Istanbul New Airport ESIA

Environmental Baseline and Impact Assessment

Water Resources

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7.5 Water Resources

7.5.1 Introduction

This chapter considers the quality and management of water resources (including dewatering of water bodies (WBs) and management of wastewaters during earthworks, construction and operational phases of the Istanbul New Airport (INA) Project. The Project is planned to be delivered in four phases and will comprise the area within the defined Project boundary and the associated Area of Influence, which can be found in **Chapter 3 Proposed Project and Project Description**.

The Project Area is located 2.5 km east of Terkos Lake, which supplies approximately 20% of Istanbul's total water demand and 12 km north of Alibey Dam which supplies approximately 7% of Istanbul's total water demand. Approximately 7.3 km^2 of the Terkos Basin (ca. 740 km^2 in total) is within the north-western side of the Project Area and approximately 17.7 km^2 of Alibey Basin (ca. 159 km^2 in total) is within the south-western side of the Project Area, as shown in Figure 7.5.1. The Project Area is not a designated water protection area.

Unless defined specifically for each water basin, the Turkish Water Pollution Control Regulation (WPCR) defines absolute protection zone, short-range, mid-range and long-range protection zones for drinking water resources and limits the activities that could take place within these zones. Accordingly, as shown in Figure 7.5.1, approximately 0.5 km^2 or 50 ha of the north-western corner of the Project Area falls within the mid-range protection zone of the Terkos Lake. The WPCR limits the activities that can take place in the protection zones. In this regard, in mid-range protection zones, industrial activities are not allowed to take place. As also committed to in the Turkish EIA Report, no construction activities will take place in this zone. Therefore, there will be no activity and structures within this protection zone (see Figure 7.5.12 for site layout and protection zones). Parts of the Project Area falls within the long-range protection zone (i.e. the basin boundary) of the Terkos Lake and Alibey Dam and there are no legal constraints on the construction of an airport in this zone. However, protection measures defined for long-range protection zone in Article 20 (Long-range Protection Zone) of Water Pollution Control Regulation is legally committed as:

"The entire water catchment basin, except the protected zones described above, of a drinking water resource is the long-range protection zone. Following protection measures are taken for this zone.

a) Within the zone having a width of 3 km starting from the border of mid-range protection zone, industrial enterprises that have a completely dry type operation, that do not generate hazardous waste and that do not generate industrial wastewater may be allowed to operate. The solid waste and air emissions that are sourced from these facilities are required to be eliminated to a degree and in a way to ensure the water resource (reservoir) quality is not affected. Landfills and waste disposal facilities are not allowed. Tourism and settlements are allowed in compliance with Article 19.

Gallery blasting, chemical and metallurgic enrichment processes are not allowed in this area. Mining can be allowed, with the conditions that; there is no risk in terms of health, the mining is conducted in a way that will not disturb the existing water quality and a notarized written commitment is submitted to the Ministry by business owners that the site will be rehabilitated after finalization of activities.

It is mandatory to transport the wastewater generated from the activities in these areas outside the basin by complying with the discharge standards related to the relevant sector stated in this Regulation or to reuse the wastewater.

b) It is mandatory to transport wastewater generated in the area, starting from the point where the area described in clause (a) ends to the end of the water catchment basin, outside the basin by complying with the discharge standards given in the Regulation's tables from Table 5 to Table 21.

However, facilities established in the long-range protection zone prior to 04/09/1988 or before the date the resource obtained drinking water resource status, are not required to comply with these provisions, provided that their liquid, gas and solid wastes are treated by advanced treatment and disposal technologies which are proven in terms of economic viability and are deemed appropriate by related authority.

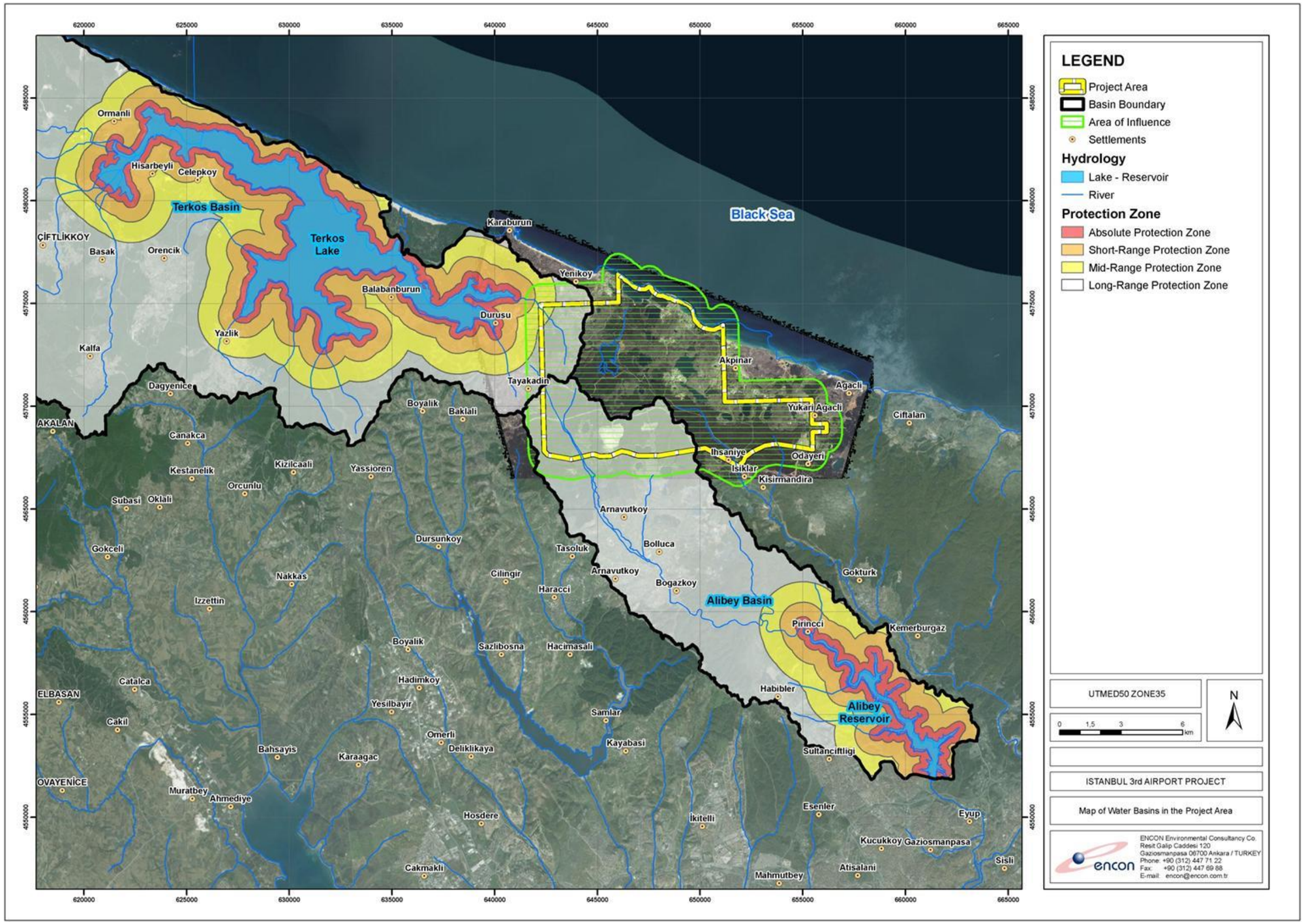
Construction of landfills and disposal sites in this area require opinion of appropriateness from the Ministry.".

According to the INA Project Master Plan (Ref. 7.5.7), the location of the fuel farm, to be used within the scope of airport activities, falls within the Terkos Lake and Alibey Dam basin boundaries (see Figure 7.5.12). ISKI's Regulation on the Drinking Water Basins (Ref. 7.5.12) has some specific restrictions regarding such activities taking place within the drinking water basin boundary taking into account the potential contamination risks. Therefore, permits will be required from ISKI and the relevant authorities prior to the construction of the fuel farm.

The Project Area is located in a region that has been used for mining activities since the first quarter of the 20th century. Pits generated as a result of excavations have filled with rain water, which has resulted in a total of 70 WBs in the Project Area.

To the north of the Project Area is the Black Sea coast. The five runways will be aligned along a north-south orientation which means that part of the sea will be under the flight path.

Figure 7.5.1 Drinking Water Basins in the Project Area



7.5.2 Policy, Regulatory and Administrative Framework

Chapter 2 Policy, Legislative and Regulatory Framework provides a general overview of the national and international policy and legal framework within which the INA Project is being developed. This chapter summarises the legal framework in the field of water quality and management applicable to the INA Project.

A baseline water quality assessment has been undertaken at the Project Area for surface waters, groundwater and seawater as summarised below and detailed in the methodology section presented in Annex 7.5.A.

During the construction and operational phases of the Project, water resources will be used taking into account water saving measures, and wastewater management and handling will be undertaken in line with national and international legislation and GIIP to avoid negative impact on the receiving environment.

7.5.2.1 Turkish Legal Requirements

Activities to be carried out as part of the INA Project will be conducted in accordance with the provisions of relevant Turkish legislation, which comprises:

- Water Pollution Control Regulation, Official Gazette date: December 31, 2004, No: 25687;
- Surface Water Quality Management Regulation, Official Gazette date: November 30, 2012, No: 28483;
- Regulation Concerning Quality of Surface Waters Planned or Used as Drinking Water Supply, Official Gazette date: June 29, 2012, No: 28338;
- ISKI Regulation on the Drinking Water Basins, 2011;
- ISKI Wastewater Discharge to Sewage System Regulation, 2013;
- Regulation on the Control of Pollution Caused by Dangerous Substances, Official Gazette date: November 26, 2005, No: 26005;
- Regulation Concerning Water for Human Consumption, Official Gazette date: February 17, 2005, No: 25730;
- Regulation on Pit Opening Where Sewer System Construction is not Applicable, Official Gazette date: March 19, 1971, No: 13783; and
- Regulation Concerning Protection of Ground Waters against Pollution and Deterioration, Official Gazette date: April 7, 2012, No: 28257.

During each stage of the Project, all activities will be carried out in accordance with the Project Standards (**Chapter 2 Policy, Legislative and Regulatory Framework**) which include standards and limits set by the applicable Turkish laws and regulations and international standards.

Surface Water Resources

Surface water quality classification standards are defined in the Turkish Surface Water Quality Management Regulation (Official Gazette No. 28483, date 30 November, 2012). The aim of this regulation is to determine the biological, chemical, physico-chemical, and hydro-morphological qualities of surface waters, and classify WBs accordingly. Table 7.5.A.1 in Annex 7.5.A of the regulation provides water quality classes, their designated uses, and specifies water quality criteria to be met for each class. These classifications are as follows:

- **Class I:** High quality waters; can be used for drinking water supply after disinfection, all recreational activities, farming of trout, irrigation and all other uses;
- **Class II:** Slightly polluted waters; can be used for supply of drinking water following appropriate treatment, recreational purposes, propagation of fish (other than trout), irrigation and industrial uses;
- **Class III:** Polluted waters; can be used following appropriate treatment for supply water for industries, except foodstuffs and textile industries; and
- **Class IV:** Highly polluted waters; inferior quality when compared with Class I, II, and III waters and cannot be used for any purposes without appropriate treatment.

Water quality criteria under Turkish legislation for different parameters are given in the methodology section in Annex 7.5.A and also presented under the findings Section 7.5.4.3.

Groundwater Resources

The chemical status of groundwater is assessed according to the Turkish Regulation on the Protection of Groundwater against Pollution and Deterioration (Official Gazette No 25687, date 31 December 2004). This regulation is compatible with the EU Water Framework Directive (WFD) on the protection of groundwater against pollution and deterioration. Good chemical status for a body of groundwater should comply with the groundwater quality standards given in the regulation.

Indicators of pollutants for groundwater are given in Annex 3 of the regulation. The minimum list of parameters are as follows: arsenic, cadmium, lead, mercury, ammonia, chloride, sulphate, trichloroethylene, tetrachloroethylene and electrical conductivity.

The threshold values in groundwater for these parameters are in the process of being established for each basin in Turkey by the General Directorate of Water Management. Such thresholds for the Project Area and its vicinity have not yet been established. In order to assess the quality of groundwater resources in the Project Area, analyses of the same parameters as for the surface waters were carried out as detailed under the findings Section 7.5.4.3.

Seawater

Baseline seawater quality in the Black Sea has been assessed according to the criteria defined in Table 4 of the Turkish Water Pollution Control Regulation (Official Gazette No. 25687, date 31 December 2004) and summarised in the methodology section in Annex 7.5.A of this chapter.

7.5.2.2 International Agreements

The Bucharest Convention (1992)

The Convention on the Protection of the Black Sea Against Pollution was signed in Bucharest in April 1992, and ratified by all six legislative assemblies of the Black Sea countries (Bulgaria, Georgia, Romania, Russian Federation, Turkey and Ukraine) at the beginning of 1994 (Ref. 7.5.1). Also referred to as the Bucharest Convention, it is the basic framework to the agreement and three specific Protocols, which are:

- the control of land-based sources of pollution;
- dumping of waste; and
- joint action in the case of accidents (such as oil spills).

The implementation of the convention is managed by the Commission for the Protection of the Black Sea against Pollution, and its Permanent Secretariat is in Istanbul, Turkey.

Basic objective of the Convention on the Protection of the Black Sea Against Pollution is to substantiate the general obligation of the Contracting Parties to prevent, reduce and control the pollution in the Black Sea in order to protect and preserve the marine environment and to provide a legal framework for co-operation and concerted actions to fulfil this obligation. In particular (Ref. 7.5.1):

- To prevent pollution by hazardous substances or matter - Annex to the convention;
- To prevent, reduce and control the pollution from land-based sources - Protocol to the convention;
- To prevent, reduce and control the pollution of the marine environment from vessels in accordance with the generally accepted rules and standards;
- To prevent, reduce and control the pollution of the marine environment resulting from emergency situations - Protocol to the convention;
- To prevent, reduce and control the pollution by dumping - Protocol to the convention;
- To prevent, reduce and control the pollution caused by or connected with activities on the continental shelf, including exploration and exploitation of natural resources;
- To prevent, reduce and control the pollution from or through the atmosphere;
- To protect the biodiversity and the marine living resources - Draft Protocol on biodiversity;
- To prevent the pollution from hazardous wastes in transboundary movement and the illegal traffic thereof - Draft Protocol to the convention; and
- To provide a framework for scientific and technical co-operation and monitoring activities.

7.5.2.3 Standards and Guidelines for International Financing

The IFC has various social and environmental criteria for the projects it finances, which include criteria which specifically relate to resource efficiency and pollution prevention. Specifically, IFC Performance Standard 3 (PS3) – Resource Efficiency and Pollution Prevention (Ref. 7.5.2) recognises that increased economic activity and urbanisation often generate increased levels of pollution to air, water and land and consume finite resources in a manner that may threaten people and the environment at local, regional and global levels. PS3 outlines a project-level approach to resource efficiency and pollution prevention and control in line with internationally disseminated technologies and practices.

Further guidance on resource efficiency and pollution prevention is provided in the following IFC documents:

- IFC Guidance Note 3: Resource Efficiency and Pollution Prevention (Ref. 7.5.3);
- IFC EHS Guidelines for Airports (Ref. 7.5.4); and
- IFC General EHS Guidelines (Ref. 7.5.5).

The guidelines are technical reference documents with general and industry-specific examples of GIIP. The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities.

Within the scope of the Project, these international requirements and the guidance have been and will continue to be taken into account during planning, design, earthworks, construction and operational activities. Relevant measures have been developed during the planning

phase in the context of the ESIA and the master planning and design studies to mitigate and, where necessary, compensate for adverse impacts on water resources. These measures have been developed in line with national requirements and international standards.

7.5.3 Assessment Methodology

7.5.3.1 Scope

The baseline description regarding existing water resources in the Project Area is used to identify potential impacts and evaluate their significance. For identified adverse impacts, relevant mitigation and monitoring measures are proposed.

7.5.3.2 Method

A review of available documentation for the Project Area and Area of Influence was undertaken and supplemented with field surveys for the analysis of baseline water quality.

Secondary Data

Information regarding water resources in the Project Area, including hydrological conditions, water use and wastewater management during the construction and operational phases of the Project and the dewatering of WBs during earthworks and construction phases, was reviewed based on the following secondary sources:

- The Turkish EIA Report (Ref. 7.5.6);
- INA Project Master Plan (Ref. 7.5.7);
- Hydrological and Hydrogeological Report (August 2014) (Ref. 7.5.8);
- Project Memorandum on Groundwater/Drainage for Istanbul New Airport, Fugro, 3 February 2015 (Ref. 7.5.9); and
- Information provided by the IGA Project team.

Field Surveys for Water Quality Sampling and Analysis

A water quality assessment was undertaken to establish a robust description of the baseline conditions in the Project Area, its Area of Influence and the vicinity of the Project Area (extending to far western point of the Terkos Lake, as shown in Figure 7.5.2). The Area of Influence for the baseline water quality assessment has been defined as the area extending 1 km from the airport border.

Terkos Lake, located 2.5 km to the west of the Project Area, was included in the water quality assessment study (Figure 7.5.2, sampling points WQ Terkos 1 and WQ Terkos 2) as it is an important key biodiversity area and also a small part in the north-western side of the Project Area falls within the mid-range protection zone of Terkos Lake. The main stream feeding into Terkos Lake (WQ Surface 1) was also included in the baseline assessment study in order to capture the incoming water quality to the Lake.

Alibey Dam, located 12 km to the south of the Project Area, does not fall within the Area of Influence of the Project and therefore was not included in the water quality assessment study. Also, the riverbeds passing from the Project Area flowing to the south towards Alibey Dam are seasonal riverbeds, i.e. there is intermittent flow in these riverbeds. Therefore, an impact due to the Project activities on water quality in Alibey Dam is not anticipated.

In this regard, surface water resources in the study area have been identified and water quality has been determined through on-site measurements, sampling and laboratory analyses, as detailed below.

Sampling locations were selected to represent the whole study area (including the Project Area, its Area of Influence and its vicinity). The water quality sampling locations are shown in Figure 7.5.2.

In order to follow the possible seasonal changes in the water quality, samples were taken in three different seasons as follows:

- Winter (10-12 February, 2014);
- Spring (13-16 May, 2014);
- Summer (11-15 August, 2014); and
- Autumn (for Terkos Lake on 16 September, 2014 and for the seawater on 10 October, 2014).

The type of samples, number of sampling locations and the frequency of sampling are given in Table 7.5.1 below.

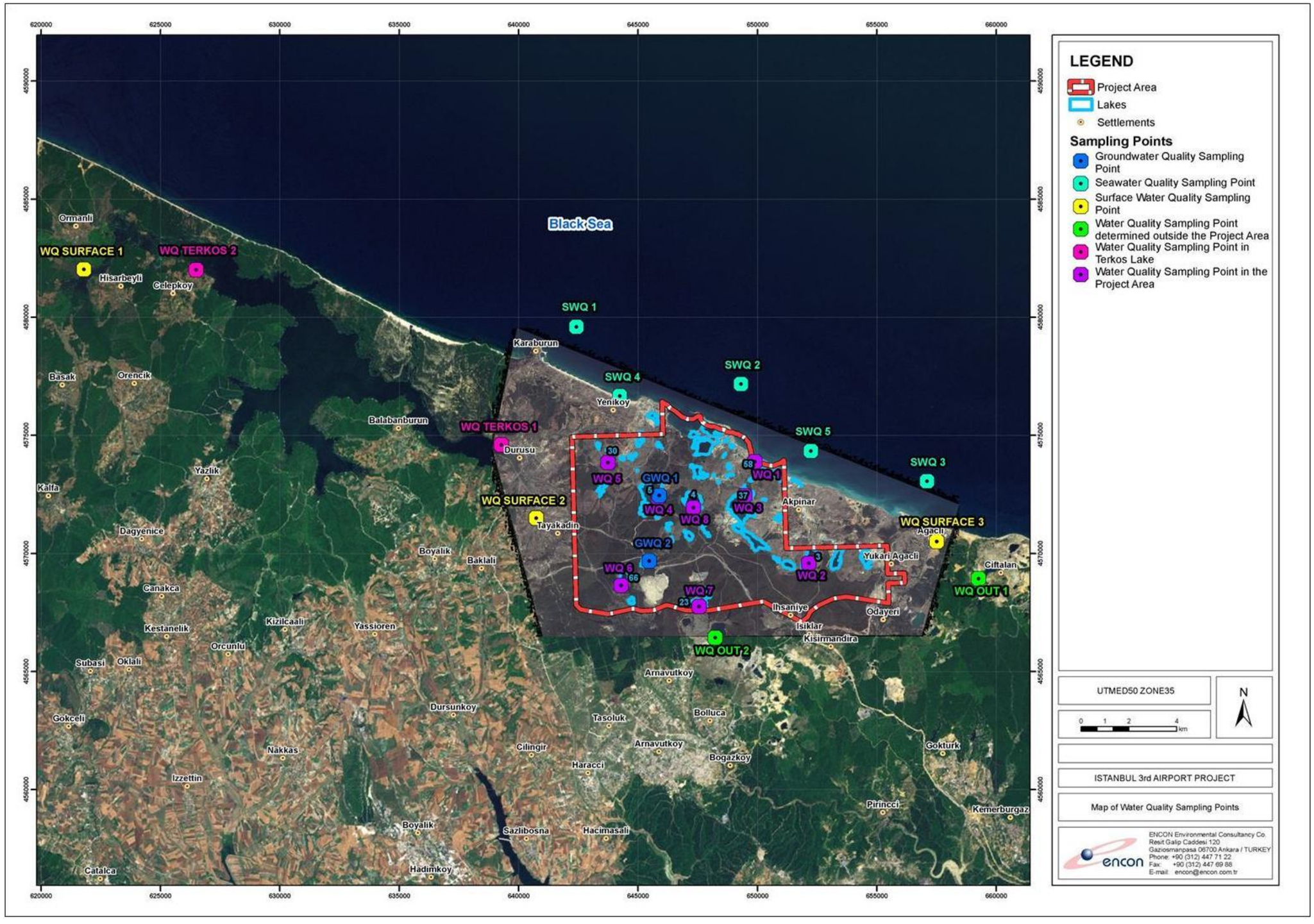
Table 7.5.1 Field Survey for Water Quality Sampling

Code	Analysis	Number of Field Samples
SWQ	Sea Water Quality Analysis (According to the parameters given in Table 4 of Water Pollution Control Regulation)	20 (5 locations, 4 times)
WQ Terkos	Water Quality Analysis - Terkos Lake (According to the parameters given in Table 5 of Surface Water Quality Management Regulation)	8 (2 locations, 4 times)
WQ	Water Quality Analysis - WBs s within the Project Area (According to the parameters given in Table 5 of Surface Water Quality Management Regulation)	24 (8 locations, 3 times) (WB no: 3, 4, 5, 23, 30, 37, 58, 66)
WQ Out	Water Quality Analysis - WBs outside the Project Area (According to the parameters given in Table 5 of Surface Water Quality Management Regulation)	6 (2 locations, 3 times)
WQ Surface	Water Quality Analysis - Streams (According to the parameters given in Table 5 of Surface Water Quality Management Regulation)	9 (3 locations, 3 times)
GWQ	Water Quality Analysis - Groundwater (According to the parameters given in Table 5 of Surface Water Quality Management Regulation)	6 (2 locations, 3 times)

The sampling procedures, sample preservation and storing techniques are carried out in compliance with the Water Pollution Control Regulation Sampling and Analysis Methods published in Official Gazette No. 27372 dated 10.10.2009 and the Turkish Standards (TS EN ISO 5667-3). Methods to be used for *in situ* measurements, laboratory analyses and sampling are presented in the methodology section in Annex 7.5.A.

