Chernglong lake, DO, oil and grease, TN, and TP at downstream of Tonle Bati stream, oil and grease, TN, TP, and coliform at upper stream of Preak Taho and Canal No 57.

Water will be used throughout the airport facilities, including washrooms, toilets, canteen, restaurants, air conditioning system, fire extinguishers, with a particular focus on the passenger terminal. External area will be irrigated as required.

The amount of water required during operation phase, which are potable water (sanitation and showering, catering services, and drinking water) and non-potable water (aircraft non-potable water (home carrier base aircraft cleaning), chiller plant, and irrigation). Water required is 3,288 m^3/day and 6,680 m^3/day in 2030 and 2050, respectively. The required amount of water for firefighting is 4,755 m^3/day and 4,817 m^3/day in 2030 and 2050, respectively. Therefore, the total of wastewater in 2030 and 2050 would be 2,550 m^3/day.

TABLE 2.10 WATER ESTIMATION IN OPERATIONAL PHASE (2030 AND 2050)

Water use	Unit	Water requirement		Wastewater		Treated wastewater
		2030	2050	Quantity	Management	
1. Potable water ▪ Sanitation and showering ▪ Catering services ▪ Drinking water	m^3/day	1,800	3,500	2,450	Wastewater Treatment	1,530 (Re-use)
2. Non-potable water						
Aircraft non-potable water (Home carrier base aircraft cleaning)	m^3/day	79	140	100	Wastewater Treatment	-
Chiller plant	m^3/day	1,008	2,570	-	Evaporated	-
Irrigation water demand	m^3/day	401	470	-	Evaporated	-
Total	**m^3/day**	**3,288**	**6,680**	**2,550**	**-**	**1,530**

Source: EIA conducted by E&A (November 2020).

The wastewater treatment plant will utilize the activated sludge process. It will be located in the southwest of the airport with anarea of 1,750 m^2, and 20,250 m^2 in 2030 and 2050, respectively, with capacity not exceeding 25,000 m^3/day. Wastewater will be collected by the sewer system (separated from stormwater) into the treatment system. The several retention periods have been applied:

- Primary settlement: 6 hours;
- Secondary settlement: 8 hours;
- Aeration basin: 24 hours.

Then the effluent will be discharged into a storage pond in the airport and pumped into the reservoir for reuse in irrigation, gardens, and toilet, road cleaning etc. As a result, the impact will be localized and long-term, the magnitude of the impact is considered to be **Small**.

Impact Significance

The impact significance for surface water quality has been assessed as **Minor**.

Additional Mitigation, Management, and Monitoring Procedures

The following measures are recommended:

- Collected sanitary wastewater effluents should be managed according to the recommendations for wastewater management in the General EHS Guidelines; and
- Diverting and treating stormwater drainage from areas of potentially frequent leaks and spills of chemicals and fuels through use of an oil / water separator prior to discharge to surface water bodies. Examples of areas where this type of runoff treatment is applicable include fuel and chemical storage, transport and dispensing facilities, fire training areas, airplane maintenance hangars, and ground service vehicle maintenance facilities.

Residual Impacts

Based on the above additional measures, the residual impact significance is expected to remain at **Minor** for operation (***Table 2.11***).

Impacts Overview

The below table presents an overview of the impacts as described in this section:

TABLE 2.11 IMPACT ASSESSMENT FOR SURFACE WATER QUALITY: OPERATIONAL PHASE

Impact Significance			
Impact Nature	**Negative**	Positive	Neutral

Impact Significance					
	Surface water quality impact from fuel runoff and wastewater runoff from the airport is negative.				
Impact Type	**Direct**	Indirect	Induced		
Impact Duration	Temporary	Short-term	**Long-term**	Permanent	
Impact Extent	**Local**	Regional	International		
Impact Scale	Localized around the Project.				
Frequency	Impacts will arise intermittent from operation related activities.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
Resource Sensitivity	Low	**Medium**	High		
Impact Significance	Negligible	**Minor**	Moderate	Major	
Residual Magnitude	Negligible	**Small**	Medium	Large	
Residual Impact significance	Negligible	**Minor**	Moderate	Major	

2.4 IMPACTS ON GROUNDWATER QUALITY

2.4.1 CONSTRUCTION PHASE

Source of Impact

The following activities can cause groundwater contamination due to improper waste management to groundwater quality during the construction phase of the Project:

- Storage and hazardous waste management.

Significance of Impacts

Since the Project is 68.6% completed as of March 2024, the impact significance on groundwater quality impact assessment during construction will be based on the EIA conducted by E&A (November 2020).

Construction and hazardous waste will be generated by the Project activities such as cement, demolishing waste, lubricant, batteries, paint container. Improper management of these wastes could lead to pollutant runoff into the soil, potentially seeping into groundwater.