The results of the water quality field surveys are discussed in Section 7.5.4.3.

Figure 7.5.2 Water Quality Sampling Points



7.5.3.3 Significance Criteria

The impact magnitude and significance of impacts were evaluated with reference to definitive standards, accepted/published criteria and legislation, where available. Where it has not been possible to quantify impacts, qualitative assessments have been carried out based on expert knowledge, GIIP and/or professional judgement, as explained in detail in **Chapter 6 Impact Assessment Methodology**. In this regard, impacts are first identified and classified as adverse (negative) or beneficial (advantageous/positive). The magnitude and likelihood of impacts are then assessed either quantitatively or qualitatively or, in certain instances, both.

Quantitative methods predict measurable changes as a result of the Project and rely on accurately measured baseline conditions to enable suitably accurate predictions/estimations to be made in respect of potential impacts. Qualitative assessment methods rely on expert judgement and experience.

The severity of the impact (i.e. none/negligible, low, moderate or high) and the likelihood of impact (probable, possible, unlikely, and improbable) criteria used in the determination of potential impacts are explained in ESIA **Chapter 6 Impact Assessment Methodology**. In combination, these are used to evaluate the overall significance of impacts. To determine the overall significance, the matrix given in Table 7.5.2 was used.

Table 7.5.2 Matrix for Evaluating Overall Impact Significance

Likelihood of Impact	Severity of Impact			
	Negligible	**Low**	**Moderate**	**High**
Probable	Negligible	Low	Moderate	High
Possible	Negligible	Negligible	Low	Moderate
Unlikely	Negligible	Negligible	Negligible	Low
Improbable	Negligible	Negligible	Negligible	Negligible

While it is important to identify the potential significant impacts associated with the Project, the key focus of the impact assessment has been to define the significance of residual impacts following the application and/or consideration of mitigation measures. A residual impact is one which continues to be present following the application of avoidance and/or mitigation measures. In this regard, a summary table is provided in the final section of this chapter, which indicates the potential significance of impacts in the absence of mitigation to assist in demonstrating the anticipated effectiveness of proposed mitigation measures.

Impacts with regard to water resources are mainly considered according to the following potential issues:

- Increased water use during the construction and operational phases of the Project resulting in increased pressure on the local/regional water resources;
- Stormwater and wastewater discharges to the Black Sea as a result of construction and operation phases of the Project leading to potential impacts such as:
  - Contamination from silt-laden runoff across the construction site and from stockpiles;
  - Contamination by polluting substances (e.g. fuels and chemicals) from accidental spillages and other wastes during general construction activity; and

- Contamination from contaminated excavated material and mobilisation of contaminants during piling and de-watering operations;

- Possible changes in local water quality at discharge points to the Black Sea and on streams or creeks within Alibey Basin where water from dewatering of the WBs will be directed to; and
- Accidental discharges/spillages and surface runoff within the Project Area during the construction and operational phases, which might reach the drinking water resources of Istanbul (Terkos Lake to the north-west and Alibey Dam to the south of the Project Area).

7.5.4 Baseline Information, Background and Sources of Information

7.5.4.1 Sources of Information

The following are the main sources of information used to collect the baseline data and describe the baseline conditions in the Area of Influence, which then formed the basis for the assessment of impacts:

- The EIA Report for the Project, which was prepared on behalf of the Ministry of Transportation, Maritime Affairs and Communications and was finalised in May 2013. The EIA received a positive decision from the Turkish MoEU (Ref. 7.5.6);
- INA Project Master Plan (Ref. 7.5.7);
- The Hydrological and Hydrogeological Report for Istanbul New Airport, Fugro, August 2014 (Ref. 7.5.8);
- Project Memorandum on Groundwater/Drainage for Istanbul New Airport, Fugro, 3 February 2015 (Ref. 7.5.9)
- Data collected (to date) during the ESIA field surveys on water quality; and
- Water Quality Database for Istanbul New Airport, Encon, August 2014 (Ref. 7.5.10).

7.5.4.2 Background

The Project Area includes a total of 70 WBs of different sizes resulting from previous open pit mining activities. They represent approximately 610 ha in total, with areas ranging between 0.17 and 100 ha each. Baseline information regarding the water resources in the Project Area is given below.

Existing and Planned Projects

As stated previously, the Project Area is located 2.5 km east of Terkos Lake which supplies approximately 20% of Istanbul's total water demand and 12 km north of Alibey Dam which supplies approximately 7% of Istanbul's total water demand.

There are four existing water transmission lines passing through the site with a total length of approximately 38 km. The pipeline material is assumed to be steel with diameter of 2,200 mm. The existing main domestic water pipelines will also be identified and relocated outside the airport boundary. Figure 7.5.3 shows the existing services diversion plan (Ref. 7.5.7).

The existing water pipelines include two ISKI water transmission pipelines currently running through the Project Area with one not in use. The operational ISKI pipeline currently running west-east across the Project Area will be relocated to the south of the Project Area. This will be undertaken under IGA's responsibility prior to the commencement of the earthworks and is

expected to be incorporated into the construction of the Northern Marmara Motorway corridor to the south of the Project Area.

The main four lane highway between Ihsaniye and Tayakadin passes through the southern section of the Project Area and will be relocated to the southern boundary of the Project Area to serve the Project. The Northern Marmara Motorway connecting the 3rd Bosphorus Crossing with western Turkey and Eastern Europe is planned to run to the south of the Project Area. This will be a six lane motorway. In addition, a metro system will be constructed to connect the City of Istanbul with the airport.

There are a number of proposed energy projects (including Verbena and Türk-Öz Natural Gas Combined Cycle Power Plants) whose energy transmission lines will pass through or in close proximity to the site. During the EIA process, a meeting was held with the Energy Distribution Company (TEİAS) and Ministry of Transportation, Maritime Affairs and Communications regarding the routes of these lines. The final decision on the routes will be announced at a meeting to be held with General Directorate of Civil Aviation.

In addition to the abovementioned projects, the following existing/planned projects were identified within the vicinity of the Project Area:

- a wind farm (Kemerburgaz Wind Farm) in operation on the south-west of the Project Area (wind turbines are outside the Project Area);
- a wind farm (Tayakadin Wind Farm) has an operational licence in place and is located to the south-west of the Project Area (within the Project Area);
- a wind farm (Gaziosmanpasa Wind Farm) has an operational licence in place and is located to the south-southeast of the Project Area (formerly approximately 2.5 km from the Project Area but understood to be moved to approximately 50 km from the Project Area); and
- a tourism facility and marina (including dry dock area) project planned to the north-north-west of the Project Area.

Figure 7.5.3 Existing Services Diversion Plan

Source: Ref. 7.5.7 (Note: the airport layout based on the December 2013 Master Plan is shown as an updated diversion plan with the revised platform area was not available at the time of this assessment).

Surface Water Resources and Sea Water in the Project Area

As stated previously, the Project Area is located in a region that has been used for mining activities since the first quarter of the 20th century. Pits generated as a result of excavations have filled due to rain water and groundwater seepage. This has resulted in the formation of 70 WBs in the Project Area. The hydrological and hydrogeological studies conducted in the Project Area have revealed that "*most of the lakes are traversed by groundwater, meaning that groundwater seeps into the lakes and the lakes likely discharges to the groundwater, respectively upstream and downstream of the groundwater flow direction*" (Ref. 7.5.8).

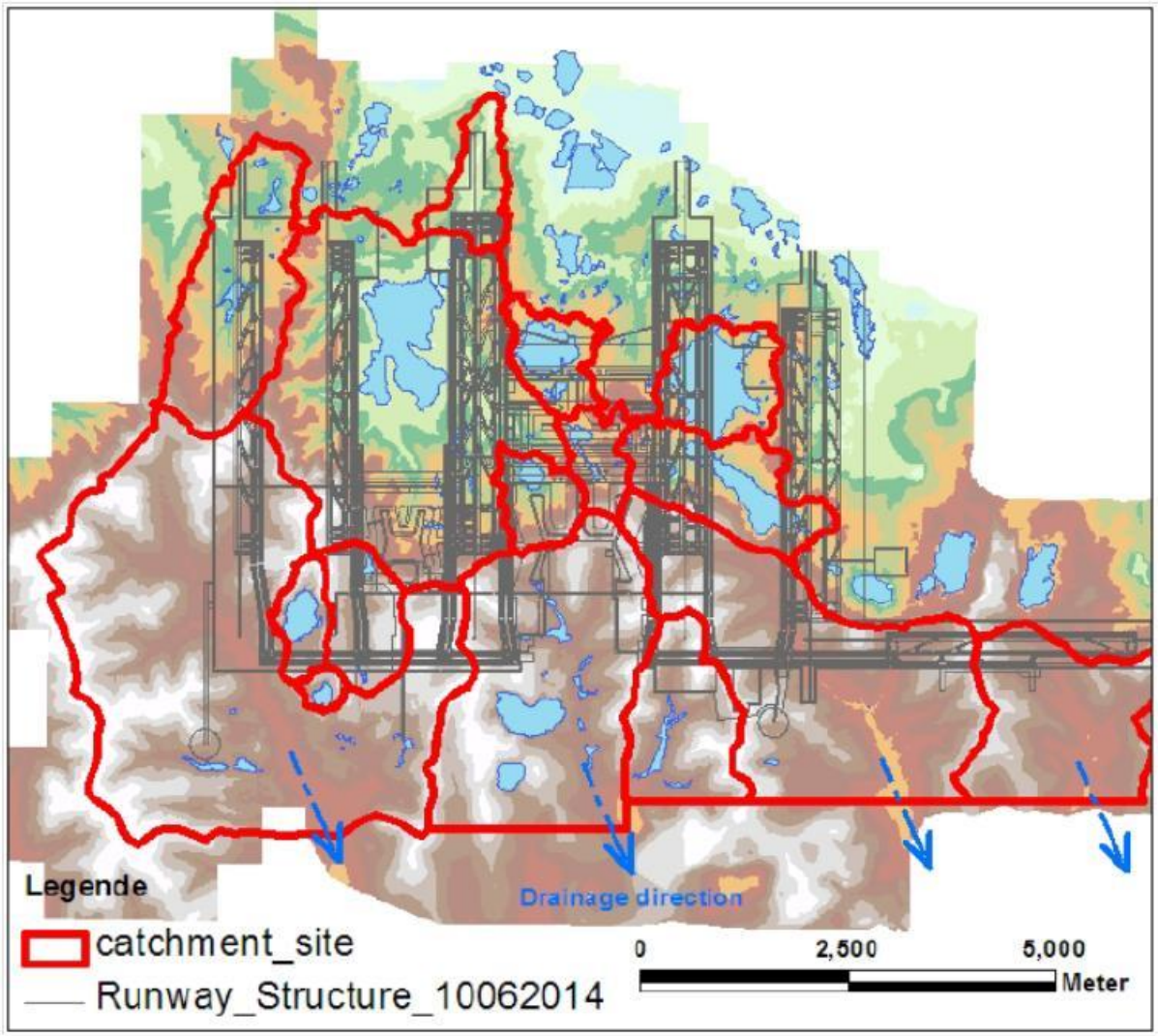
There are no natural lakes within the Project Area. One of the major water resources supplying the City of Istanbul is Terkos Lake, which is located 2.5 km to the west of the Project Area. The lake provides 220 million m^3 per annum. Approximately 7.3 km^2 of Terkos Basin (ca. 740 km^2 in total) is within the north-west side of the Project Area (Figure 7.5.1). Alibey Dam which supplies approximately 7% of Istanbul's total water demand is located 12 km south of the Project Area. Approximately 17.7 km^2 of Alibey Basin (ca. 159 km^2 in total) is within the south-west side of the Project Area (Figure 7.5.1). The Project Area is not a designated water protection area.

Unless defined specifically for each water basin, the WPCR defines absolute protection zone, short-range, mid-range and long-range protection zones for drinking water resources and limits the activities that could take place within these zones. As shown in Figure 7.5.1, approximately 0.5 km^2 of the north-western corner of the Project Area falls within the mid-range protection zone of Terkos Lake. The WPCR limits the activities that could take place in the protection zones. In this regard, in mid-range protection zones, industrial activities are not allowed to take place. As committed to in the Turkish EIA Report, there will be no construction activities that take place in this zone. Part of the Project Area falls within the long-range protection zone (i.e. the basin boundary) of the Terkos Lake and Alibey Dam and there are no legal constraints on the construction of an airport in this zone. According to the INA Project Master Plan (Ref. 7.5.7), the location of the fuel farm, to be used within the scope of airport activities, falls within the Terkos Lake and Alibey Dam basin boundaries (see Figure 7.5.12). ISKI's Regulation on the Drinking Water Basins (Ref. 7.5.12) has some restrictions regarding such activities taking place within the drinking water basin boundary taking into account the potential contamination risks. Therefore, permits will be required from ISKI and the relevant authorities prior to the construction of the fuel farm.

The Project Area slopes downwards in a northerly direction towards the Black Sea. The natural terrain is between 19 m and 176 m above the sea level. There are no continuously flowing rivers in the Project Area. There are some intermittent riverbeds flowing towards the south that carry runoff following precipitation during the wet season.

The WBs remaining from past coal mining activities have their own small catchments which cover the airport site. Figure 7.5.4 shows the natural catchments within the Project Area. In the southern parts of the planned platform area, a main watershed is located which separates the surface runoff into northerly and southerly directions (Ref. 7.5.8). The catchments to the south of the platform area (Figure 7.5.4) are larger and drain towards south. Close to the planned runway platform, the valleys are mostly dry. Many WBs are located in small sinks whose catchments do not have a surface outlet. Due to the earthworks, during the construction of the airport platform, the main watershed in the south will be cut and the northern parts will be elevated and filled. In order to control the surface runoff as a result of change of the topography, an engineered site drainage system will be installed to accommodate peak flows.

Figure 7.5.4 Surface Water Catchments in the Project Area



Source: Ref. 7.5.8 (Note: the airport layout based on the December 2013 Master Plan is shown as an updated figure was not available at the time of this assessment)

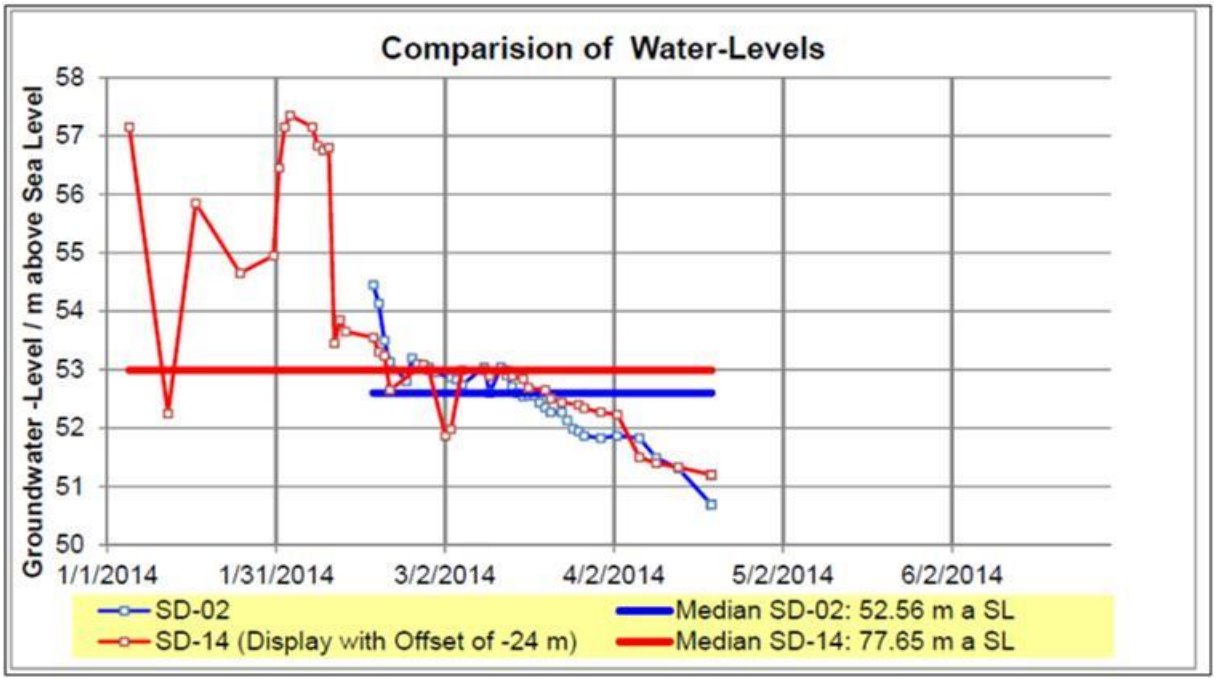
Groundwater Resources in the Project Area

As stated previously, mining activities have been undertaken in the area since the first quarter of the 20th century and therefore there is a possibility of groundwater contamination. Additionally, there are three landfill operations. The largest of which is the Tayakadın Landfill, which is located to the south-west of the Project and operated by the Municipality. This landfill was licensed as a demolition waste landfill. Two other smaller landfills are located in the south-east of the Project Area; one run by the Municipality (ISTAÇ Agacli Demolition Waste Landfill) and the other is the privately run Dunya Maden Landfill which is also located in Agacli. In addition, these two landfills are licensed to receive demolition waste.

For the geological and hydrogeological studies of the Project, standpipes were introduced in a number of boreholes excavated at the Project Area. The groundwater levels in the observation wells (SD-02 and SD-14) have been measured intermittently since the beginning of 2014 (Ref. 7.5.8). As can be seen from Figure 7.5.5, since January 2014 a decreasing trend has been observed in groundwater elevations in the observation wells. It has been observed that the variation of the water levels within the measuring period is very high, which indicates a very low storage coefficient. The groundwater levels are expected to continue to drop until

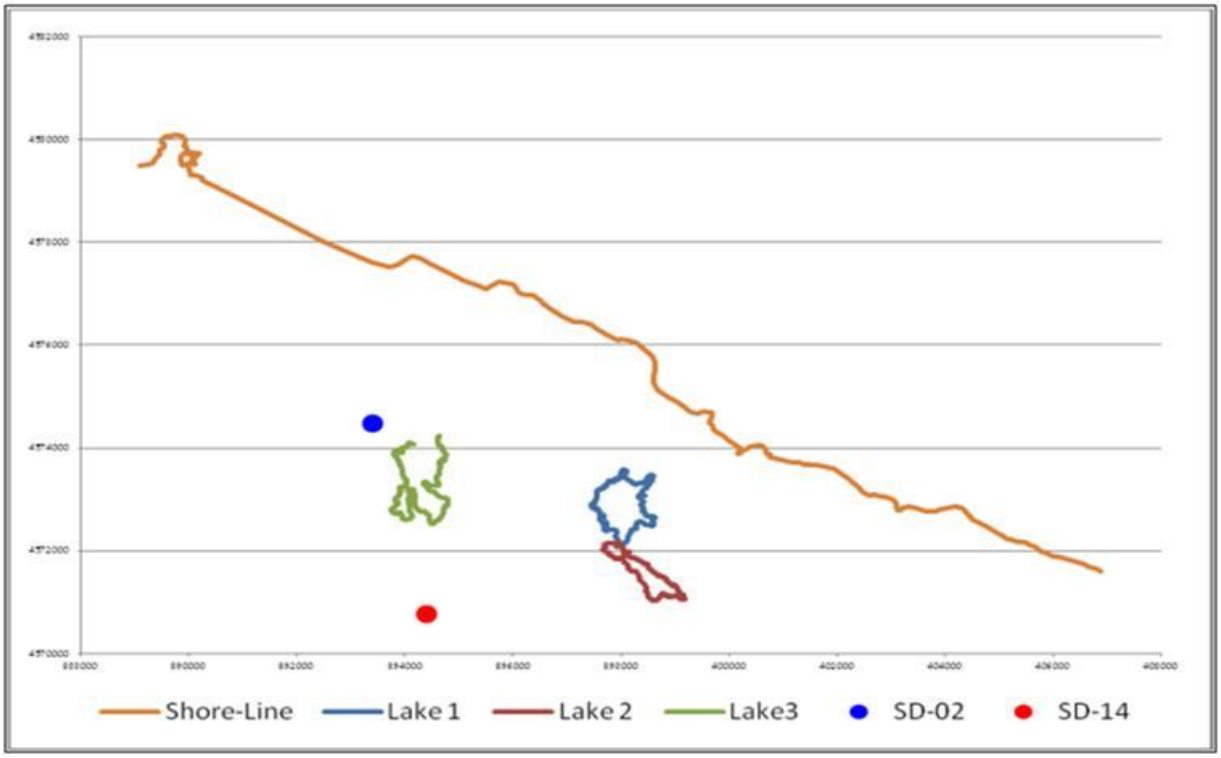
the end of the hydrological summer. From then on, rising groundwater levels are expected until spring (Ref. 7.5.8). The locations of the observation wells are shown in Figure 7.5.6.

Figure 7.5.5 Groundwater Level Hydrograph of the Observation Wells in the Project Area



Source: Ref. 7.5.8

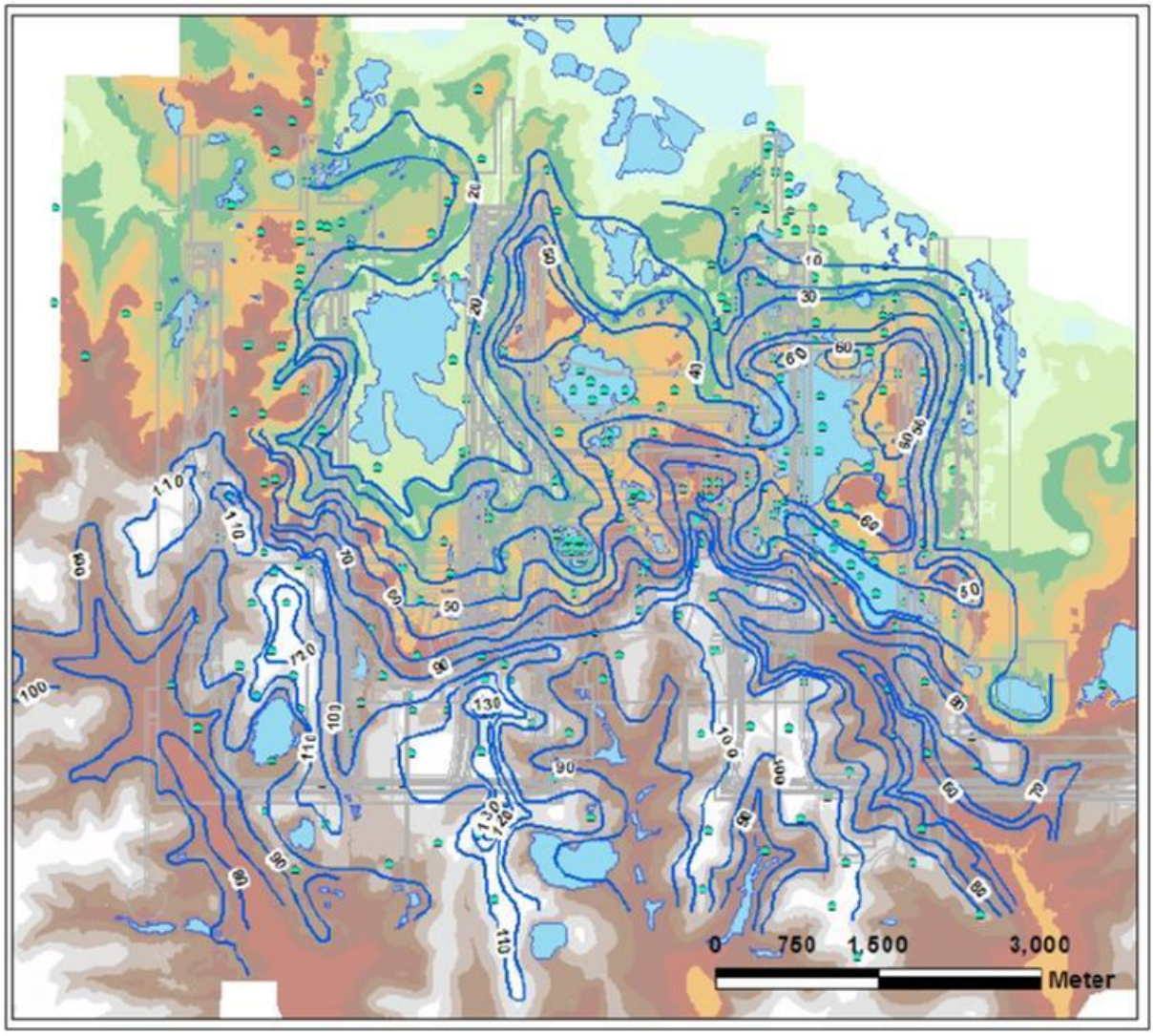
Figure 7.5.6 Locations of the Groundwater Observation Wells (SD-02 and SD-14)



Source: Ref. 7.5.8

As part of the baseline studies, a groundwater contour map has been produced based on groundwater levels from April 2014 (Figure 7.5.7) using both the data from observation wells and geological drilling logs (Ref. 7.5.8).

Figure 7.5.7 Groundwater Contour Map



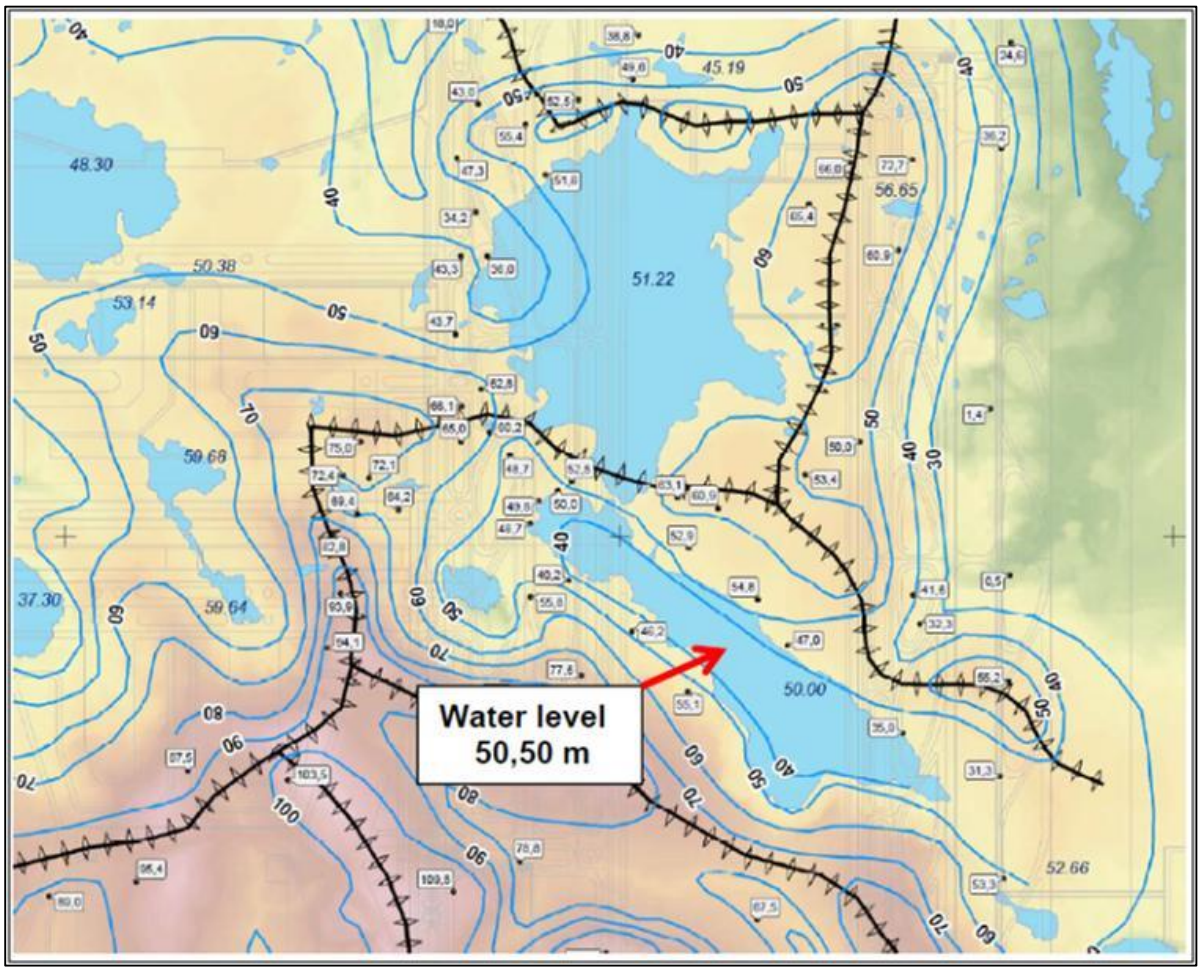
Source: Ref. 7.5.8

It is concluded in Ref. 7.5.8 that "*the evaluation of groundwater levels in combination with geological drilling logs allow for the conclusion that multiple aquifers do not exist. Except for very few measurements, all observations appear to be attributable to a single aquifer*". As can be seen in Figure 7.5.8, the groundwater contours follow the topography. Groundwater sheds follow the highest points in surface level. In the valleys, the groundwater levels are lower. The slopes of the groundwater table towards the valleys can be very steep (Ref. 7.5.8).

Ref. 7.5.8 concludes that "*most of the lakes are traversed by groundwater, meaning that groundwater seeps into the lakes and the lakes likely discharges to the groundwater, respectively upstream and downstream of the groundwater flow direction. An exception is the lake at the east side of the investigation area*". As can be seen from Figure 7.5.8, most of the measured groundwater levels surrounding this WB are below the water level. In this case, the assumption is that the bottom of the WB is strongly clogged. There is no or very little contact with the groundwater body.

According to the Project Memorandum on Groundwater/Drainage prepared by Fugro (Ref. 7.5.9), surface area is assumed highly impermeable with little infiltration, the low permeability suggests low interaction between the lakes and the long term water table.

Figure 7.5.8 Groundwater Contour Map on the Eastern Part of the Project Area



Source: Ref. 7.5.8

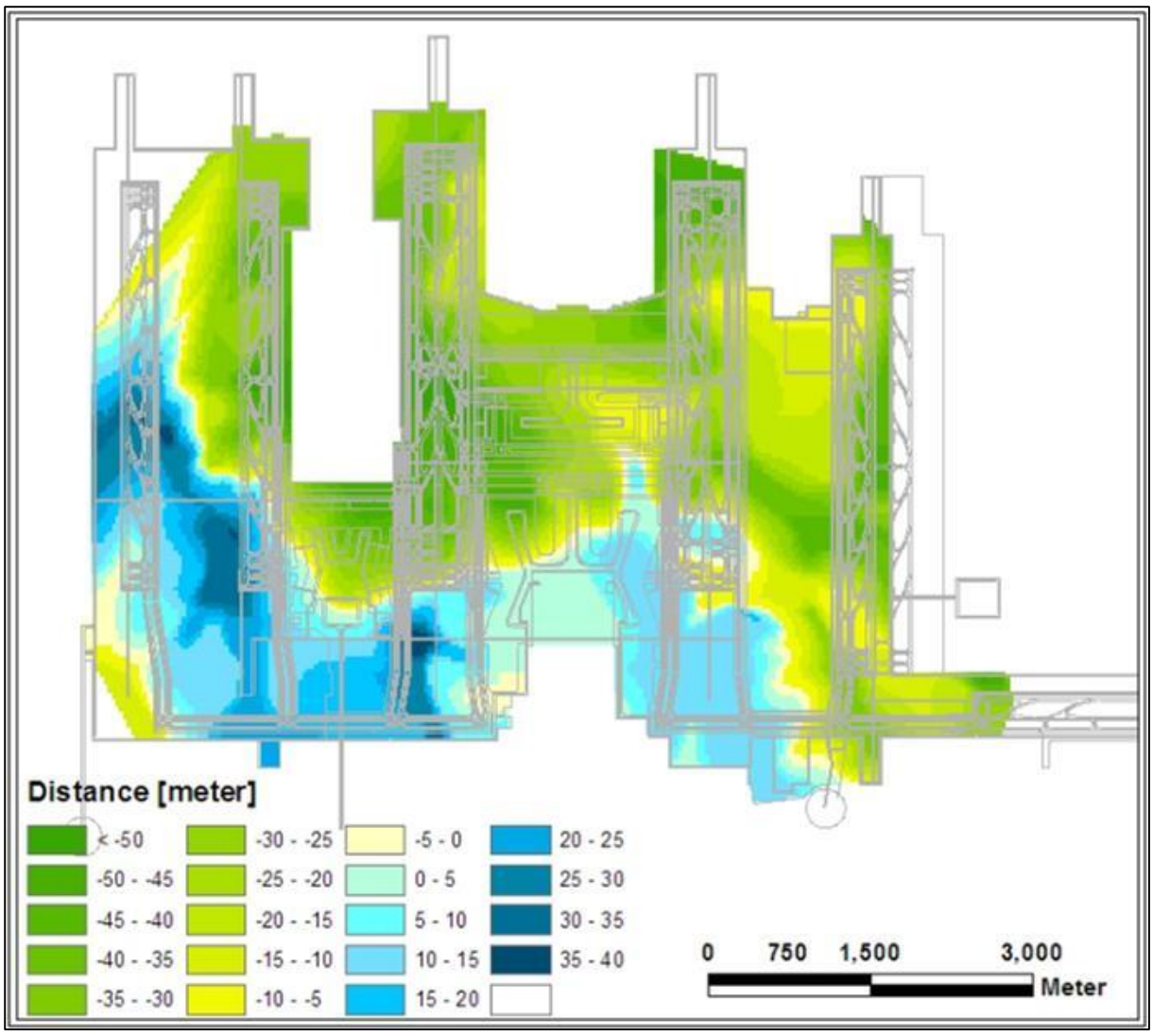
As concluded in Ref. 7.5.8, "*the very steep gradients of the groundwater table as well as the high number of watersheds in the investigation area appear to be associated with the low hydraulic conductivities as well as the significant evaporation rates in the areas with shallow groundwater levels. Although in the south of the model area mostly dry valleys exist, a groundwater flow in the direction of the southern valleys can be observed as the result of this evaporation. The open water surfaces of the lakes add to a dynamic pattern of the groundwater table*". Figure 7.5.9 shows the groundwater table at the Project Site.

The hydraulic conductivities were estimated from grain size and hydrometer data using the Kaubisch method. This method is especially suitable for clayey soils with conductivities of $k < 10^{-6}$ m/s and degrees of inequality of $5 < U < 400$ (Ref. 7.5.8).

The results of the k-value calculations have been displayed in relation to the depth (Figure 7.5.10). As concluded in Ref. 7.5.8 "*at depths up to 70 meter the conductivities are in the range of 10^{-10} to 10^{-8} m/s. Only at greater depths are an increase in the conductivities observed, which is likely to be related to the small sample population. It appears that the majority of the samples show low to very low conductivities, corresponding to those of an aquitard. The low conductivities cause very small horizontal groundwater movements, which*

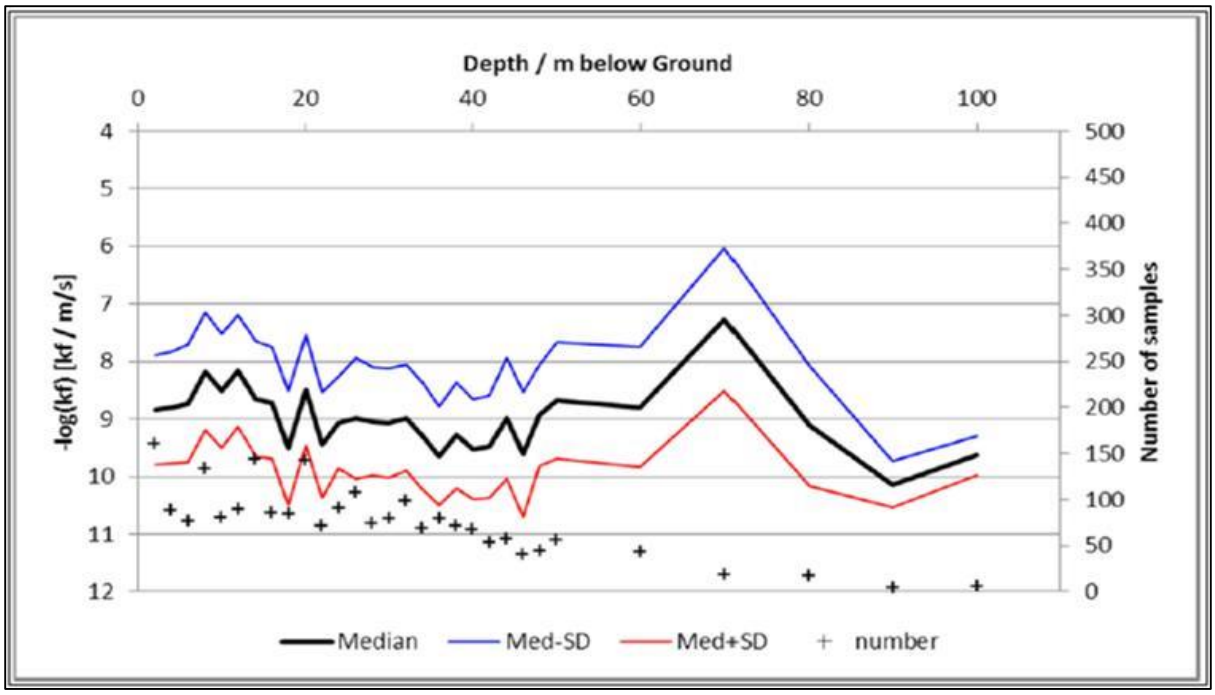
suggest that the site drainage design need not consider significant contributions from groundwater".

Figure 7.5.9 Groundwater Table in the Project Area



Source: Ref. 7.5.8 (Note: the airport layout based on the December 2013 Master Plan is shown as an updated figure was not available at the time of this assessment)

Figure 7.5.10 Average Conductivity vs. Depth of Samples



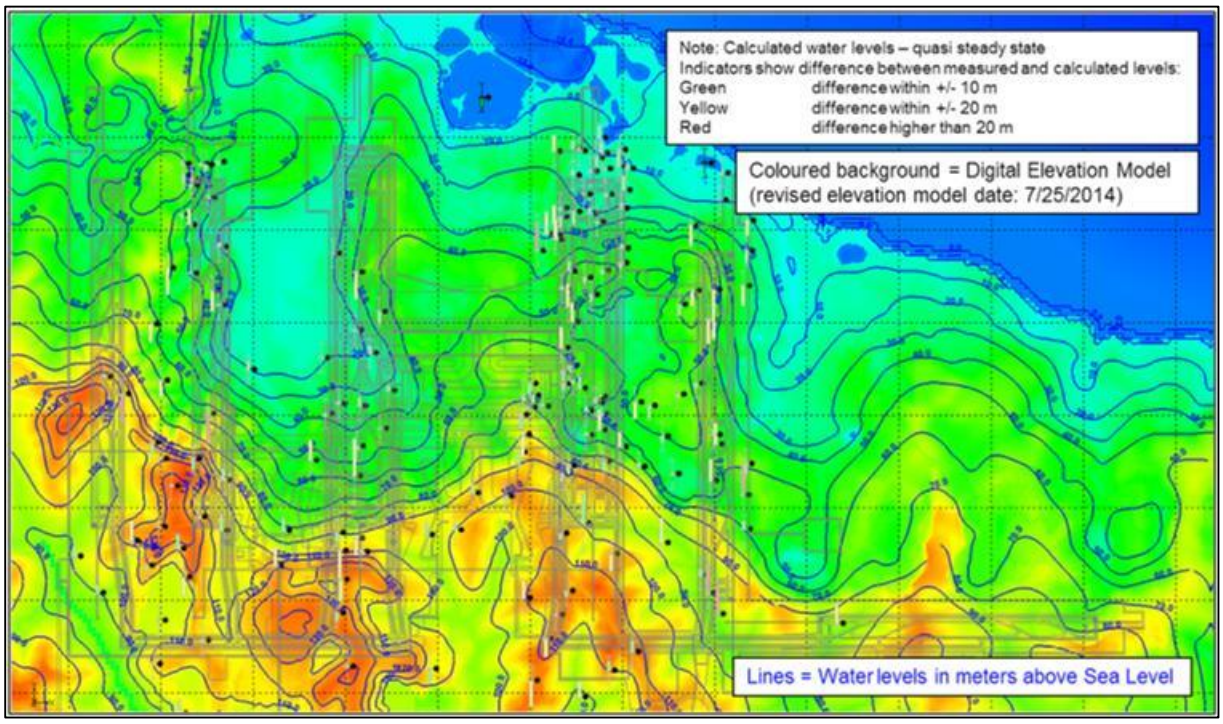
Source: Ref. 7.5.8

Model Simulations (Before the Implementation of the Project)

Underground flow processes in the Project Area were simulated using the MODFLOW programme. The details of the model simulation are given in Ref. 7.5.8. The parameters of geological strata (permeability coefficient, aquifer thickness alternatively height above datum elevation or bottom and top edge of the aquifer, groundwater recharge) have been included in the calculations. Furthermore, defined initial and boundary conditions were taken into consideration. Based on these, a spatial and temporal development of the groundwater flow conditions has been simulated.

As concluded in Ref. 7.5.8, the model results for the conditions before the implementation of the Project show that due to the influence of evaporation in the proximity of the land surface, the groundwater table is strongly dependent on the land surface. The total model area is recharged by a volume of approximately 39,950 m^3/d. Of this volume, 39,600 m^3/d is lost by evaporation. The approximate balance figures, as well as the low conductivities, indicate a very small horizontal groundwater flow. In practice, this means that areal or linear drainage will have a limited lateral impact (low efficiency). The calculated groundwater levels are shown in Figure 7.5.11.

Figure 7.5.11 Calculated Groundwater Levels (Current Situation)



Source: Ref. 7.5.8 (Note: the airport layout based on the December 2013 Master Plan is shown as an updated figure was not available at the time of this assessment).

Existing Water Use in the Project Area

Currently, water in the Project Area is mainly used by nearby settlements. There are five settlements located very close to the Project Area, namely the neighbourhoods of Tayakadin (350 m west), Akpinar (250 m east), Ihsaniye (150 m south), Yenikoy (200 m northwest) and Yukari Agacli, which is currently located within the Project Area. It should be noted that in recent design changes, the east-west runway length has been shortened to avoid the Yukari Agacli neighbourhood. However, the final decision regarding the status of the neighbourhood has yet to be confirmed by the Turkish government.

The total population of all these settlements is around 5,800. At the time of preparation of this section of the ESIA, the amount of water used by those settlements was not yet known. In the event that the Project uses the same water resources as these settlements, this will be undertaken in a manner that will not create pressure on the water availability for these communities.

7.5.4.3 Findings

The results from field surveys conducted for assessing the baseline quality of water resources in the Project Area and its vicinity are presented in this section.

Field Surveys

Field survey results are given under three groups: surface waters, groundwater and sea water.

Surface Waters

Baseline water quality has been assessed for the following surface water resources:

- Eight WBs within the Project Area;

- Terkos Lake (from 2 different points, one at the eastern end and the other at the western end of the lake);
- Two WBs outside the boundary of the Project Area (WQ Out 1 on the eastern side of the Project Area and WQ Out 2 to the southern side of the Project Area); and
- Three streams outside the borders of the Project Area (WQ Surface 1 towards the western side of Terkos Lake, WQ Surface 2 to the west of the Project Area boundary and WQ Surface 3 to the east of the Project Area border).

The locations of the sampling points are given in Figure 8.3.2.1 and the results obtained are tabulated in Tables 8.4.3.1 to 8.4.3.4.