The groundwater quality baseline was conducted by the Ministry of Environment's Laboratory; 2 locations in villages. The results showed that both stations indicated that most parameters met the standards set by the National drinking water quality standard of Ministry of Industry and Handicraft (2004), Prakas on the adoption of terms of references for infrastructure and tourism sectors of MoE (2018), and WHO Drinking Water Standards.

Except one parameter was not meet standards, which was arsenic in Preak Khmer Village (GW-01), Potsor Village (GW-02) exceeded both national (<0.05 mg/l) and international (0.01 mg/l) standards.

According to the EIA conducted by E&A (November 2020), it indicates that groundwater is mainly used for cooking, bathing, and cleaning. (100% in Kandoak commune, 90% in Ampov Prey commune, 45% in Boeung Khyang, 43% in Prek Sleng commune, 79% in Sa'ang Phnom commune, and 37% in Pot Sor commune).

The receptor sensitivity is considered as **Medium** given that nearby villages mainly use groundwater for cooking, bathing, and cleaning. Although groundwater result showed most of parameters meet the standard. The groundwater quality during construction will be considered as **Small** magnitude given that waste will be collected and temporary storage on site before disposed by the certified waste collection agency. However, the construction will occur in short-term. Therefore, the impact significance has been assessed as **Minor**.

Additional Mitigation, Management, and Monitoring Procedures

The following mitigation and management measures included in the EIA conducted by E&A (November 2020), will be implemented to manage the potential impacts identified:

- Segregate and store waste in appropriate, secure, and properly labelled containers;
- Keep a register of all hazardous substances on site and ensure that relevant Material Safety Data Sheets (MSDS) are readily accessible for reference;
- For hazardous waste and other hazardous material, the Project will properly manage hazardous waste storage and handling, and ensure that it is properly labelled and undertaken in a designated, sealed, bunded area with appropriate closed drainage and oil traps;
- Conduct regular inspections of waste and sanitation areas to ensure there are no harms to the groundwater quality;
- The Project will clean up immediately if there are any spills/leakages, and properly pack and store contaminated materials;
- Monitor groundwater quality to verify construction activity does not increase pollutants; and
- Ensure groundwater is not used as a potable source without appropriate treatment.

2.4.2 OPERATION PHASE

Source of Impact

The groundwater quality would be potentially affected by fuel and hazardous materials spills and leaks.

Significance of Impacts

Criteria for Assessing Impact Significance

The impact magnitude and receptor sensitivity criteria for groundwater quality has been provided in ***Table 2.12*** and ***Table 2.13***, respectively.

TABLE 2.12 CRITERIA FOR IMPACT MAGNITUDE FOR ASSESSMENT OF IMPACT TO WATER

	Extent / Duration / Scale / Frequency
Negligible	Immeasurable, undetectable or within the range of normal natural variation.
Small	Slight change in water quality expected over a limited area with water quality returning to background levels within a few metres and/or discharges are well within benchmark effluent discharge limits.
Medium	Temporary or localized change in water quality with water quality returning to background levels thereafter and/or occasional exceedance of benchmark effluent discharge limits.
Large	Change in water quality over a large area that lasts over the course of several months with quality likely to cause secondary impacts on marine ecology; and/or routine exceedance of benchmark effluent discharge limits.

TABLE 2.13 CRITERIA FOR WATER RECEPTOR SENSITIVITY

Category	**Designation / Importance / Vulnerability**
Low	Existing water quality is good and the ecological resources that it supports are not sensitive to a change in water quality.
Medium	Existing water quality already shows some signs of stress and/ or supports ecological resources that could be sensitive to change in water quality.
High	Existing water quality is already under stress and/ or the ecological resources it supports are very sensitive to change (secondary ecological or health impacts are likely).

Receptor Sensitivity and Impact Magnitude

The receptor sensitivity is considered **Medium** due to existing groundwater contamination by heavy metal (Arsenic), this makes the area particularly sensitive to changes in water quality, as nearby villages primarily rely on groundwater for cooking, bathing, and cleaning.

The EIA conducted by E&A stated that Iron levels exceeded the standards in the monitoring results, however, this was mis-identified and Iron levels are below the stipulated parameters. The impacts on groundwater quality during operation is considered as **Medium** magnitude given that the airport's operation will require significant storage of aviation and vehicular fuel and a variety of hazardous materials such as oils and degreasers. The impact will be localized and long-term.

To mitigate potential groundwater contamination, a wastewater treatment plant will be implemented using the activated sludge process. Wastewater will be collected through a separate sewer system and directed to the treatment plant. Treated effluent will be discharged into a storage pond on the airport site and subsequently pumped into a reservoir for reuse in irrigation, gardens, toilets, and road cleaning.