For the eight WBs sampled within the Project Area, the results show that the water quality falls under **Class III** (polluted waters which can be used, following appropriate treatment, for supply of water for industries, except foodstuffs and textile industries) for all eight WBs sampled except WQ1 in February 2014 according to Annex 5 – Table 5 of the Regulation on Surface Water Quality Management. As can be seen from the results given in Table 7.5.3, these WBs fall under Class III due to exceeded pH, conductivity, ammonia nitrogen (NH_3-N), Total Kjeldahl Nitrogen (TKN) and total phosphorus (total P) values. WQ1 falls under **Class IV** due to exceeded TKN value.

The field surveys conducted in May 2014 (Table 7.5.4) show that seven out of eight WBs (from WQ1 to WQ7) fall under **Class III** due to exceeded pH, conductivity and TKN values and WQ8 falls under **Class II** (slightly polluted waters which can be used for supply of drinking water, following appropriate treatment, for recreational purposes and propagation of fish other than trout, irrigation, and industrial use) due to exceeded values of biochemical oxygen demand (BOD) and total coliform.

The field surveys conducted in August 2014 (Table 7.5.5) show that all WBs except WQ6 fall under **Class III** due to exceeded conductivity, TKN and nitrite nitrogen (NO_2-N) values and WQ6 fall under **Class II** due to exceeded conductivity, dissolved oxygen (DO), total P, zinc, faecal and total coliform values.

Water quality results for Terkos Lake showed that the sampling point to the west of the lake (WQ Terkos 2) was **Class III** due to exceeded TKN and faecal coliform values for the winter season results, **Class III** due to exceeded pH value in the spring season results, **Class III** due to exceeded value of TKN for the summer season results and **Class III** due to exceeded value of TKN for the autumn season results.

Water quality results for Terkos Lake showed that the sampling point to the east of the lake (WQ Terkos 1) was **Class IV** due to the exceeded TKN value in the winter season results, **Class III** due to exceeded pH value for the spring season results, **Class III** due to exceeded TKN value for the summer season results and **Class III** due to exceeded value of temperature, colour, ammonia nitrogen (NH_3-N) and TKN for the autumn season results.

Water quality results for the two WBs outside the borders of the Project Area have been found as:

- **Class IV** for WQ Out-1 due to exceeded pH value and **Class II** for WQ Out-2 due to exceeded conductivity, TKN, total P and total coliform values for the winter season results;
- **Class IV** for WQ Out-2 due to exceeded conductivity value for the spring season results (due to access problems WQ Out-1 was not sampled); and

- **Class IV** for WQ Out-2 due to exceeded TKN value for the summer season results (due to access problems WQ Out-1 was not sampled).

Water quality results for the three streams outside the borders of the Project Area have been found as:

- **Class IV** for WQ Surface 1 (NH_3-N and TKN), WQ Surface 2 (TKN) and WQ Surface 3 (NH_3-N, TKN and faecal coliform) for the winter season results;
- **Class II** for WQ Surface 1 (BOD, total P, faecal and total coliform), **Class IV** for WQ Surface 2 (chemical oxygen demand (COD) and BOD) and **Class III** for WQ Surface 3 (conductivity, COD, BOD, total P and faecal coliform) for the spring season results; and
- **Class III** for WQ Surface 1 (NO_2-N), **Class IV** for WQ Surface 2 (faecal coliform) and **Class IV** for WQ Surface 3 (NH_3-N) for the summer season results.

Groundwater

Baseline groundwater quality has been assessed in the Project Area. The locations of the sampling points are given in Figure 8.3.2.1 and the results obtained are tabulated in Table 7.5.3, Table 7.5.4 and Table 7.5.5.

Comparison is made for the parameters in Table 5 of Annex 5 of the Regulation on Surface Water Quality Management as detailed in the methodology.

Table 7.5.3 Winter Season (10-12 February 2014) Water Quality Survey Results for Surface Waters and Groundwater

Parameter		Unit	SWQMR (App-5, Table 5) Water Quality Classes				Water Bodies								Surface Water			Groundwater		Terkos Lake		Water Bodies Outside the Boundary	
			I	II	III	IV	WQ1	WQ2	WQ3	WQ4	WQ5	WQ6	WQ7	WQ8	WQ Surface 1	WQ Surface 2	WQ Surface 3	GWQ1	GWQ2	WQ Terkos 1	WQ Terkos 2	WQ Out-1	WQ Out-2
							Class IV	Class III	Class III	Class III	Class III	Class III	Class III	Class III	Class IV	Class IV	Class IV			Class IV	Class III	Class IV	Class II
General Conditions	Temperature	°C	≤25	≤25	≤30	>30	12.2	9.7	10.1	9.4	9.5	12.3	9.5	9.0	12.3	14.5	14.4	9.0	12.9	15.4	13.1	12.2	9.0
	pH		6.5-8.5	6.5-8.5	6.0-9.0	beyond 6.0-9.0	8.13	8.51	8.28	8.12	7.94	8.89	8.28	8.9	8.30	8.39	8.44	6.96	6.22	8.39	8.26	5.41	8.44
	Conductivity	µs/cm	<400	400-1000	1001-3000	> 3000	1362	964	1186	701	1599	567	544	934	2016	552	1724	1162	490	425	183.6	1887	482
	Colour	RES 436 nm	1.5	3	4.3	5	0.1	0.1	<0.1	0.2	0.1	0.1	0.1	0.1	0.8	0.3	0.6	<0.1	<0.1	0.5	0.9	<0.1	<0.1
		RES 525 nm	1.2	2.4	3.7	2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1
		RES 620 nm	0.8	1.7	2.5	2.8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A) Oxygenation Parameters	DO	mg/L	>8	6-8	3-6	<3	10.95	11.84	11.63	12.04	11.12	11.66	11.79	11.71	11.09	9.72	11.09	3.57	6.90	10.66	10.87	10.91	11.84
	Oxygen Saturation	(%)	90	70-90	40-70	<40	104.6	106	103.8	104.8	97.1	109.3	103.4	103.0	102.5	94.9	110.4	33.6	65.7	107.3	103.7	102.6	104
	COD	mg/L	<25	25-50	50-70	>70	7.96	9.72	8.8	15.40	12.8	9.48	8.96	12.24	16.88	22.92	39.96	28.48	8.56	42.52	20.24	8.08	7.96
	BOD	mg/L	<4	4-8	8-20	>20	<3	<3	<3	4.30	3.8	<3	<3	3.8	5.1	5.2	11.90	9.6	<3	11.3	5.00	<3	<3
	Salinity**	-	-	-	-	-	0.65	0.48	0.59	0.34	0.81	0.27	0.26	0.46	0.1	0.27	0.87	0.58	0.24	0.2	0.09	0.96	0.23
B) Nutrient Parameters	NH3-N	mg/L	<0.2	0.2-1	1-2	>2	<0.2	<0.2	<0.2	<0.2	1.66	<0.2	<0.2	<0.2	2.26	<0.2	3.68	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	NO2-N	mg/L	<0.002	0.002-0.01	0.01-0.05	>0.05	<0.005*	<0.005*	<0.005*	<0.005*	0.0053	<0.005*	<0.005*	<0.005*	<0.005*	0.017	<0.005*	0.009	<0.005*	<0.005*	<0.005*	<0.005	<0.005*
	NO3-N	mg/L	<5	5-10	10-20	>20	0.189	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.728	0.656	0.128	0.332	0.102	0.426	<0.1	0.216	0.109
	TKN	mg/L	0.5	1.5	5	>5	10.78	3.66	2.88	<0.5	0.70	<0.5	1.59	<0.5	6.32	11.17	9.85	<0.5	<0.5	10.89	3.36	2.74	1.12
	Total P	mg/L	<0.03	0.03-0.16	0.16-0.65	>0.65	0.064	0.022	0.084	0.172	0.014	0.054	0.064	0.013	0.06	0.128	0.44	0.198	0.11	0.23	0.102	0.036	0.052
C)Trace Elements (Metals)	Mercury	µg/L	<0.1	0.1-0.5	0.5-2	>2	<0.2*	<0.2*	<0.2*	<0.2*	<0.2*	<0.2*	<0.2*	<0.2*	<0.2*	<0.2*	<0.2*	<0.2*	<0.2*	<0.2*	<0.2*	<0.2*	<0.2*
	Cadmium	µg/L	≤2	2-5	5-7	>7	1.28	1.15	1.097	0.628	1.506	0.650	0.667	0.824	0.614	0.826	1.35	1.33	0.522	<0.5	<0.5	2.81	0.702
	Lead	µg/L	≤10	10-20	20-50	>50	<4.5	9.37	9.74	<4.5	<4.5	<4.5	5.38	<4.5	<4.5	6.9	<4.5	5.52	7.61	8.29	5.05	5.96	5.69
	Copper	µg/L	≤20	20-50	50-200	>200	8.61	7.84	4.19	3.55	4.1	4.52	4.18	3.66	5.048	9.14	4.83	3.86	2.80	12.82	6.3	13.36	3.57
	Nickel	µg/L	≤20	20-50	50-200	>200	<1.2	12.97	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	186.2	<1.2
	Zinc	µg/L	≤200	200-500	500-2000	>2000	161.4	79.59	29.05	16.17	31.01	27.01	32.9	13.00	53.25	70.64	204.5	34.87	33.28	39.76	47.13	160.9	15.01
D)Bacteriological Parameters	Faecal Coliform	EMS/100 mL	≤10	10-200	200-2000	>2000	<10	<10	100	160	150	150	190	290	360	270	2200	10	20	120	270	50	<10
	Total Coliform	EMS/100 mL	≤100	100-20000	20000-100000	>100000	150	100	300	970	860	530	1930	740	3440	8500	8000	380	1220	1080	6400	680	1500

Water Quality Class IV Water Quality Class III Water Quality Class II Water Quality Class I

(*) Class I or Class II (**) Parameter is not included in Table 5 of Annex 5 of SWQMR

Table 7.5.4 Spring Season (13-16 May 2014) Water Quality Survey Results for Surface Waters and Groundwater

Parameter		Unit	SWQMR (App-5, Table 5) Water Quality Classes				Water Bodies								Surface Water			Groundwater		Terkos Lake		Water bodies Outside the Boundary	
			I	II	III	IV	WQ1	WQ2	WQ3	WQ4	WQ5	WQ6	WQ7	WQ8	WQ Surface 1	WQ Surface 2	WQ Surface 3	GWQ1	GWQ2	WQ Terkos 1	WQ Terkos 2	WQ Out-1*	WQ Out-2
							Class III	Class III	Class III	Class III	Class III	Class III	Class III	Class II	Class II	Class IV	Class III			Class III	Class III	-	Class IV
General Conditions	Temperature	°C	≤25	≤25	≤30	>30	20.4	17.6	19	23	20	18.8	18.5	20	20.2	18.8	18.2	16.5	14.6	21.8	21	-	19.8
	pH		6.5-8.5	6.5-8.5	6.0-9.0	beyond 6.0-9.0	8.07	8.63	8.22	8.5	7.4	8.14	8.55	8.23	7.97	7.93	7.98	6.63	6.08	8.56	8.57	-	8.45
	Conductivity	µs/cm	<400	400-1000	1001-3000	> 3000	1799	1320	1654	1003	2100	785	702	130	245	858	1320	1589	676	461	228	-	6890
	Colour	RES 436 nm	1.5	3	4.3	5	0.2	0.1	0.3	0.2	0.2	0.3	<0.1	0.3	1.2	0.8	1.2	0.3	0.1	0.6	1.2	-	0.1
		RES 525 nm	1.2	2.4	3.7	2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	0.2	0.2	<0.1	<0.1	<0.1	0.4	-	<0.1
		RES 620 nm	0.8	1.7	2.5	2.8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.1	0.1	<0.1	<0.1	<0.1	0.2	-	<0.1
A) Oxygenation Parameters	DO	mg/L	>8	6-8	3-6	<3	9.86	10.59	9.24	10.71	8.54	9.33	10.55	9.79	9	7.6	8.9	2.64	6.52	11.32	13.29	-	10.5
	Oxygen Saturation	(%)	90	70-90	40-70	<40	111.4	112.3	102.3	120.2	96.7	101.6	115.5	109.1	99.8	77.5	94.3	27.1	66.5	131.8	151.4	-	118.8
	COD	mg/L	<25	25-50	50-70	>70	6.16	8.32	<3	<3	15.76	6.8	15.36	13.16	16.04	82.96	65.44	6.92	4.96	15.52	13.84	-	<3
	BOD	mg/L	<4	4-8	8-20	>20	<3	<3	<3	<3	4.8	<3	5.3	4.6	4.3	23.1	19.2	<3	<3	4.8	4.5	-	<3
	Salinity**	-	-	-	-	-	0.91	0.66	0.83	0.49	1.13	0.38	0.34	0.65	0.12	0.42	0.95	0.8	0.33	0.22	0.11	-	0.33
B) Nutrient Parameters	NH3-N	mg/L	<0.2	0.2-1	1-2	>2	<0.2	0.851	<0.2	<0.2	<0.2	<0.2	1.35	<0.2	<0.2	<0.2	0.224	<0.2	<0.2	<0.2	<0.2	-	<0.2
	NO2-N	mg/L	<0.002	0.002-0.01	0.01-0.05	>0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005
	NO3-N	mg/L	<5	5-10	10-20	>20	0.147	<0.1	<0.1	0.152	<0.1	<0.1	<0.1	0.414	0.208	1.07	<0.1	0.192	<0.1	<0.1	<0.1	-	<0.1
	TKN	mg/L	0.5	1.5	5	>5	<0.5	3.66	<0.5	0.5	<0.5	3.08	3.08	<0.5	<0.5	4	0.84	<0.5	5.51	<0.5	<0.5	-	2.04
	Total P	mg/L	<0.03	0.03-0.16	0.16-0.65	>0.65	0.036	0.08	0.084	0.128	0.134	0.112	0.024	<0.02	0.05	0.508	0.528	0.25	0.04	0.02	0.04	-	0.158
C)Trace Elements (Metals)	Mercury	µg/L	<0.1	0.1-0.5	0.5-2	>2	<0.2	0.337	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2
	Cadmium	µg/L	≤2	2-5	5-7	>7	<0.5	<0.5	<0.5	<0.5	<0.5	0.654	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5
	Lead	µg/L	≤10	10-20	20-50	>50	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5	33.73	<4.5	<4.5	<4.5	<4.5	<4.5	-	<4.5
	Copper	µg/L	≤20	20-50	50-200	>200	<2	<2	5.09	3.35	2.51	<2	<2	<2	2.47	21.53	2.89	<2	<2	3.8	<2	-	5.81
	Nickel	µg/L	≤20	20-50	50-200	>200	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	-	<1.2
	Zinc	µg/L	≤200	200-500	500-2000	>2000	67.8	77.7	77.14	63.84	68.18	75.45	69.7	75.73	31.98	152.00	69.83	66.67	91.96	81.61	17.34	-	77.36
D)Bacteriological	Faecal Coliform	EMS/100 mL	≤10	10-200	200-2000	>2000	20	<10	<10	<10	<10	<10	<10	<10	30	40	720	<10	<10	30	20	-	20
	Total Coliform	EMS/100 mL	≤100	100-20000	20000-100000	>100000	2500	3890	560	3000	3000	3800	3000	360	3000	4000	20000	1500	1800	2800	2500	-	200

Water Quality Class IV Water Quality Class III Water Quality Class II Water Quality Class I

(*) Samples from WQ Out 1 could not be taken due to access problems, (**) Parameter is not included in Table 5 of Annex 5 of SWQMR

Table 7.5.5 Summer Season (11-15 August 2014) Water Quality Survey Results for Surface Waters and Groundwater

Parameter		Unit	SWQMR (App-5, Table 5) Water Quality Classes				Water Bodies								Surface Water			Groundwater		Terkos Lake		Water Bodies Outside the Boundary	
			I	II	III	IV	WQ1	WQ2	WQ3	WQ4	WQ5	WQ6	WQ7	WQ8	WQ Surface 1	WQ Surface 2	WQ Surface 3	GWQ1	GWQ2	WQ Terkos 1	WQ Terkos 2	WQ Out-1	WQ Out-2
							Class III	Class III	Class III	Class III	Class III	Class II	Class II	Class III	Class III	Class IV	Class IV		Class III	Class III	Class III		Class IV
General Conditions	Temperature	°C	≤25	≤25	≤30	>30	28.1	29.9	28	27.2	31.1	28.6	28.4	28.6	24.4	28.6	31.2	-	16.2	29	28.1	-	31.1
	pH		6.5-8.5	6.5-8.5	6.0-9.0	beyond 6.0-9.0	7.65	8.56	8.07	7.87	7.72	7.59	7.83	7.9	7.61	8.27	8.16	-	5.83	7.52	8.14	-	8.24
	Conductivity	µs/cm	<400	400-1000	1001-3000	> 3000	1675	1356	1504	1147	1480	825	745	1347	349	834	2090	-	694	475	244	-	2090
	Colour	RES 436 nm	1.5	3	4.3	5	<0.45	<0.45	<0.45	<0.45	<0.45	<0.45	<0.45	<0.45	<0.45	0.48	1.08	-	<0.45	0.72	0.62	-	<0.45
		RES 525 nm	1.2	2.4	3.7	2	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	-	<0.37	<0.37	<0.37	-	<0.37
		RES 620 nm	0.8	1.7	2.5	2.8	<0.32	<0.32	<0.32	<0.32	<0.32	<0.32	<0.32	<0.32	<0.32	<0.32	<0.32	-	<0.32	<0.32	<0.32	-	<0.32
A) Oxygenation Parameters	DO	mg/L	>8	6-8	3-6	<3	7.81	10.4	8.09	8.62	6.7	7.08	8.11	8.22	8.14	10.32	8.05	-	6.01	7.89	9.15	-	9.65
	Oxygen Saturation	(%)	90	70-90	40-70	<40	100	138.7	104.5	112.7	90.5	92	104.9	106.9	97.4	133	111.1	-	64.2	103.2	116.5	-	131.9
	COD	mg/L	<25	25-50	50-70	>70	3.36	7.56	<3	5.2	7.24	6.92	4.96	13.96	<3	3.76	40.64	-	<3	10.56	18.16	-	8.44
	BOD	mg/L	<4	4-8	8-20	>20	<3	<3	<3	<3	<3	<3	<3	3.7	<3	<3	14	-	<3	3.2	5.2	-	<3
	Salinity*	-	-	-	-	-	0.84	0.68	0.76	0.56	0.74	0.4	0.36	0.67	0.17	0.41	1.07	-	0.34	0.23	0.11	-	0.34
B) Nutrient Parameters	NH3-N	mg/L	<0.2	0.2-1	1-2	>2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	2.96	-	<0.2	<0.2	<0.2	-	<0.2
	NO2-N	mg/L	<0.002	0.002-0.01	0.01-0.05	>0.05	<0.002	<0.002	<0.002	0.008	0.02	<0.002	<0.002	0.006	0.017	0.035	0.008	-	<0.002	0.002	0.007	-	<0.002
	NO3-N	mg/L	<5	5-10	10-20	>20	<0.4	<0.4	<0.4	<0.4	0.677	<0.4	<0.4	<0.4	<0.4	<0.4	0.996	-	<0.4	<0.4	0.418	-	<0.4
	TKN	mg/L	0.5	1.5	5	>5	3.3	1.4	<0.5	2.29	0.56	<0.5	<0.5	<0.5	0.588	<0.5	4.48	-	<0.5	1.96	1.9	-	6.35
	Total P	mg/L	<0.03	0.03-0.16	0.16-0.65	>0.65	0.052	<0.02	0.062	0.03	0.134	0.08	0.024	0.028	0.088	0.088	0.344	-	0.03	0.068	0.144	-	<0.02
C)Trace Elements (Metals)	Mercury	µg/L	<0.1	0.1-0.5	0.5-2	>2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	-	<0.2
	Cadmium	µg/L	≤2	2-5	5-7	>7	0.6	0.947	0.5	0.973	1.192	0.943	0.954	1.026	0.696	0.852	1.28	-	0.887	0.675	0.747	-	1.059
	Lead	µg/L	≤10	10-20	20-50	>50	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5	<4.5	-	<4.5	<4.5	<4.5	-	<4.5
	Copper	µg/L	≤20	20-50	50-200	>200	8.6	3.33	8.3	3.63	6.44	3.46	2.7	3.69	3.45	4.5	5.4	-	2.59	6.66	2.95	-	4.37
	Nickel	µg/L	≤20	20-50	50-200	>200	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	-	<1.2	<1.2	<1.2	-	<1.2
	Zinc	µg/L	≤200	200-500	500-2000	>2000	197	174.6	259	218.2	219.4	213	218	345.5	236.9	203.2	176.3	-	228.3	219.8	232	-	1534
D)Bacterio logical Parameter	Faecal Coliform	EMS/100 mL	≤10	10-200	200-2000	>2000	40	<10	100	<10	<10	70	10	<10	170	2540	2200	-	<10	10	10	-	40
	Total Coliform	EMS/100 mL	≤100	100-20000	20000-100000	>100000	6000	2400	8000	7220	2840	9800	1900	2150	11360	14000	14400	-	960	3460	9200	-	5400

Water Quality Class IV Water Quality Class III Water Quality Class II Water Quality Class I

Samples from GWQ1 could not be taken due to increase of water level around the sampling point. Samples from WQOut-1 could not be taken due to access problems. (*) Parameter is not included in Table 5 of Annex 5 of SWQMR

Table 7.5.6 Autumn Season (16 September 2014) Water Quality Survey Results for Terkos Lake

Parameter		Unit	SWQMR (App-5, Table 5) Water Quality Classes				Terkos Lake	
			I	II	III	IV	WQ Terkos 1	WQ Terkos 2
General Conditions	Temperature	°C	≤25	≤25	≤30	>30	26	22.7
	pH		6.5-8.5	6.5-8.5	6.0-9.0	beyond 6.0-9.0	7.25	7.89
	Conductivity	µs/cm	<400	400-1000	1001-3000	> 3000	103.8	34.9
	Colour	RES 436 nm	1.5	3	4.3	5	3.92	18
		RES 525 nm	1.2	2.4	3.7	2	1.7	1.28
		RES 620 nm	0.8	1.7	2.5	2.8	1.22	0.38
A) Oxygenation Parameters	DO	mg/L	>8	6-8	3-6	<3	7.6	8
	Oxygen Saturation	(%)	90	70-90	40-70	<40	90.1	94.3
	COD	mg/L	<25	25-50	50-70	>70	32.32	15.28
	BOD	mg/L	<4	4-8	8-20	>20	7.96	3.88
	Salinity*	-	-	-	-	-	0.05	0.02
B) Nutrient Parameters	NH3-N	mg/L	<0.2	0.2-1	1-2	>2	1.38	<0.2
	NO2-N	mg/L	<0.002	0.002-0.01	0.01-0.05	>0.05	<0.002	<0.002
	NO3-N	mg/L	<5	5-10	10-20	>20	<0.4	<0.4
	TKN	mg/L	0.5	1.5	5	>5	3.44	2.68
	Total P	mg/L	<0.03	0.03-0.16	0.16-0.65	>0.65	0.084	0.144
C)Trace Elements (Metals)	Mercury	µg/L	<0.1	0.1-0.5	0.5-2	>2	<0.2	<0.2
	Cadmium	µg/L	≤2	2-5	5-7	>7	<0.5	<0.5
	Lead	µg/L	≤10	10-20	20-50	>50	<4.5	<4.5
	Copper	µg/L	≤20	20-50	50-200	>200	<2	<2
	Nickel	µg/L	≤20	20-50	50-200	>200	<1.2	<1.2
	Zinc	µg/L	≤200	200-500	500-2000	>2000	1.63	20.11
D)Bacteriological Parameters	Faecal Coliform	EMS/100 mL	≤10	10-200	200-2000	>2000	<10	<10
	Total Coliform	EMS/100 mL	≤100	100-20000	20000-100000	>100000	11800	9600

Water Quality Class IV Water Quality Class III Water Quality Class II Water Quality Class I

(*) Parameter is not included in Table 5 of Annex 5 of SWQMR

Sea Water

As given in Figure 7.5.2, sea water quality analyses have been conducted in five different locations at the Black Sea coast, where sampling points SWQ2, SWQ4 and SWQ5 are located close to the Project Area. SWQ1 is located towards the north-west and SWQ3 towards the north-east of the Project Area. The water quality survey results for the winter, spring, summer and autumn seasons are given in Tables 7.5.7 to 7.5.10 respectively. The survey results have been compared with Table 4 (General Quality Criteria for Sea Water) of the Turkish Water Pollution Control Regulation.

The red cells refer to the exceedance values for the parameter at the given sampling location. It can be seen from the results that for all sampling locations, for all seasons, crude oil and petroleum products have exceeded the thresholds set out in the regulation by 10 to 170 times.

Sampling point SWQ1 had copper, zinc and ammonia values that exceed the regulation for the winter season samples, high ammonia values for the spring season and copper values that exceed the regulation for the summer season.

Sampling point SWQ2 had phenols and ammonia values that exceed the regulation for the winter season samples, high pH and ammonia values for the spring season and copper values that exceed the regulation for the summer season.

Sampling point SWQ3 had only ammonia value that exceed the regulation for both the winter and spring season samples and copper values that exceed the regulation for the summer season.

Sampling point SWQ4 had copper and phenol values that exceed the regulation for the winter season samples, high pH, mercury and ammonia values for the spring season and copper values that exceed the regulation for the summer season.

Sampling point SWQ5 had phenol and ammonia values that exceed the regulation for the winter season samples, had high ammonia values for the spring season, copper and zinc values that exceed the regulation for the summer season.

For the autumn season results, all sampling points had copper values that exceed the regulation.

Table 7.5.7 Winter Season (10-12 February 2014) Water Quality Survey Results for Sea Water

Parameter	Unit	WPCR Table 4	SWQ1	SWQ2	SWQ3	SWQ4	SWQ5
pH	**-**	6.0-9.0	8.88	8.51	8.82	8.78	8.47
Colour ([1])	**-**	Natural	Natural (5 Pt-Co)	Natural (5 Pt-Co)	Natural (5 Pt-Co)	Natural (5 Pt-Co)	Natural (10 Pt-Co)
Floating matter ([2])		-	None	None	None	None	None
Suspended Solids	**mg/L**	30	<15	<15	<15	<15	<15
Turbidity ([1])	**-**	Natural	Natural (2.41 NTU)	Natural (1.75 NTU)	Natural (1.62 NTU)	Natural (1.81 NTU)	Natural (0.89 NTU)
Dissolved Oxygen ([3])	**%**	Over 90% of saturation	102.0	101.1		100.2	101.8
Crude oil and petroleum products ([4])	**mg/L**	0.003	0.21	0.43	0.52	0.22	0.04
Chlorophyll-a ([5])	**µg/L**	-	<0.1	<0.1	<0.1	<0.1	<0.1
Toxicity Dilution Factor (TDF)	**-**	Not allowed any	No	No	No	No	No
Phenols	**mg/L**	0.001	<0.001	0.0128	<0.001	0.039	0.0081
Cu	**mg/L**	0.01	0.033	0.0059	0.0057	0.0175	0.0044
Cd	**mg/L**	0.01	0.0023	0.0022	0.0022	0.0023	0.0024
Cr	**mg/L**	0.1	0.016	0.0046	0.0046	0.0091	0.0055
Pb	**mg/L**	0.1	0.021	0.011	<0.007	0.0078	<0.007
Ni	**mg/L**	0.1	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Zn	**mg/L**	0.1	0.226	0.061	0.053	0.095	0.050
Hg	**mg/L**	0.004	0.004	0.004	0.001	0.003	0.0007
As	**mg/L**	0.1	<0.008	<0.008	0.009	<0.008	<0.008
Ammonia	**mg/L**	0.02	0.041	0.044	0.03	<0.02	0.042
Degradable Organic Pollutants (BOD_5) ([6])	**mg/L**	-	8.3	5.5	7.6	5.8	6.3

([1]) There are not any defined criteria for these parameters in the regulation. It is indicated that, colour and turbidity should not affect more than 90% the normal photosynthesis activity at the depth of sampling.
([2]) There is not any defined criterion for this parameter in the regulation. It is stated that, no floating matter should be present in the sample as liquids (oil, tar, etc.) or solids (waste materials).
([3]) Dissolved oxygen should be monitored with respect to depth all along the sea depth.
([4]) The parameters should be evaluated separately in the water, the biota and the sediment and preferably should not exist.
([5]) This parameter is defined as “reproductivity” in the regulation. There is not any defined criterion for this parameter in the Regulation. It is stated that the “seasonal reproductivity levels of the sea environment will be maintained”.
([6]) This parameter is defined as “Degradable Organic Pollutants” in the regulation and no criterion is defined within the regulation. For the purposes of analysis BOD_5 has been measured in the samples. The regulation states that “after dilution, the amount of degradable organic pollutants should not be at a level so as to endanger the DO level reported above”.

Table 7.5.8 Spring Season (13-16 May 2014) Water Quality Survey Results for Sea Water

Parameter	Unit	WPCR Table 4	SWQ1	SWQ2	SWQ3	SWQ4	SWQ5
pH	-	6.0-9.0	8.18	9.63	8.22	9.6	8.36
Colour ([1])	-	Natural	Natural (10 Pt-Co)	Natural (10 Pt-Co)	Natural (10 Pt-Co)	Natural (10 Pt-Co)	Natural (10 Pt-Co)
Floating matter ([2])		-	None	None	None	None	None
Suspended Solids	mg/L	30	<15	<15	<15	<15	<15
Turbidity ([1])	-	Natural	Natural (0.75 NTU)	Natural (1.76 NTU)	Natural (1.68 NTU)	Natural (0.71 NTU)	Natural (1.93 NTU)
Dissolved Oxygen ([3])	%	Over 90% of saturation	112.8	112.9	117.2	109.5	115.4
Crude oil and petroleum products ([4])	mg/L	0.003	0.06	0.14	0.06	0.04	0.04
Chlorophyll-a ([5])	µg/L	-	<3.6	<3.6	<3.6	<3.6	<3.6
Toxicity Dilution Factor (TDF)	-	Not allowed any	No	No	No	No	No
Phenols	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cu	mg/L	0.01	<0.002	<0.002	<0.002	<0.002	<0.002
Cd	mg/L	0.01	<0.001	<0.001	<0.001	<0.001	<0.001
Cr	mg/L	0.1	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
Pb	mg/L	0.1	<0.007	<0.007	<0.007	<0.007	<0.007
Ni	mg/L	0.1	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Zn	mg/L	0.1	0.073	0.074	0.032	0.074	0.067
Hg	mg/L	0.004	0.0039	0.0014	0.0007	0.0056	<0.0002
As	mg/L	0.1	<0.008	<0.008	<0.008	<0.008	<0.008
Ammonia	mg/L	0.02	0.26	0.064	0.05	0.054	0.08
Degradable Organic Pollutants (BOD_5) ([6])	mg/L	-	6	9.6	10.4	8	4

([1]) There are not any defined criteria for these parameters in the regulation. It is indicated that, colour and turbidity should not affect more than 90% the normal photosynthesis activity at the depth of sampling.
([2]) There is not any defined criterion for this parameter in the regulation. It is stated that, no floating matter should be present in the sample as liquids (oil, tar, etc.) or solids (waste materials).
([3]) Dissolved oxygen should be monitored with respect to depth all along the sea depth.
([4]) The parameters should be evaluated separately in the water, the biota and the sediment and preferably should not exist.
([5]) This parameter is defined as “reproductivity” in the regulation. There is not any defined criterion for this parameter in the regulation. It is stated that the “seasonal reproductivity levels of the sea environment will be maintained”.
([6]) This parameter is defined as “Degradable Organic Pollutants” in the regulation and no criterion is defined within the regulation. For the purposes of analysis BOD_5 has been measured in the samples. The regulation states that “after dilution, the amount of degradable organic pollutants should not be at a level so as to endanger the DO level reported above”.

Table 7.5.9 Summer Season (11-15 August 2014) Water Quality Survey Results for Sea Water

Parameter	Unit	WPCR Table 4	SWQ1	SWQ2	SWQ3	SWQ4	SWQ5
pH	-	6.0-9.0	8.47	8.46	8.46	8.47	8.43
Colour ([1])	-	Natural	Natural (2.02 Pt-Co)	Natural (2.02 Pt-Co)	Natural (2.02 Pt-Co)	Natural (2.02 Pt-Co)	Natural (3.54 Pt-Co)
Floating matter ([2])		-	None	None	None	None	None
Suspended Solids	mg/L	30	<15	<15	<15	<15	<15
Turbidity ([1])	-	Natural	Natural (0.9 NTU)	Natural (0.49 NTU)	Natural (0.51 NTU)	Natural (2.68 NTU)	Natural (1.25 NTU)
Dissolved Oxygen ([3])	%	Over 90% of saturation	103.5	107.6	105.2	104.2	107
Crude oil and petroleum products ([4])	mg/L	0.003	0.136	0.232	0.346	<0.104	0.352
Chlorophyll-a ([5])	µg/L	-	<3.6	<3.6	<3.6	<3.6	<3.6
Toxicity Dilution Factor (TDF)	-	Not allowed any	<4	<4	<4	<4	<4
Phenols	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cu	mg/L	0.01	0.033	0.036	0.032	0.035	0.038
Cd	mg/L	0.01	<0.001	<0.001	<0.001	<0.001	<0.001
Cr	mg/L	0.1	0.036	0.036	0.032	0.029	0.039
Pb	mg/L	0.1	0.035	0.009	<0.007	0.031	0.014
Ni	mg/L	0.1	0.003	<0.0015	<0.0015	0.009	0.006
Zn	mg/L	0.1	0.073	0.01	0.031	0.093	0.166
Hg	mg/L	0.004	0.0003	0.0004	0.0004	0.0015	0.0004
As	mg/L	0.1	<0.008	<0.008	<0.008	<0.008	<0.008
Ammonia	mg/L	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Degradable Organic Pollutants (BOD_5) ([6])	mg/L	-	<3	<3	<3	<3	<3

([1]) There are not any defined criteria for these parameters in the regulation. It is indicated that, colour and turbidity should not affect more than 90% the normal photosynthesis activity at the depth of sampling.
([2]) There is not any defined criterion for this parameter in the regulation. It is stated that, no floating matter should be present in the sample as liquids (oil, tar, etc.) or solids (waste materials).
([3]) Dissolved oxygen should be monitored with respect to depth all along the sea depth.
([4]) The parameters should be evaluated separately in the water, the biota and the sediment and preferably should not exist.
([5]) This parameter is defined as “reproductivity” in the regulation. There is not any defined criterion for this parameter in the regulation. It is stated that the “seasonal reproductivity levels of the sea environment will be maintained”.
([6]) This parameter is defined as “Degradable Organic Pollutants” in the regulation and no criterion is defined within the regulation. For the purposes of analysis BOD_5 has been measured in the samples. The Regulation states that “after dilution, the amount of degradable organic pollutants should not be at a level so as to endanger the DO level reported above”.

Table 7.5.10 Autumn Season (10 October 2014) Water Quality Survey Results for Sea Water

Parameter	Unit	WPCR Table 4	SWQ1	SWQ2	SWQ3	SWQ4	SWQ5
pH	-	6.0-9.0	8.62	8.66	8.73	8.56	8.57
Colour ([1])	-	Natural	Natural (<5 Pt-Co)	Natural (<5 Pt-Co)	Natural (<5 Pt-Co)	Natural (<5 Pt-Co)	Natural (<5 Pt-Co)
Floating matter ([2])		-	None	None	None	None	None
Suspended Solids	mg/L	30	<15	<15	<15	<15	<15
Turbidity ([1])	-	Natural	Natural (0.47 NTU)	Natural (1.24 NTU)	Natural (0.78 NTU)	Natural (0.71 NTU)	Natural (1.63 NTU)
Dissolved Oxygen ([3])	%	Over 90% of saturation	102.0	101.5	102.0	101.3	100.4
Crude oil and petroleum products ([4])	mg/L	0.003	<0.104	<0.104	0.221	0.211	0.165
Chlorophyll-a ([5])	µg/L	-	<3.6	<3.6	<3.6	<3.6	<3.6
Toxicity Dilution Factor (TDF)	-	Not allowed any	<4	<4	<4	<4	<4
Phenols	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cu	mg/L	0.01	0.019	0.020	0.022	0.022	0.022
Cd	mg/L	0.01	<0.001	<0.001	<0.001	<0.001	<0.001
Cr	mg/L	0.1	<0.0012	<0.0012	<0.0012	<0.0012	<0.0012
Pb	mg/L	0.1	<0.007	<0.007	<0.007	<0.007	<0.007
Ni	mg/L	0.1	0.003	0.0033	0.0034	0.005	0.004
Zn	mg/L	0.1	0.007	0.005	0.009	0.03	0.025
Hg	mg/L	0.004	0.0003	<0.0002	<0.0002	<0.0002	<0.0002
As	mg/L	0.1	<0.008	<0.008	<0.008	<0.008	<0.008
Ammonia	mg/L	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Degradable Organic Pollutants (BOD_5) ([6])	mg/L	-	<3	<3	<3	<3	<3

([1]) There are not any defined criteria for these parameters in the regulation. It is indicated that, colour and turbidity should not affect more than 90% the normal photosynthesis activity at the depth of sampling.
([2]) There is not any defined criterion for this parameter in the regulation. It is stated that, no floating matter should be present in the sample as liquids (oil, tar, etc.) or solids (waste materials).
([3]) Dissolved oxygen should be monitored with respect to depth all along the sea depth.
([4]) The parameters should be evaluated separately in the water, the biota and the sediment and preferably should not exist.
([5]) This parameter is defined as “reproductivity” in the regulation. There is not any defined criterion for this parameter in the regulation. It is stated that the “seasonal reproductivity levels of the sea environment will be maintained”.
([6]) This parameter is defined as “Degradable Organic Pollutants” in the regulation and no criterion is defined within the regulation. For the purposes of analysis BOD_5 has been measured in the samples. The Regulation states that “after dilution, the amount of degradable organic pollutants should not be at a level so as to endanger the DO level reported above”.

7.5.5 Potential Impacts

The potential impacts on water resources associated with the Project are expected to be primarily related to the water use and wastewater discharge during the earthworks, construction and operational phases of the Project. Additionally, the dewatering of the WBs within the Project Area may also create a potential change or deterioration in the local water quality at the discharge points. The potential impacts are considered under the following main issues in this section:

- Change or deterioration in the local water quality at the discharge points to the Black Sea and to streams/creeks within Alibey Basin due to dewatering of the WBs within the Project Area;
- Increased water use due to construction and operation of the Project resulting in increased pressure in the local/regional water resources;
- Stormwater and wastewater discharge to the Black Sea during construction and operation of the Project, including potential impacts such as:
  - Contamination from silt-laden runoff across the construction site and from stockpiles;
  - Contamination by polluting substances (e.g. fuels and chemicals) from accidental spillages and other wastes during general construction activity; and
  - Contamination from contaminated excavated material and mobilisation of contaminants during piling and de-watering operations; and
- Accidental discharges/spillages and surface runoff within the Project Area during the construction or operational phases, which might reach to the drinking water resources of Istanbul (Terkos Lake to the north-west and Alibey Dam to the south of the Project Area).

7.5.5.1 Receptors

The following existing sensitive receptors are likely to be impacted by the construction and operation of the Project:

- Black Sea as the receiving environment (wastewater discharge points to the sea and their vicinity);
- Terkos Lake and Alibey Dam (in case any accidental discharges/spillages and surface runoff within the Project Area);
- Regional groundwater aquifer systems (due to possible water abstraction during operation phase of the Project and potential groundwater contamination if best practices are not implemented); and
- Local and regional communities (due to increased water use).

7.5.5.2 Earthworks and Construction

Water Discharge due to Dewatering of Water Bodies

The Project Area includes 70 WBs created as a result of the mineral working excavations which will be dewatered and then filled to accommodate construction of runway platforms, airport terminals and support buildings and operations. According to the engineering design/evaluation of the dewatering process, firstly, the WBs within the runway construction sites will require dewatering prior to earthworks. Water from those WBs will be used for dust suppression, concrete mixing and vehicle wash during the construction phase. In total,

15.5 million m^3 of water from the WBs will be used during construction phase. However, as the volume of water in the WBs is in excess of that expected to be required for dust suppression, concrete mixing and vehicle wash, alternative options for dewatering and discharge have been considered, as detailed below.

The 70 WBs (see Figure 7.5.12) will be dewatered following an agreed schedule. Initially WBs No. 1, 37, 38 and 39 will be dewatered via diverting the water to WB No. 58 from where it will be discharged to the sea (these four WBs contain approximately one third of the total volume of water contained in all WBs).

According to the engineering design/evaluation of the dewatering process, WB No. 58 will act as a sediment trap. The water will not be discharged immediately from this WB but rather will overflow to the sea once the water level within the WB reaches the maximum level on the sea side of the WB.

The same approach will be taken for the WBs in the southern parts of the Project Area. They will be directed to streams/creeks within Alibey Basin after being settled. WBs No. 18, 23, 24, 25 and 66 which fall within the boundaries of Alibey Basin will be directed southwards to streams/creeks within Alibey Basin.

According to the dewatering schedule, WB No. 4 will be discharged to WB No. 5 (Kulakcayiri) from where water will be used for concrete mixing, dust suppression and camp needs (water treatment might be required depending on the water uses). Figure 7.5.13 through Figure 7.5.16 show the dewatering works that started at the beginning of July 2014. The figures show discharge to WB No. 5 (Kulakcayiri).

It is assumed that the sampled WBs are representative of all existing WBs within the Project Area most of which will ultimately be dewatered. Table 7.5.11 provides the corresponding numbers of the eight sampled WBs.

Table 7.5.11 WB Sampling Points

WB Sampling Point	WB No.
WQ1	58
WQ2	3
WQ3	37
WQ4	5
WQ5	30
WQ6	66
WQ7	23
WQ8	4

Considering the water quality results of the WBs, they have mostly been classified as **Class III** due to exceeded pH, conductivity, NH_3-N, TKN, total P and faecal coliform values. Although the WBs fall under **Class III**, the results reported for parameters such as metals, colour, chemical oxygen demand (COD) and biochemical oxygen demand (BOD) fall under higher quality classes (Class I or Class II). Therefore, based on the baseline water quality results tabulated above under section 7.5.4.3, it can be concluded that the dewatering process is not expected to result in increased levels of metals, colour, COD and BOD at the discharge points to the Black Sea.

WB No. 58 has been found to fall under Class III and Class IV due to values measured for pH and/or TKN.

As can be seen from Table 7.5.11, WB No. 4 and WB No. 5 have also been subject to the baseline water quality assessment study. According to the water quality results given under section 7.5.4.3, WB No. 4 (WQ8) was found to fall under Class III due to results for pH and faecal coliform in winter season, Class II due to BOD and total coliform in the spring season and Class III due to conductivity for the summer season results. WB No. 5 (WQ4) was found to fall under Class II at all times in the winter season due to total P, in the spring season due to conductivity and in the summer season due to conductivity and TKN. Therefore, if WB No. 5 is used for camp needs, the existing water quality and the quality required for the purposes of camp needs have to be taken into account and treatment will be required accordingly.

WB No. 23 (WQ7), located to the south of the Project Area, was found to fall under Class III due to results for TKN in the winter season, Class III due to pH, NH_3-N and TKN in the spring season and Class II due to conductivity, zinc, faecal coliform and total coliform for the summer season results.

WB No. 66 (WQ6), located to the south of the Project Area, was found to fall under Class III due to results for pH in the winter season, Class III due to TKN in the spring season and Class II due to conductivity, DO, total P, zinc, faecal coliform and total coliform for the summer season results.

The WBs No. 18, 23, 24, 25 and 66 located to the south of the Project Area fall within the boundaries of Alibey Basin and will be directed southwards to streams/creeks within Alibey Basin. Taking into account the baseline water quality results as detailed under the Findings section, opinions of relevant governmental institutions will be taken regarding the dewatering within Alibey Basin and, if required, relevant permissions will be taken in advance as Alibey Reservoir is one of the drinking water resources of Istanbul.

One issue regarding dewatering will be sediment transport throughout the WB interconnections, which has the potential to result in increased turbidity, suspended solids and sediment deposition at the discharge points to the Black Sea coast and to the streams/creeks flowing within Alibey Basin. As it is the case for WB No. 58, in order to prevent any negative environmental impact due to discharge of high suspended solids, the discharge will be made after water has been settled for a certain period of time using the final WB as a sediment trap before the discharge.

The dewatering has the potential to have a temporary impact on the local water quality at the discharge points to the Black Sea and to the streams/creeks flowing within Alibey Basin.