Impact Significance

The impact significance for groundwater quality has been assessed as **Moderate**.

Additional Mitigation, Management, and Monitoring Procedures

The following mitigation and management measures are recommended:

- Develop and implement a groundwater monitoring program for both the construction and operation phases, to ensure groundwater quality is within the stipulated parameters;
- All fuel oil storage units must be securely sealed and covered to prevent leakage;
- Implement regular inspections, repairs, and maintenance of equipment related to fuel storage and handling to prevent damage or fuel leakage;
- Prepare emergency preparedness and response plans;
- Organize regular emergency drills;
- Prepare a spill kits/equipment and post spill procedure;
- Store and refuel in a designated area with an impermeable surface;
- Spills or leaks must be cleaned up immediately and install oil-water separator at stormwater management area outlets; and
- Fuel and hazardous substances must be stored in bunded areas with an underlying impervious surface.

<u>Airport Operations</u>

- Hazardous materials should be managed to prevent accidental releases, fire, or explosions, as described in the General EHS Guidelines;
- Operators should develop spill prevention and control plans, and emergency preparedness and response plans for airports that are specific to the nature of the operations; and

Airplane Maintenance

Hazardous or potentially hazardous wastes generated during airplane overhaul and repair activities may include waste oil and oil emulsions and fuel residuals; organic solvents and glycols; metal hydroxide sludge; lead batteries; nickel-cadmium and nickel-metal hydride batteries; spent surface treatment solutions (from degreasing, pickling, passivating, electroplating, and chemical coating) containing cyanides, hexavalent chromium and cadmium; solid and semisolid cyanide residuals; paint sludge and spray box water; isocyanates; and mercury containing fluorescent lamps and tubes. Wastes, including hazardous wastes, should be managed according to the applicable recommendations provided in the General EHS Guidelines.

Residual Impacts

Based on the above additional measures, the residual impact significance is expected to reduce to **Minor** for operation (***Table 2.14***).

Impacts Overview

The below table presents an overview of the impacts as described in this section:

TABLE 2.14 IMPACT ASSESSMENT FOR GROUNDWATER QUALITY: OPERATIONAL PHASE

Impact Significance					
Impact Nature	**Negative**	Positive	Neutral		
	Groundwater quality impact from fuel or hazardous materials leaks and spills from the airport is negative.				
Impact Type	**Direct**	Indirect	Induced		
Impact Duration	Temporary	Short-term	**Long-term**	Permanent	
Impact Extent	**Local**	Regional	International		
Impact Scale	Localized around the Project.				
Frequency	Impacts will arise intermittent from operation related activities.				
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
Resource Sensitivity	Low	**Medium**	High		

Impact Significance				
Impact Significance	Negligible	Minor	**Moderate**	Major
Residual Magnitude	Negligible	**Small**	Medium	Large
Residual Impact significance	Negligible	**Minor**	Moderate	Major

2.5 IMPACTS ON SOIL QUALITY

2.5.1 CONSTRUCTION PHASE

Source of Impact

Based on the progress Project status report of NPPIA (March 2024), the Project is 68.6% completed. Therefore, the soil quality impact assessment during construction is based on the EIA conducted by E&A (November 2020).

The following activities can have impacts to soil quality during the construction phase of the Project:

- Site preparation, backfilling, and construction activities;
- Contaminated fill materials; and
- Land pollution due to solid/liquid/hazardous waste.

These activities cause various impact to soil such as soil erosion and soil contamination.

Significance of Impacts

Since the Project is 68.6% completed as of March 2024, the impact significance on soil quality during construction will be based on EIA conducted by E&A (November 2020).

Hazardous waste will be generated during construction, mainly lubricant, paint containers, batteries, and accessories. The Project will work with contractor to transport and require all staff and workers in the landfill to separate waste, hazardous waste, recyclable and non-recyclable waste properly. All collected waste will be temporary storage on site before sending to certified waste collector.

As a result, the potential negative impact on soil quality was rated as **Low** due to short duration of the Project and all types of waste will be properly managed.

The soil quality baseline was conducted by the Department of Agriculture of the Ministry of Agriculture, Forestry and Fisheries; 1 location was Alluvial Soils in the Prasat Village and 1 location was Cultural hydromorphics in Khla Kon.

The results showed that Alluvial Soils in the village was found to be fine sand and coarse silt with moderate nutrition as well as good pH. While soil at Khla Kon consisted of coarse sand and fine silt with moderate nutrition as well as low pH. Therefore, the soil in the village is of higher quality than the soil at Khla Kon.

Site clearance, backfilling, soil settlement activities will cause impacts on the environment as soil will be transported from Beoung Choung Leoung and Boeung Rean. Environmental concerns related to river sand dredging include river embankment destruction; increased flood risk; fish kills; groundwater table retention reduction; changes in flow velocity; loss of land; and animal habitat loss. Construction activities often result in soil erosion, which can lead to increased sedimentation in rivers and lakes. This sedimentation raises the total dissolved solids (TDS) levels, degrading water quality and aquatic habitats. High TDS levels can harm fish and other aquatic organisms, reducing biodiversity and disrupting the ecological balance.

The receptor sensitivity is considered as **Medium** given during construction there will be land clearing, excavation, and ground levelling, which will impact soil erosion.

Impacts on soil quality will be considered as **Small** magnitude given that the construction will occur in short-term and waste will be collected and temporary storage on site before disposed by the certified waste collection agency. Therefore, the impact significance has been assessed as **Minor**.

Additional Mitigation, Management, and Monitoring Procedures

The following mitigation and management measures included in the EIA conducted by E&A (November 2020), will be implemented to manage the potential impacts identified:

- Ensure that key parameters are within Cambodian wastewater disposal standards before discharge;
- Excavate only the required amount of soil to avoid unnecessary disturbance;
- Clean up immediately if there are any spills/leakages, and properly pack and store contaminated materials; and
- Conduct regular inspections of waste and sanitation areas to ensure there are no harms to the groundwater quality.

2.5.2 OPERATION PHASE

Source of Impact

Similar to impacts on groundwater, soil quality would be potentially affected by fuel or hazardous materials leaks and spills.

Significance of Impacts

Criteria for Assessing Impact Significance

The impact magnitude and receptor sensitivity criteria for soil has been provided in ***Table 2.15*** and ***Table 2.16***, respectively.

TABLE 2.15 CRITERIA FOR IMPACT MAGNITUDE FOR ASSESSMENT OF IMPACT TO SOIL

Category	Extent / Duration / Scale / Frequency
Negligible	Soil quality changes correspond to the expected range. Change remains within the range commonly experienced within the household or community.
Small	The change in soil quality exceeds the expected. Perceptible difference from baseline conditions. Tendency is that impact is local, rare and affects a small proportion of receptors and is of a short duration.
Medium	Clearly evident difference from baseline conditions. Tendency is that impact affects a substantial area, ecosystem, or number of people and/or is of medium duration. Frequency may be occasional, and impact may potentially be regional in scale.
Large	Change in soil quality over a large area that lasts over the course of several months with quality likely to cause secondary impacts on ecosystems and nearest household or community. Affects the majority of the area or population in the area of influence and/or persists over many years. The impact may be experienced over a regional or national area.

TABLE 2.16 CRITERIA FOR SOIL RECEPTOR SENSITIVITY

Category	Designation / Importance / Vulnerability
Low	Existing soil quality is good and the ecological resources that it supports are not sensitive to a change in soil quality.
Medium	Existing soil quality already shows some signs of stress and/ or supports ecological resources that could be sensitive to change in soil quality.
High	Existing soil quality is already under stress and/ or the ecological resources it supports are very sensitive to change (secondary ecological or health impacts are likely).

Receptor Sensitivity and Impact Magnitude

The receptor sensitivity is considered **Low** as these sources are not unique or especially productive, and not sensitive to changes in soil conditions. Additionally, the airport surfaces are generally concrete. Concrete is impermeable, making soil contamination less likely and oil or fuel spills easier to manage compared to spills on soil. As such, the soil will be considered as **Small** magnitude.

Impact Significance

The impact significance for soil quality has been assessed as **Negligible**.

Additional Mitigation, Management, and Monitoring Procedures

The same measures as recommended for groundwater (in operation phase) also apply to this section.

Residual Impacts

Based on the above additional measures, the residual impact significance is expected to remain at **Negligible** for operation (***Table 2.17***).

Impacts Overview

The below table presents an overview of the impacts as described in this section:

TABLE 2.17 IMPACT ASSESSMENT FOR SOIL QUALITY: OPERATIONAL PHASE

Impact Significance					
Impact Nature	**Negative**	Positive	Neutral		
	Soil quality impact from the operation activities is negative.				
Impact Type	**Direct**	Indirect	Induced		
Impact Duration	Temporary	Short-term	**Long-term**	Permanent	
Impact Extent	**Local**	Regional	International		
Impact Scale	Localized around the Project.				
Frequency	Impacts will arise continuously from operation related activities.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
Resource Sensitivity	**Low**	Medium	High		
Impact Significance	**Negligible**	Minor	Moderate	Major	
Residual Magnitude	**Negligible**	Small	Medium	Large	
Residual Impact significance	**Negligible**	Minor	Moderate	Major	

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