Figure 7.5.12 WB Dewatering Plan

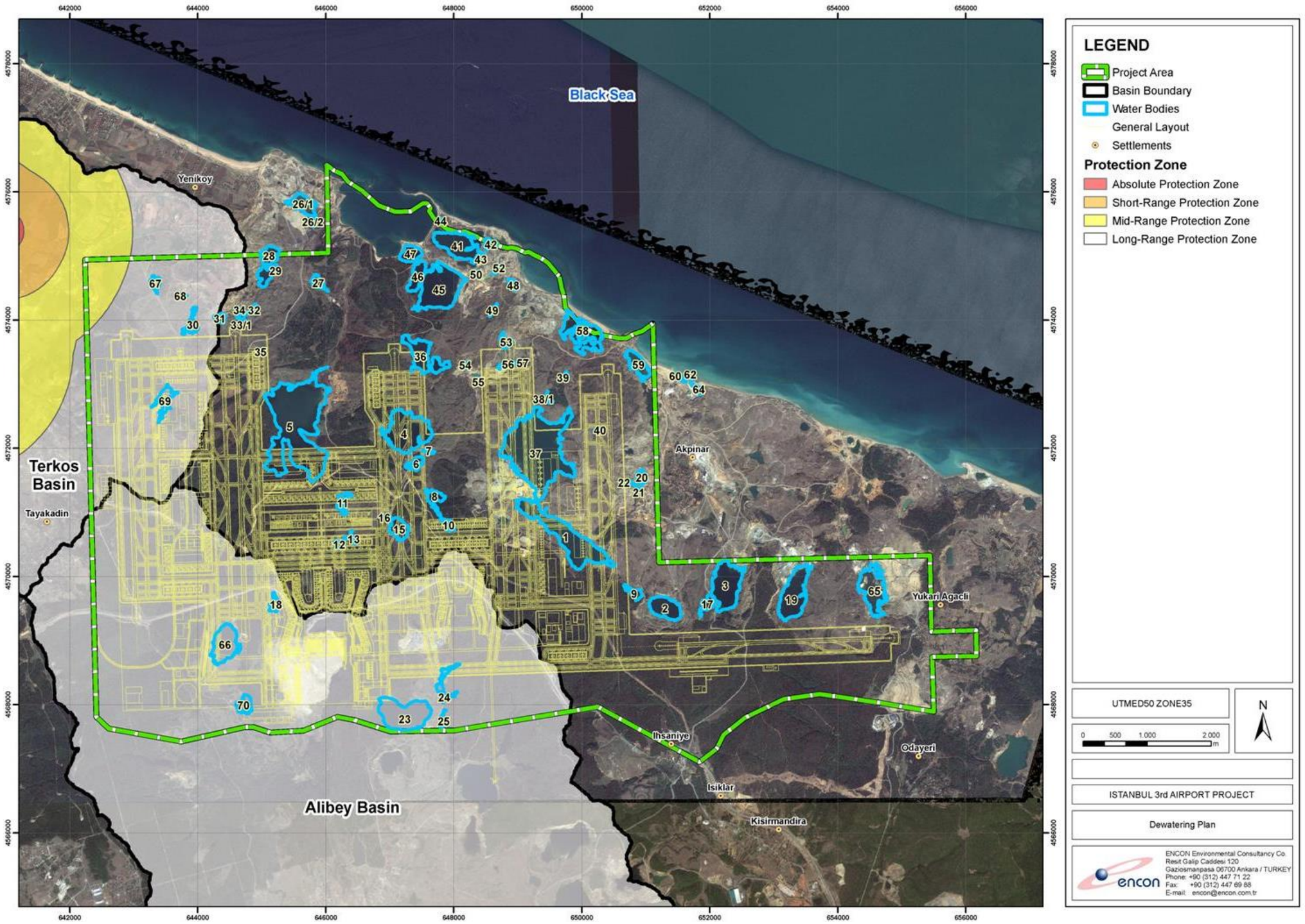


Figure 7.5.13 Dewatering Works (1/4) (July 2014)

Figure 7.5.14 Dewatering Works (2/4) (July 2014)

Figure 7.5.15 Dewatering Works (3/4) (July 2014)

Figure 7.5.16 Dewatering Works (4/4) (July 2014)

Hydrological Characteristics

The Project Area is located in an area where there is currently limited development. Surface runoff is expected to be low and most of the precipitation will be absorbed by the forest soils in the vicinity of the Project. According to Fugro (Ref. 7.5.9), "*the Project Area is located within an area of former lignite extraction on the Black Sea coast. The topographic profile of the site comprises natural wooded hillsides to the south, and vegetated spoil heaps over the northern portion. The site primarily drains to the Black Sea, either as groundwater flow, surface water discharge running northwards, or conveyance through river valleys to reservoirs to the west and south.*"

During earthworks, the surface water flow rates will increase due to the clearance of forested areas in the Project Area. Additionally, soil removal and land levelling will also create disturbance in the Project Area, resulting in the loss of natural drainage systems, causing the surface runoff to increase in both total volume and peak runoff rate. Also, the water retention capacity of the soils will be lost or reduced by soil removal and land levelling, which will cause greater surface water to run freely. Flood risks and landslide risks are discussed in details (with proposed mitigation measures) under **Chapter 7.9 Natural Hazards**.

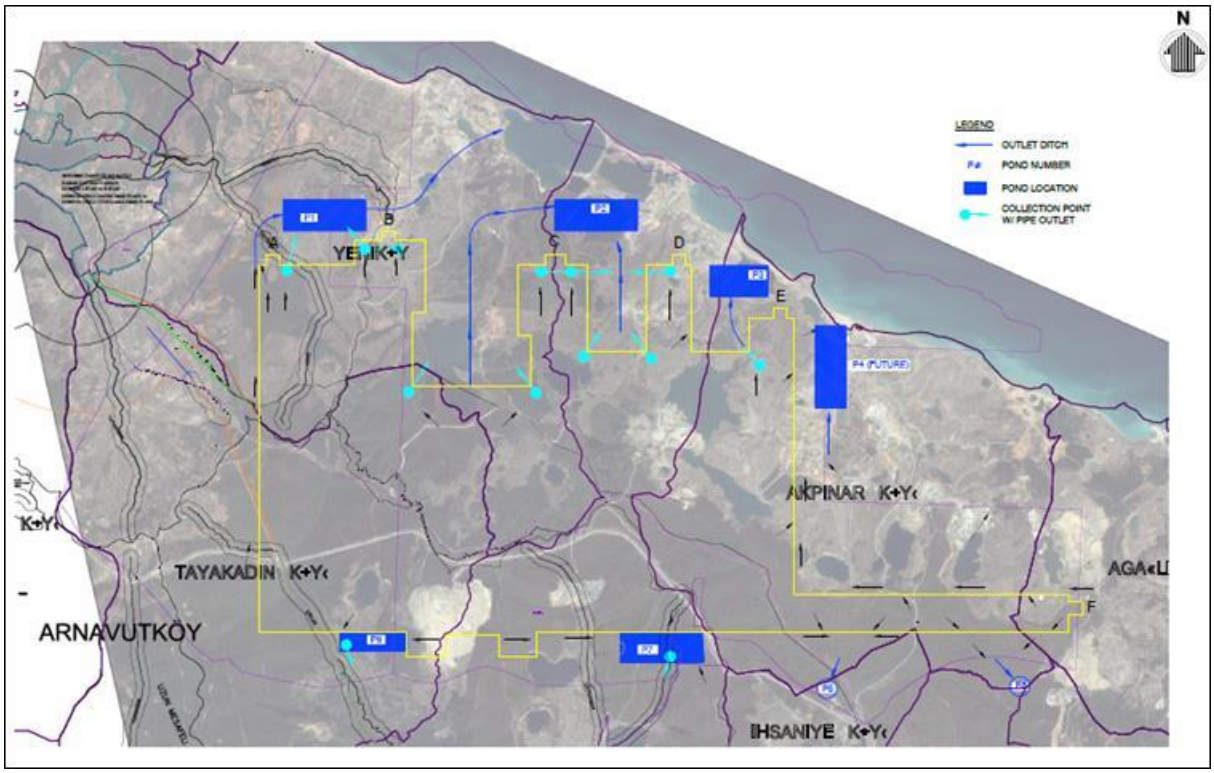
The construction phase is the only phase where a considerable risk of flooding exists. Floods have the potential to damage the works on site and may cause occupational health and safety issues. In addition to these potential impacts on the Project Area, floods caused by Project related activities may also affect nearby communities. During construction, exposed soil can be washed into local WBs resulting in siltation and increased suspended solids levels. Storm water runoff can enter local watercourses and result in increased turbidity, flow rates leading to increased erosion and potential for flooding in downstream locations.

As indicated in Ref. 7.5.9, "*the site is inclined from south (high side) to north (low side) and the proposed site development follows this landform by having cut on the south side and fill to the north. However, the southern portion is located along a topographic divide which will cause a portion of the offsite project drainage to be directed southward (towards Alibey Basin) while the rest will be directed northward to the Black Sea. The design intent is to redirect surface drainage from the site away from Terkos Basin (see Figure 7.5.17 below).*"

As concluded in Ref. 7.5.9, "*the construction of the airport infrastructure will fundamentally change the permeability of the development area, both in the temporary condition and once construction of the surfaced areas are complete. Since the site is composed of relatively impermeable soils, the groundwater table tends to follow the site grades, with relatively small lateral flows. The lateral subsurface flows are unlikely to be substantially impacted by the development.*"

The hydrological and hydrogeological studies conducted in the Project Area (Ref. 7.5.8) revealed that "*most of the lakes are traversed by groundwater, meaning that groundwater seeps into the lakes and the lakes likely discharges to the groundwater, respectively upstream and downstream of the groundwater flow direction*". The studies also concluded that "*the low conductivities cause very small horizontal groundwater movements, which suggest that the site drainage design need not consider significant contributions from groundwater*".

Figure 7.5.17 Site Drainage System



Source: Ref. 7.5.9

Underground flow processes in the Project Area were simulated for the situation before the implementation of the Project using the MODFLOW programme. The details of the model simulation are given in Ref. 7.5.8. The model results for the conditions before the implementation of the Project revealed that "*due to the influence of evaporation in the proximity of the land surface, the groundwater table is strongly dependent on the land surface. In the sinks and the valleys the lowest groundwater levels occur, at topographic rises the highest groundwater levels form the water divides of the catchment areas. The approximate balance figures, as well as the low conductivities, indicate a very small horizontal groundwater flow. In practice this means that areal or linear drainage will have a limited lateral impact (low efficiency)*".

As stated in the Fugro report (Ref. 7.5.9), "*surface area is assumed highly impermeable with little infiltration, the low permeability suggests low interaction between the WBs and the long term water table*".

Water Use

Construction camps will be installed within the Project Area and will accommodate approximately 3,680 workers (camps for the construction phase of the superstructure facilities are not included). The total number of workers during the Project timeframe is estimated to be around 25,000.

During the earthworks and construction phases of the Project, water use will mostly be for the mixing of concrete and during earth filling activities, dust suppression on roads and potable use. It has been estimated that 25,000 L/day will be used for the dust suppression activities (Ref. 7.5.7), which will be sourced from the WBs that will be ultimately dewatered within the Project Area. Assuming a typical daily water consumption of 150 L/day/person for 25,000 workers on site, the total daily water consumption will be 3,750 m^3.

For concrete mixing and earth filling activities and for the campsites, a total of 15, 500,000 m^3 water will be required. It should be noted that this estimated number is subject to change depending on the amount of concrete to be used.

Potable water will be supplied separately (locations of wells for potable water are yet to be determined); the water to be consumed by workers will be supplied from the water supply network in the Project Area and from the WBs that will be dewatered within the Project Area.

Wastewater Discharge (Controlled and Uncontrolled Releases)

During the construction phase, wastewater will be generated from vehicle washing, batch and crushing plants as well as from the construction work force. Water resources can potentially be affected during earthworks and the construction phase by accidental spillages of oil or diesel through infiltration of polluted runoff through soil. In addition, inefficient management of stockpiled soils can lead to direct and indirect pollution impacts from silt-laden runoff. All wastewater streams will require treatment and disposal in accordance with national legal requirements and GIIP.

There is no planned discharge to the riverbeds (dry or running) that are flowing to Terkos Lake and Alibey Dam, the two closest drinking water sources for the City of Istanbul, from the Project activities. In order to ensure that any accidental discharge/spillage within the Project Area does not reach the drinking water resources of Istanbul (Terkos Lake and Alibey Dam), weekly visual monitoring is to be conducted at points just outside the Project Area: Yenikoy (flowing to Terkos Lake), Koydere (flowing towards Alibey Dam) and Yassigecit (flowing towards the basin to the east of the Project Area).

The engineering design of the temporary site drainage for the construction phase of the Project will be developed by IGA. The approval will be obtained from State Hydraulic Works (DSI) by DHMI. At the time of preparation of this ESIA, detailed engineering design studies were underway.

As indicated in Ref. 7.5.9, "*using the available survey data and the proposed platform grading, drainage catchments have been delineated and the resulting catchments and drainage areas identified. The Project Area resides on a topographic divide. The development of the new airport seeks to retain the basic drainage configuration of the existing landform, with the watershed retained through the airport footprint. The design principle of the drainage system has sought to protect receptors, either by diverting potential run off away from areas of highest sensitivity (the reservoir features to the west) and by creation of interception and settlement features on all primary drainage routes.*"

As discussed in Ref. 7.5.9, "*in the temporary state, the vegetated surfaces will be cleared of woodland and topsoil, with the profiled surfaces predominantly draining to the north. All runoff will be diverted through settlement lagoon areas to reduce the level of suspended solids discharged into the sea. It has been decided to reconfigure the earlier arrangement such that all runoff from the northern portion of the site will be taken through a silt attenuation system prior to discharge to the sea. The realigned Phase 1 has therefore reduced the potential for sediment discharge to the main reservoir (in the temporary condition).*"

According to Ref. 7.5.9, "*the development of drainage structures will be based on the permanent drainage configuration, to implement a regime of environmental management and protection throughout the construction phase. The temporary drainage features are being designed for a 2-yr event with the exception of diversion ditches along the top of the platform which are sized to be easily installed by a motor grader and can be reconstructed immediately as the platform is raised on a daily basis. It is expected that these diversion ditches will be earthen during the dry season and rock-lined during the wet season. All temporary drainage*

features on the main earthworks platforms will discharge to collector drains that will be sized and aligned for the permanent drainage requirements."

As summarised in Ref. 7.5.9, the site drainage system has the following features:

- Concept based on collection, direction to drainage corridors, and settlement/desilting in containment lagoons prior to discharge to sea/watercourses;
- Configuration uses integrated discharge pathway for interim plateaus and final platform elements;
- Configuration respects existing watersheds;
- Configuration acknowledges sensitivity of drinking water receptors;
- Configuration derived for original Phase 1;
- Concept based on creation of throttled vegetated swale areas between areas of hard surfacing (runway/taxiway);
- Swales designed to partially accommodate storm runoff;
- Swales not designed as permanent wetland features;
- Surface area assumed highly impermeable with little infiltration – the low permeability suggests low interaction between the lakes and the long term water table;
- Culverts under runway and taxiway to be sized for defined event;
- Strategy avoids oversized culverts for extreme events; and
- No barrier structures required at the platform surface.

A separate water quality database study has been carried out by IGA (Ref. 7.5.10) in order to monitor the water quality within Terkos and Alibey Basins including Terkos Lake and Alibey Reservoir and streams flowing into these water bodies during earthworks, construction and operational phases of the Project as also committed in the Turkish EIA Report. None of the rivers are born within the Project Area. Water quality assessments and classifications have been made in line with the Turkish Regulation on the Quality of Surface Waters Used as Drinking Water Resources or Intended to be Used as Drinking Water Resources (Official Gazette No: 28338, date June 29, 2012).

The preliminary results for Terkos Lake when compared to the regulation standards showed that phenol, hydrocarbon, BOD, total and faecal coliform levels are high indicating impacts of discharges from industrial activities and residential areas as also revealed by the results of the streams flowing to Terkos Lake. The results for Alibey Reservoir when compared to the regulation standards showed that phenol, hydrocarbon, TKN and total coliform levels are high indicating impacts of discharges from industrial and agricultural activities to streams feeding into the Alibey Reservoir. Phenol and hydrocarbon levels have also been reported as high in the stream flowing to the Alibey Reservoir.

Seasonal water quality monitoring (every 3 months) will be conducted in line with the Turkish legislation (Table 5 in Annex 5 of the Surface Water Quality Management Regulation, Official Gazette No. 28483, date 30 November, 2012) on the streams Yenikoy, Koydere and Yassigecit just outside the borders of the Project Area (see Figure 7.5.18), flowing to Terkos Lake, Alibey Dam and the water basin to the east of the Project Area, respectively, and also at Kumluca, Ciftepinar, Terkos 1 and Terkos 2 (see Figure 7.5.18). In case any contamination due to earthworks or construction of the Project is detected then necessary actions will be put in place in line with the Emergency Response Plan. It should be noted that the sampling points on the map are indicative at this stage and are not exact locations.

Seasonal (every 3 months) sea water quality monitoring will be conducted at locations SWQ1 to SWQ5 (see Figure 7.5.18) in line with Table 4 (General Quality Criteria for Sea Water) of the Turkish Water Pollution Control Regulation.

Domestic wastewater treatment plants (WWTP) will be installed at each camp site. Project approvals and discharge permits will be obtained for these biological WWTPs from the Ministry of Environment and Urbanisation in line with Circular No. 2014/07 dated 04.03.2014 on "Project Approval for Wastewater Treatment/Deep Sea Discharge Plants" of the Ministry.

The wastewater discharge requirements to be met in line with Turkish legislation and IFC EHS General Guidelines are given in Table 7.5.12. The most stringent discharge criteria for each parameter will be adopted as the Project's discharge standard. Monthly monitoring will be made in line with WPCR Table 21.1 (domestic wastewater discharges, Class 1).

Table 7.5.12 Construction Phase – Domestic Wastewater Discharge Requirements

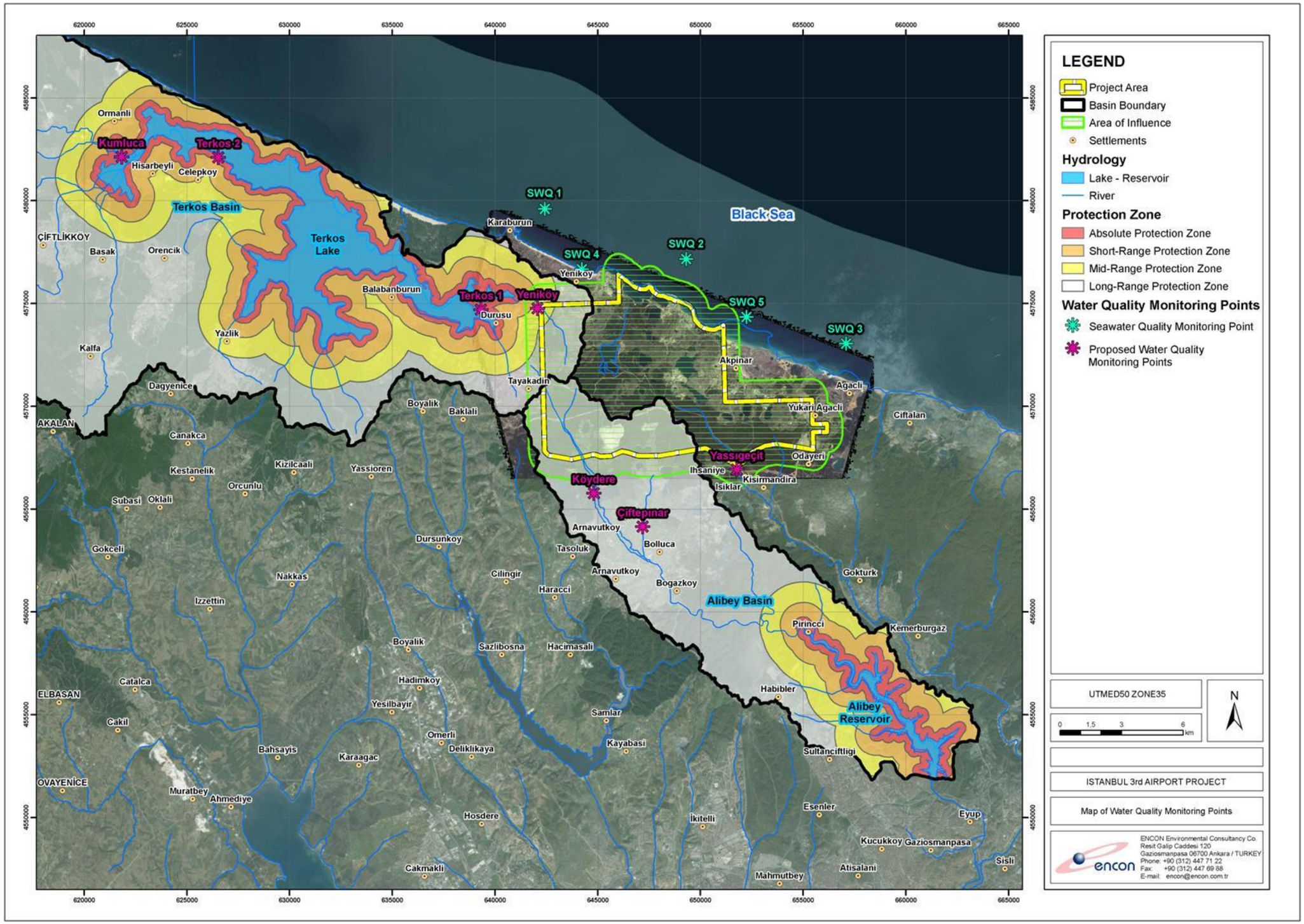
Parameter	Turkish Legal Requirement ([a])		IFC ([b])
	2-hr Composite Sampling	24-hr Composite Sampling	
Biochemical Oxygen Demand (BOD_5) (mg/L)	50	45	30
Chemical Oxygen Demand (COD) (mg/L)	180	120	125
Total Suspended Solids (TSS) (mg/L)	70	45	50
pH	6-9	6-9	6-9
Total Nitrogen (mg/L)	-	-	10
Total Phosphorus (mg/L)	-	-	2
Oil and Grease (mg/L)	-	-	10
Total Coliform Bacteria MPN([c])/100 ml	-	-	400

([a]) Water Pollution Control Regulation, Table 21.1 Domestic Wastewater Discharges (Class 1: BOD load 5-120 kg/day, Population: 84-2000)

([b]) Table 1.3.1-Indicative Values for Treated Sanitary Sewage Discharges, IFC Environmental, Health, and Safety General Guidelines, April 30, 2007.

([c]) MPN: Most Probable Number

Figure 7.5.18 Proposed Water Quality Monitoring Points for the Construction and Operational Phase of the Project



7.5.5.3 Airport Operation

Hydrological Characteristics

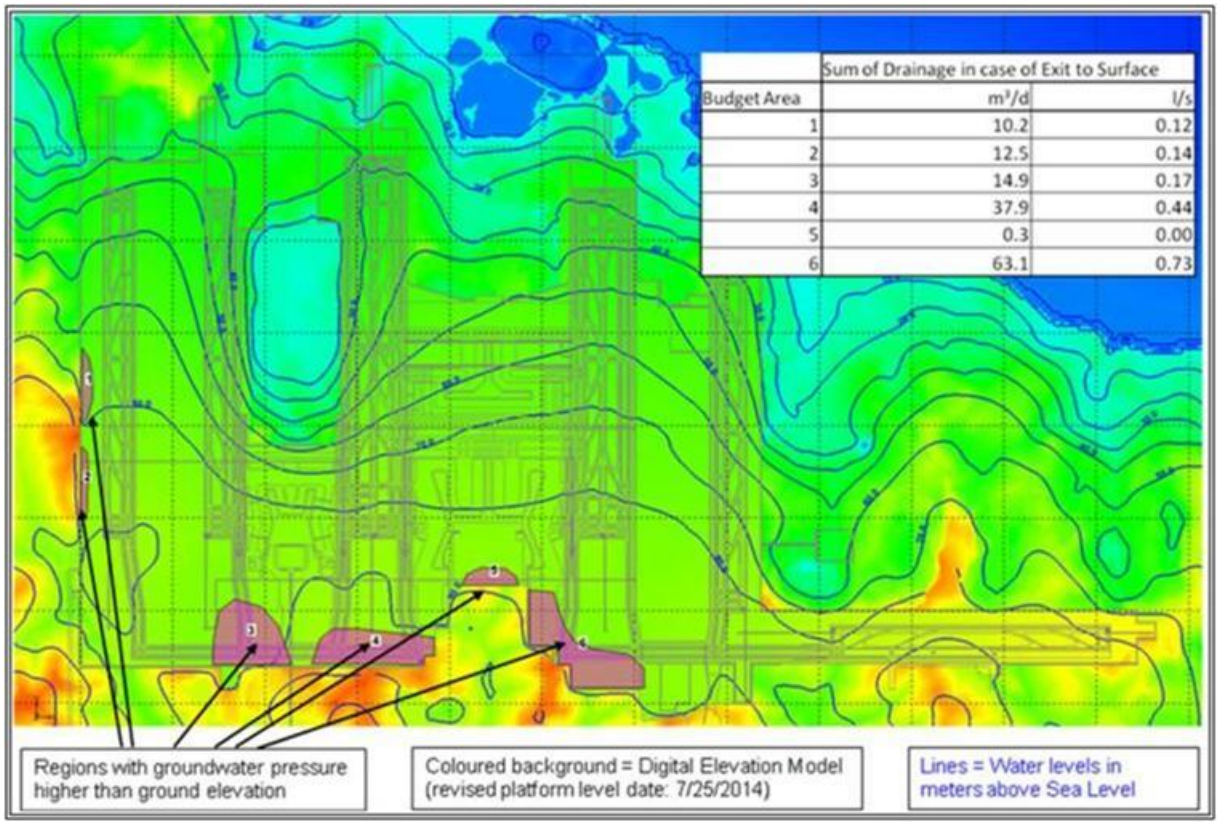
According to Ref. 7.5.9, "*the development of the airport will result in accelerated runoff from impermeable surfaces. The design strategy for the surface areas utilises swale features in grassland areas adjacent to runways and taxiways which will allow limited infiltration but will throttle run off rates somewhat, by incorporation of swale elements on the platform surface. All discharge will pass through an attenuation feature to allow interception of suspended material (including hydrocarbons) arising from spill. The presence of standing water features in close proximity to airport runways and approaches is strongly discouraged and the drainage design should seek to avoid the use of ponds and permanent wetland areas to avoid encouragement of bird habitat close to the flight areas*."

Underground flow processes in the Project Area were simulated through the use of the MODFLOW programme to simulate conditions after the implementation of the Project. The details of the model simulation are given in Ref. 7.5.8.

As detailed in Ref. 7.5.8, due to the strong influence of surface elevations on groundwater levels, the future runway platform surface was considered in the forecast model and the groundwater recharge for the platform area was adapted to the future situation. For this purpose, the platform area was divided into paved and unpaved areas. The paved area was considered to provide a recharge of zero, because it was assumed that the precipitation would be discharged through the drainage system. The unpaved area was considered to have a recharge of 76.5 mm/y, assuming grassy vegetation. Depending on the groundwater level, this amount was decreased in accordance with the evaporation. The total model area is recharged by a volume of approximately 35,000 m^3/d. The evapotranspiration extracts ca. 34,700 m^3/d from the model.

The calculated groundwater levels after the establishment of the platform are shown in Figure 7.5.19.

Figure 7.5.19 Calculated Groundwater Levels (Future Situation)



Source: Ref. 7.5.8 (Note: the airport layout based on the December 2013 Master Plan is shown as an updated figure was not available at the time of this assessment)

As concluded in Ref. 7.5.8 and as can be seen from Figure 7.5.19, after the construction of the platform the groundwater level decreases until it is below the platform level, although the initial water level was located up to 30 meter above the planned platform level. In the vicinity of the western and southern edges of the platform, very shallow groundwater levels were established. At six locations the groundwater hydraulic head is estimated to be higher than the platform level.

During the operation phase of the Project, an engineered site drainage system will be put in place, designed and implemented in accordance with DHMI specifications, with the right capacity to prevent floods.

Water Use

Water use will mainly include water consumption by passengers and staff in the airport terminals and on aircraft and terminal and aircraft cleaning activities. Daily water demand estimated for each Project phase is given in Table 7.5.13.

Table 7.5.13 Daily Water Demand

		Phases 1&2	Phase 3	Phase 4	Ultimate
Water Demand (m^3/day)	**Passengers**	3699	4932	6164	7397
	Employees	8630	11507	14384	17260
	Total	12329	16438	20548	24658

Source: Ref. 7.5.7

Water storage tanks will be supplied from wells and/or the municipal water network depending upon the results of the studies at the future design stages. If the water supply network is to be used a permit will be granted from ISKI. If wells are to be used then a permit will be granted from the DSI.

At the ultimate phase of the Project, the total water demand will be approximately 25,000 m^3/day. Terkos Lake already supplies water to 20% of Istanbul. Thus, such an amount could be supplied from ISKI network to the airport and this option can be easily considered as a relevant/sufficient source of water for the Project. Regarding the use of water from the wells further studies should be conducted on the water availability and feasibility of water abstraction.

The storage tanks will be located within higher elevation areas to utilise water head pressure in the network. Water Treatment Unit(s) will be installed on-site to adjust the water quality regarding drinking water needs.

Two water storage tanks will serve the demands of Phase 1/2 and 3 and Phase 4 and the ultimate phase separately (Ref. 7.5.7). These will therefore be delivered and installed during Phase 1 and 4. The tanks will be supplied from wells and/or the municipal water network depending upon the results of further studies. Each tank will have two separate compartments, one for raw water and the other one for processed water.

Raw water storage tanks will be designed in consideration of the two-day water demand of their service area. The capacity of processed water tank will be a 12-hour demand. The indicative capacities of the tanks to be installed are 33,000m^3 for Phase 1 and 17,000m^3 for Phase 4 as given in Table 7.5.14.

Table 7.5.14 Water Tank Features

	Phases 1&2	Phase 3	Phase 4	Ultimate
Water Demand (m^3/s)	0.1427	0.1903	0.2378	0.2854
Storage Volume (m^3)	24,658	32,877	41,096	49,315
Tank Capacity (m^3)	33,000		17,000	
Storage Tank Dimensions (m)	H = 3.3, W = 100, L = 100		H = 2.5, W = 85, L = 85	

Source: Ref. 7.5.7

Raw water tanks will also supply the firefighting water system, which requires 12 atm pressure with respect to relevant DHMI Specifications as detailed in Ref. 7.5.7.

The airport water supply flow diagram is given in Figure 7.5.20 and water supply plan is given in Figure 7.5.21.

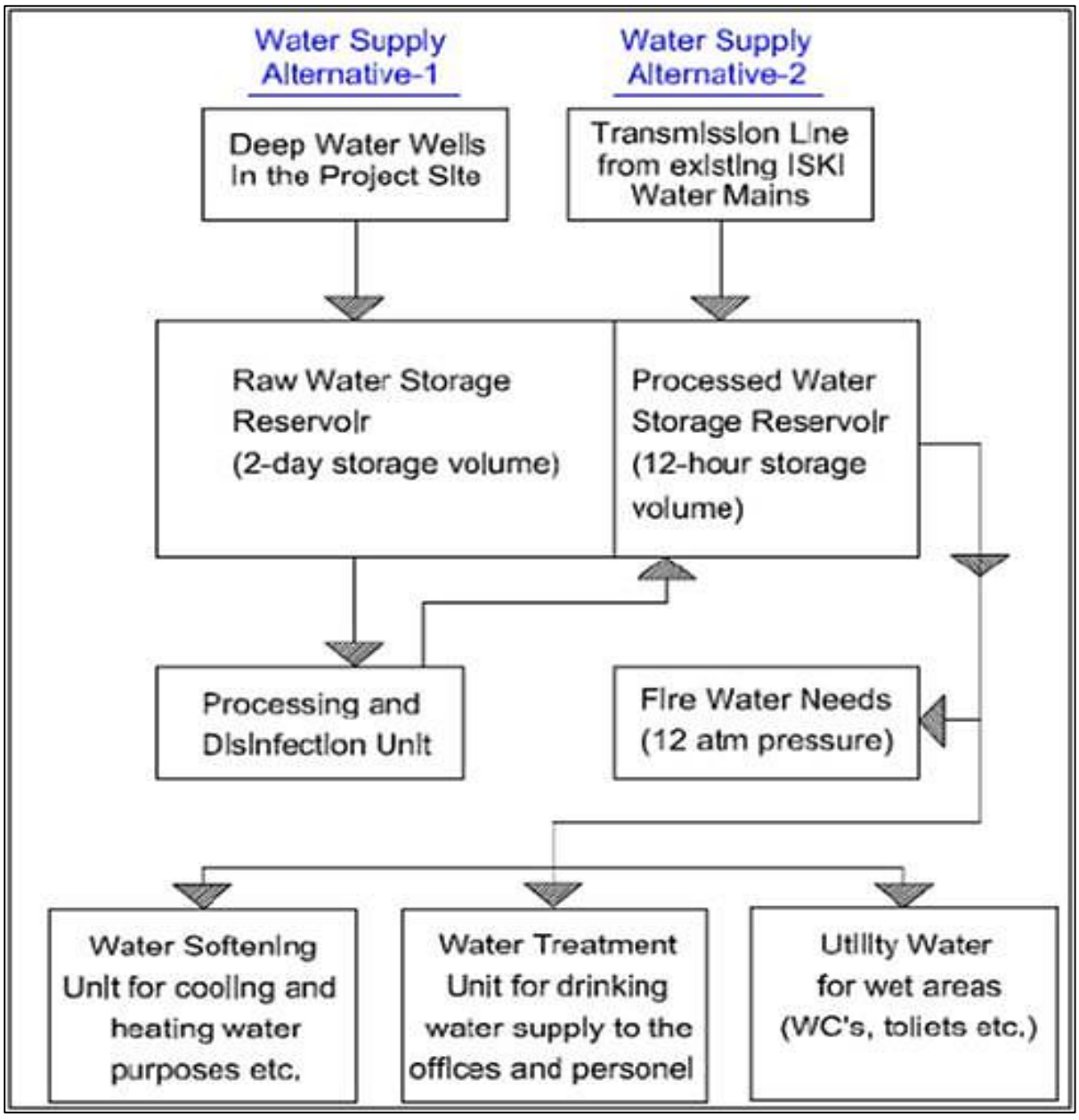
The operation of the Project will result in increased water demand in the Project Area and this should not cause or contribute to unacceptable water stress on third parties (including local communities). Water saving measures will be put in place in order to prevent and/or minimise water consumption where possible and feasible during the operational phase of the Project.

As indicated by the IFC GN3 (Ref. 7.5.3), '*when a project is a significant net consumer of water, or contributes to depletion of water resources to the extent that third parties' ability to access water is adversely affected, then the Project's water consumption should be reduced to a level at which these adverse impacts are adequately mitigated, as determined by a suitable community engagement process*'.

If water is to be abstracted, then the Project should show that such abstraction does not cause adverse effects to such other users of the water that exist or can reasonably be expected to move into the Area of Influence of the Project.

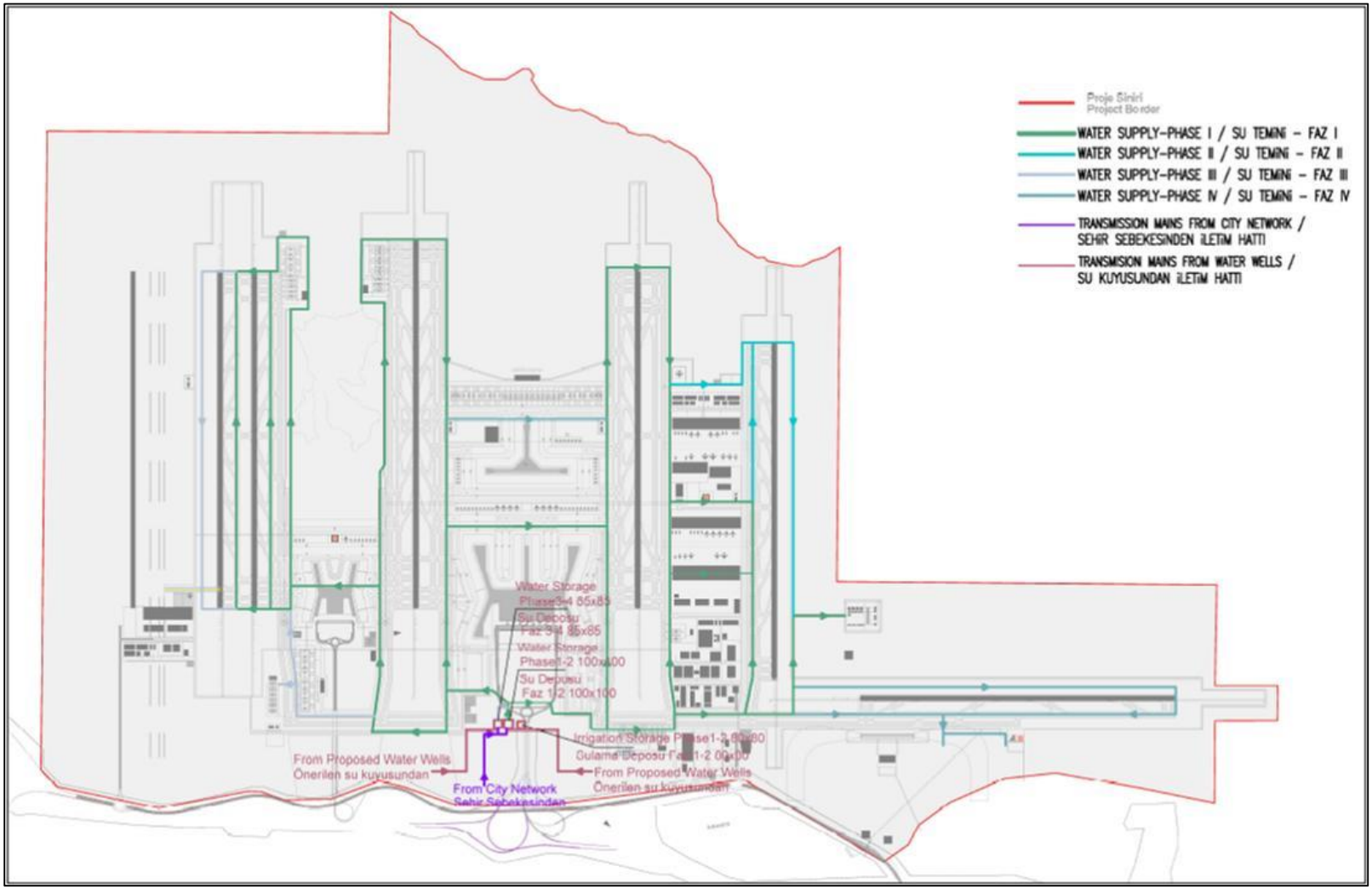
Airport operations can result in groundwater contamination as a result of incorrect storage and handling of potentially contaminating substances. Appropriate storage and handling procedures will be incorporated into detailed design and management procedures as shown below.

Figure 7.5.20 Water Supply Flow Diagram



Source: Ref. 7.5.7

Figure 7.5.21 Water Supply Plan



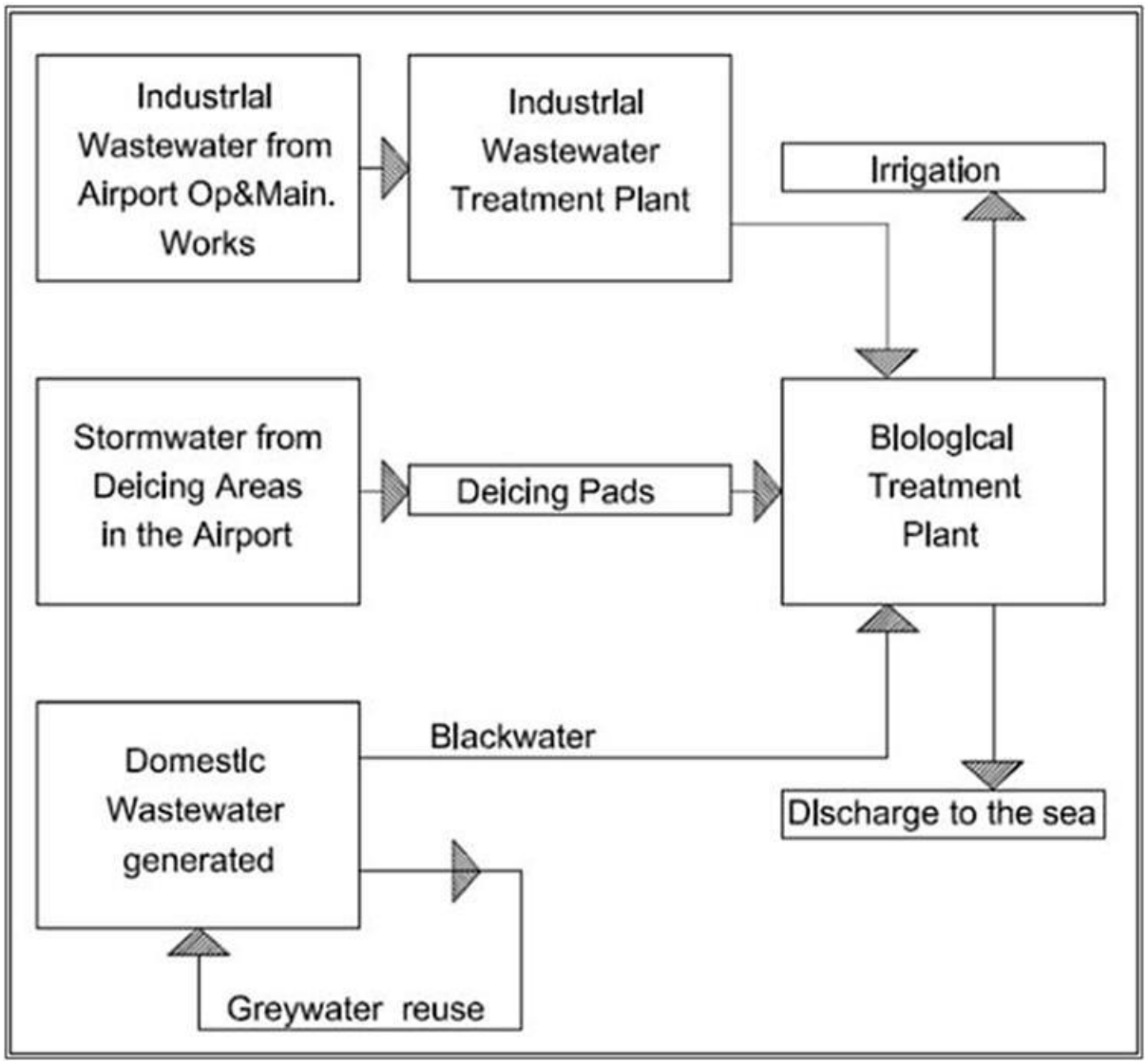
Source: Ref. 7.5.7 Note: the airport layout based on the December 2013 Master Plan is shown as an updated figure was not available at the time of this assessment.

Wastewater Discharge (including Stormwater and Surface Runoff)

Effluents from airport operations mainly consist of stormwater runoff from paved surfaces and sanitary/domestic wastewater from employees, passengers and from aircraft.

Figure 7.5.22 shows the wastewater flow diagram of the INA Project.

Figure 7.5.22 Wastewater Flow Diagram



Source: Ref. 7.5.7

Industrial wastewater generated from operation and maintenance works will first be sent to the Industrial Wastewater Treatment Plant IWWTP located on the north-eastern/eastern boundary of the Project Area. Effluent from the industrial WWTP will be directed to the biological WWTP. All domestic wastewater collected in the sewerage system will be directed to the biological WWTP. Grey water will be treated by a local package treatment system in the building where it is generated, to be reused in the toilets and to irrigate landscaped areas. Stormwater from de-icing areas will first be directed to the de-icing pads. Overflows from these pads will be discharged to the biological WWTP.

INA will open with a capacity of 90 mppa (Phase 1) and expand to the planned capacity of 150 mppa (Phase 4). Wastewater production figures have been defined in the Master Plan (Table

7.5.15) and have been based on 100% return rate from domestic water, including a peak water flow rate of 1.7m^3/s. The WWTP capacity is given in Table 7.5.16.

Table 7.5.15 Wastewater Production Levels

		Phases 1&2	Phase 3	Phase 4	Ultimate
Wastewater (m^3/s)	**Passengers**	0.0428	0.0571	0.0713	0.0856
	Employees	0.0999	0.1332	0.1665	0.1998
	Total	0.1427	0.1903	0.2378	0.2854

Source: Ref. 7.5.7

Table 7.5.16 Wastewater Treatment Plant Capacity

	Phase 1&2	Phase 3	Phase 4	Ultimate
Maximum Daily Flow (m^3/day)	21,000	28,000	35,000	42,000

Source: Ref. 7.5.7

The effluent from the biological WWTP will be discharged into the Black Sea and/or pumped to terminal areas for irrigation of landscaped areas. There is a potential impact on the receiving waters of the Black Sea and treatment prior to discharge will need to be undertaken in accordance with the Project's discharge limit values and the necessary permits for discharge will be obtained by IGA. If a sewerage system exists at the time of the operation of INA, effluent might also be discharged to the municipal system in compliance with ISKI's Wastewater Discharge to Sewage System Regulation (Ref. 7.5.11) and permit requirements.

In order to ensure that any accidental discharge/spillage within the Project Area does not reach the drinking water resources of Istanbul (Terkos Lake and Alibey Dam), weekly visual monitoring will be conducted at points just outside the Project Area including: Yenikoy (flowing to Terkos Lake), Koydere (flowing towards Alibey Dam) and Yassigecit (flowing towards the basin to the east of the Project Area).

As indicated in Ref. 7.5.9, "*dry swales and short term retention areas will be used to attenuate runoff from extreme events, but the presumption is that normal rain fall events will be carried to low level drainage infrastructure with limited retention and delay. The main receiving drainage structures at the base of runway embankments will therefore be designed for a 100-yr event. The swales will not be impermeable, but infiltration into the embankment structure is expected to be minimal, based on the grading and compaction requirements of the embankment fill and the seasonal transpiration demand of the surface vegetation. The design of the permanent catch basin/piping systems and permanent slope drains that comprise the permanent platform drainage will be sized for a 100-yr event with a check of the 200-yr event.*"

Moreover, as concluded in Ref. 7.5.9, "*all of the permanent drainage ultimately discharges into stormwater treatment ponds. A preliminary check of the surface area required for the 40mm water quality volume shows that the size required for settling the sediment distribution for the 2-yr event will control. However, the required pond size may increase once routing of the 25-yr (pre- vs. post) and the 100-yr (flooding) events are finalised. For the sediment basin (pond) design, the basins (ponds) will be sized to provide at least an average of 60% settling of the overall sediment distribution expected to be present in the runoff which is described by the composite distribution based on hydrometer and sand sieve data provided for the site.*"

According to Ref. 7.5.9, "*the requirements for discharge to water catchment features associated with drinking water supply is onerous, with consideration of the 500yr storm event.*

A risk evaluation based on potential contamination/pollution event coupled with the impacts of retention of storm volumes associated with this extreme return period has led to the design of a drainage system that discharge away from sensitive areas. Drainage to the south will continue to follow the same flow path as at present, but with incorporation of settlement features to remove suspended sediment and to provide pollution control measures."

Seasonal (every 3 months) water quality monitoring will be conducted in line with the Turkish legislation (Table 5 in Annex 5 of the Surface Water Quality Management Regulation, Official Gazette No. 28483, date 30 November, 2012) on the Yenikoy and Koydere streams just outside the boundary of the Project Area (Figure 7.5.18) flowing to Terkos Lake, Alibey Dam and the water basin to the east of the Project Area, respectively, and also at Kumluca, Ciftepinar, Terkos 1 and Terkos 2 (see Figure 7.5.18). It should be noted that the sampling points on the map are not exact locations. In the event that contamination due to the operation of the Project is detected, necessary actions will be put in place in line with the Emergency Response Plan.

Seasonal (every 3 months) sea water quality monitoring will be conducted at locations SWQ1 to SWQ5 (see Figure 7.5.18) in line with Table 4 (General Quality Criteria for Sea Water) of the Turkish Water Pollution Control Regulation.

For discharges to the Black Sea, the wastewater discharge requirements to be met in line with Turkish legislation and IFC Environmental, Health, and Safety General Guidelines are given in Table 7.5.17. The most stringent discharge criteria for each parameter has been established as the Project Standard for discharges. Monthly monitoring will be made in line with WPCR Table 21.4 (domestic wastewater discharges, Class 4).

Table 7.5.17 Operation Phase – Domestic Wastewater Discharge Requirements

Parameter	Turkish Legal Requirement ([a])		IFC ([b])
	2 hr Composite Sampling	24 hr Composite Sampling	
Biochemical Oxygen Demand (BOD_5) (mg/L)	**40**	**35**	**30**
Chemical Oxygen Demand (COD) (mg/L)	**120**	**90**	**125**
Total Suspended Solids (TSS) (mg/L)	**40**	**25**	**50**
pH	**6-9**	**6-9**	**6-9**
Total Nitrogen (mg/L)			**10**
Total Phosphorus (mg/L)			**2**
Oil and Grease (mg/L)			**10**
Total Coliform Bacteria MPN([c])/100 ml			**400**

(a) Water Pollution Control Regulation, Table 21.4 Domestic Wastewater Discharges (Class 4: BOD load>6000 kg/day, Population>100.000)
(b) Table 1.3.1-Indicative Values for Treated Sanitary Sewage Discharges, IFC Environmental, Health, and Safety General Guidelines, April 30, 2007.
(c) MPN: Most Probable Number

Where treated wastewater from the biological WWTP is to be used for irrigation of landscaped areas, it will have to meet the quality criteria defined in Annex 7 of the Communique on

Technical Procedures for Wastewater Treatment Plants (Official Gazette No: 27527, date March 20, 2010).

In case the wastewater is to be discharged to the municipal sewerage network, it will have to meet the discharge quality criteria of ISKI's Wastewater Discharge to Sewage System Regulation (Table 7.5.18) and permit requirements.

Table 7.5.18 Operation Phase – ISKI Wastewater Discharge Requirements to the Sewerage System

Parameter	Discharge to sewage systems connected to a full treatment system	Discharge to sewage systems connected to a preliminary treatment + deep sea discharge
Temperature (°C)	50	50
pH	6-12	6-12
Total Suspended Solids (TSS) (mg/L)	500	350
Oil and Grease (mg/L)	150	50
Chemical Oxygen Demand (COD) (mg/L)	1000	600
Sulphate (SO_4^{-2}) (mg/L)	1700	1700
Total sulphur (S) (mg/L)	2	2
Phenols (mg/L)	10	10
Total phosphorus (P) (mg/L)	-	10
Arsenic (As) (mg/L)	3	10
Total cyanide (total CN^-) (mg/L)	10	10
Total lead (Pb) (mg/L)	3	3
Total cadmium (Cd) (mg/L)	2	2
Total chromium (Cr) (mg/L)	5	5
Total mercury (Hg) (mg/L)	0.2	0.2
Total copper (Cu) (mg/L)	5	5
Total nickel (Ni) (mg/L)	5	5
Total zinc (Zn) (mg/L)	10	10
Chloride (Cl^-) (mg/L)	15000	-
Methylene Blue Active Substance (MBAS) (mg/L)	The discharge of substances that are not biodegradable according to Turkish Standards Institute is not allowed.	

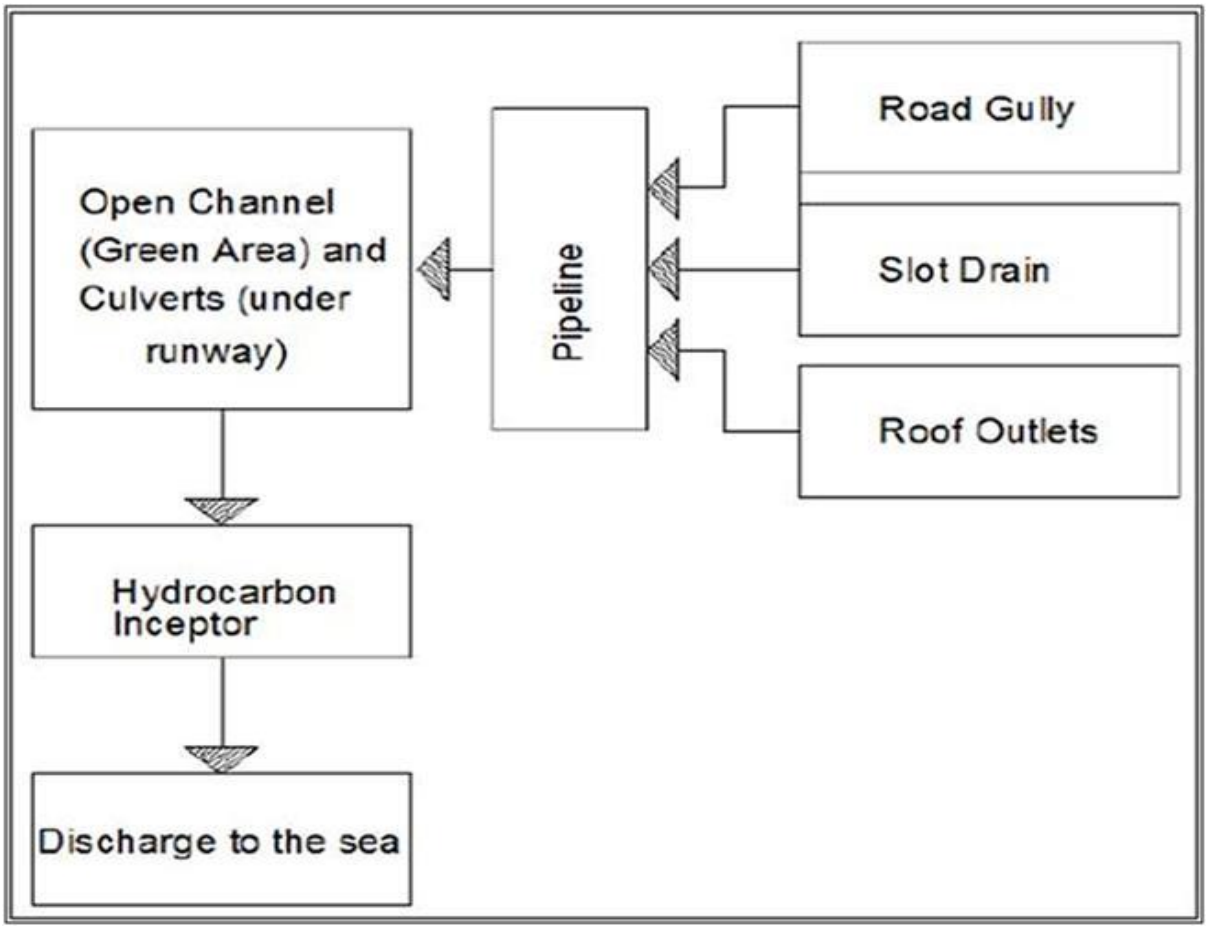
Stormwater is mainly runoff from paved surfaces and this may include runway debris, fine dust particulates, pollutants associated with leaks and spills of oil, diesel and jet fuels generated during operation and maintenance of ground service vehicles, fuel storage and handling activities; and aircraft, runway and taxiway de-icing/anti-icing fluids. Surface runoff from runways, taxiways and overland flow from grassy areas will be intercepted by trapezoid-

shaped open channels (side slope has been assumed as 2:3 in accordance with the DHMI Specification), whereas runoff from aprons and aircraft stands will be collected via slot drains and surface water from the terminal areas will be collected via pipe and gulley systems. Stormwater will be transmitted in the pipelines and open channels via gravity. All collected stormwater will be connected to hydrocarbon (HC) inceptors prior to discharging to the Black Sea (Table 7.5.17 for discharge requirements). The stormwater flow diagram is given in Figure 7.5.23 and the stormwater discharge system plan is given in Figure 7.5.24.

Aircraft de-icing/anti-icing fluids typically include ethylene or propylene glycol, runway and taxiway de-icing/anti icing fluids typically containing potassium acetate, sodium acetate, calcium magnesium acetate or mixtures of urea and water. While these chemicals are biodegradable, their direct discharge into surface waters through the stormwater drainage network can negatively impact on aquatic environments through an increase in oxygen demand as well as eutrophication caused by nutrients from de-icing chemicals (e.g. nitrogen from urea and phosphorus from glycol). As shown in Figure 7.5.22, de-icing pads will be used for collection of de-icing fluids, which will then be diverted to the biological WWTP. The recovery of the de-icing agents by distillation or any other appropriate GIIP technique will also be an option.

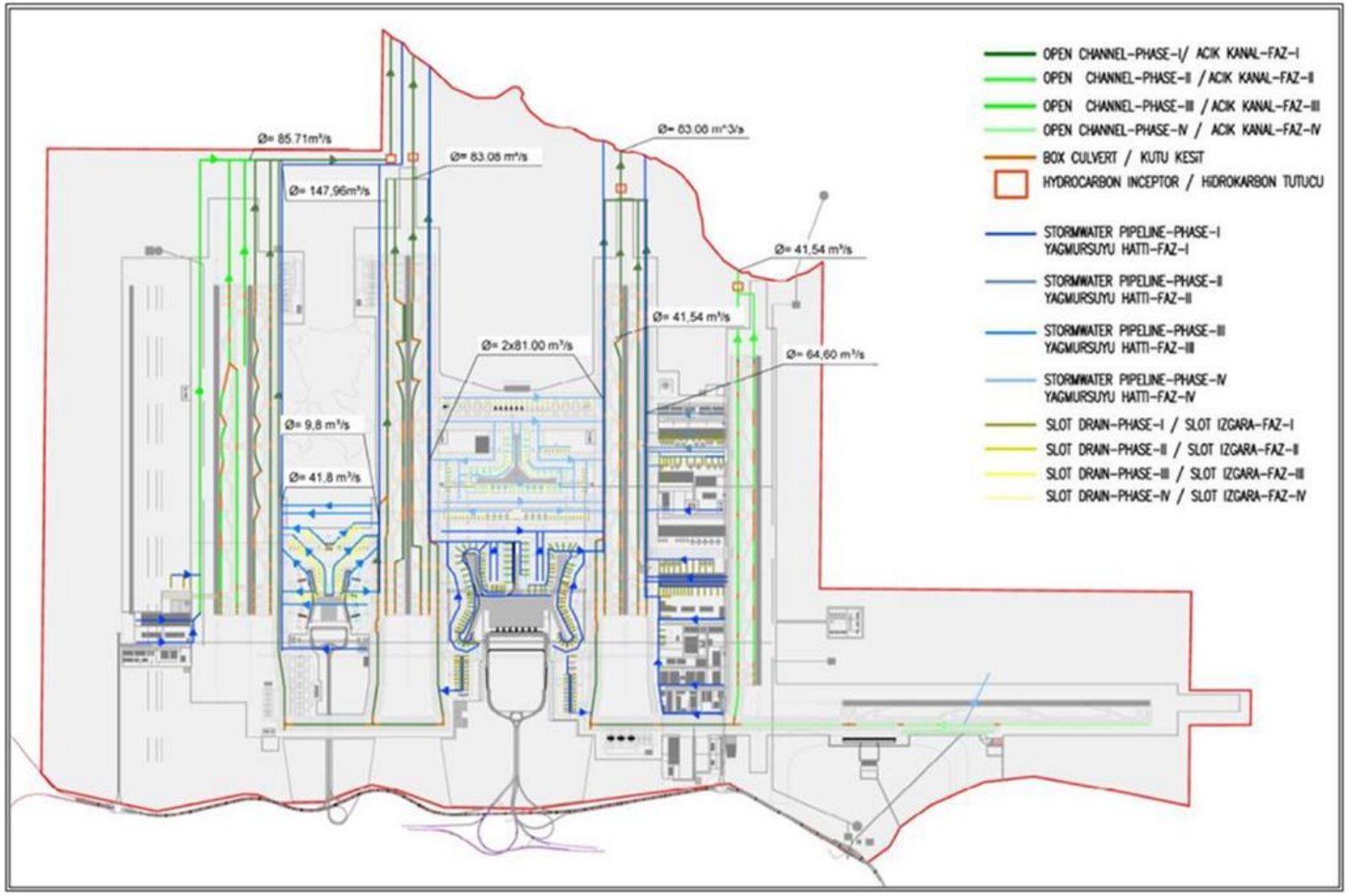
Runoff from firefighting activities (both practice runs and actual responses) can present a risk to stormwater systems.

Figure 7.5.23 Stormwater Flow Diagram



Source: Ref. 7.5.7

Figure 7.5.24 Stormwater Discharge System Plan



Source: Ref. 7.5.7

Note: the airport layout based on the December 2013 Master Plan is shown as an updated figure was not available at the time of this assessment.

7.5.6 Mitigation and Residual Impacts

The following management plans should be used to reference monitoring and mitigation plans:

- Environmental and Social Management Plan (ESMP);
- Pollution Prevention Plan; and
- Emergency Response Plan.

7.5.6.1 Earthworks and Construction

Dewatering

During the earthworks phase of the Project, the dewatering programme will be closely monitored in order to avoid negative impacts to the Black Sea coast and to streams/creeks within Alibey Basin. The baseline water quality assessments made for the eight WBs within the Project Area is considered to be representative of all the WBs which reveal that they have no quality problems regarding metals, colour, BOD and COD. In order to minimise potential negative impacts due to the discharge of water containing high suspended solids, water will not be discharged immediately and will let to settle within the final WB which will act as a sediment trap. Once the water level within the final WB reaches the maximum level on the sea side of the WB, water will overflow to the sea. The same approach will be used for the WBs in the southern part of the Project Area. WBs No. 18, 23, 24, 25 and 66 (which fall within the Alibey Basin boundaries) will be directed southwards to streams/creeks within Alibey Basin after being settled for a period of time.

At the discharge points to the Black Sea, weekly monitoring will be conducted for suspended solids and biweekly monitoring for the rest of the parameters listed in Table 4 of the Water Pollution Control Regulation (Table 7.5.19). The biweekly monitoring frequency may be decreased depending on the successive monitoring results.

Table 7.5.19 Parameters Listed in Table 4 of the Water Pollution Control Regulation

Parameter	Unit	WPCR Table 4
pH	-	6.0-9.0
Colour ([1])	-	Natural
Floating matter ([2])		-
Suspended Solids	mg/L	30
Turbidity ([1])	-	Natural
Dissolved Oxygen ([3])	%	Over 90% of saturation
Degradable Organic Pollutants ([4])	-	-
Crude oil and petroleum products ([5])	mg/L	0.003
Radioactivity ([6])	-	-
Reproductivity ([7])	-	-
Toxicity	-	Not permitted
Phenols	mg/L	0.001
Cu	mg/L	0.01

Parameter	Unit	WPCR Table 4
Cd	mg/L	0.01
Cr	mg/L	0.1
Pb	mg/L	0.1
Ni	mg/L	0.1
Zn	mg/L	0.1
Hg	mg/L	0.004
As	mg/L	0.1
Ammonia	mg/L	0.02

(1)There is no defined criterion for this parameter in the regulation. It is indicated that, colour and turbidity should not affect more than 90% the normal photosynthesis activity at the depth of sampling.
(2)There is no defined criterion for this parameter in the regulation. It is stated that, no floating matter should be present in the sample as liquids (oil, tar, etc.) or solids (waste materials).
(3) Dissolved oxygen should be monitored with respect to depth all along the sea depth.
(4)There is no criterion defined within the regulation. The regulation states that "after dilution, the amount of degradable organic pollutants should not be at a level so as to endanger the DO level reported above".
(5) The parameters should be evaluated separately in the water, biota and the sediment and preferably should not exist.
(6) Natural radioactivity types and levels should not be exceeded. Also, artificial radioactivity should be below detection levels.
(7) There is no defined criterion for this parameter in the regulation. It is stated that the "seasonal reproductivity levels of the sea environment will be maintained".

The trigger level for an intervention will be the exceedance of Table 4 parameters as compared to the baseline water quality at the discharge point (it should be noted that some Table 4 parameters could already be exceeding the limits for the baseline seawater quality). If any exceedance occurs than the dewatering would stop and depending on the level of exceedance and the parameter of concern a treatment option will be considered before discharge.

Taking into account the baseline water quality results as detailed under in Section 7.5.4.3 Findings, consultation with the relevant governmental institutions will be undertaken regarding the dewatering within Alibey Basin and, if required, relevant permits will be obtained in advance as the Alibey Reservoir is one of the drinking water sources for Istanbul. At points where water from the WBs is directed to streams/creeks within Alibey Basin, weekly monitoring will be conducted for suspended solids and biweekly monitoring for the rest of the parameters listed in Table 5 in Annex 5 of the Surface Water Quality Management Regulation (Official Gazette No. 28483, date 30 November, 2012). The biweekly monitoring frequency may change depending on the successive monitoring results.

The trigger level for an intervention will be the exceedance of Table 5-Annex 5 parameters as compared to the baseline water quality results. It should be noted that some Table 5-Annex 5 parameters may already be exceeding the limits for the baseline water quality. If any exceedance occurs then the dewatering would stop and, depending on the level of exceedance and the parameter of concern, a treatment option will be considered before redirecting the water.

Details on the monitoring requirements (including parameters and frequency) for dewatering works are summarised within **Chapter 8 Framework ESMP**.

Water Use

During the construction phase of the Project, in line with best practices, a water management programme will be adopted which will seek to:

- Identify, regularly measure and monitor the principal flows within construction works;
- Identify construction activities where action should be taken to reduce water use; and
- Harvest and use storm/rainwater where possible.

Details on the water management programme will be contained within the ESMP.

Wastewater Discharge

During the construction phase of the Project, in line with best practices, a sound wastewater management strategy will be adopted so as to minimise impacts to the receiving environment. The strategy includes:

- Managing storm water runoff from earthworks and construction operations by implementing slope stabilisation and careful cut and fill sloping and providing an engineered site drainage system to accommodate flood risks as well;
- Appropriate treatment of wastewater from vehicle wash facilities, batch and crushing plants prior to discharge; and
- Appropriate wastewater treatment and discharge systems from construction camps prior to discharge.

Wastewater discharges will comply with the applicable discharge standards to the receiving environment as given in Section 7.5.5.2. Monthly monitoring will be undertaken in line with WPCR Table 21.1 (domestic wastewater discharges, Class 1).

Water resources can potentially be affected during earthworks and construction phases by accidental spillage of oil and diesel through infiltration of polluted runoff through soil. In addition, inefficient management of stockpiled soils can lead to direct and indirect pollution impacts from silt-laden runoff. To reduce the potential impact from spills and leaks GIIP control measures will be adopted by responsible parties (e.g. contractors) and defined within a plan identifying the actions to address spill prevention.

There is no planned discharge to the riverbeds (dry or running) that are flowing to Terkos Lake and Alibey Dam, the two closest drinking water sources of Istanbul, from the Project activities. In order to ensure that any accidental discharge/spillage within the Project Area does not reach the drinking water resources of Istanbul (Terkos Lake and Alibey Dam), weekly visual monitoring is to be conducted at points just outside the Project Area including: Yenikoy (flowing to Terkos Lake), Koydere (flowing towards Alibey Dam) and Yassigecit (flowing towards the basin to the east of the Project Area).

Seasonal (every 3 months) water quality monitoring will be conducted in line with the Turkish legislation (Table 5 in Annex 5 of the Surface Water Quality Management Regulation, Official Gazette No. 28483, date 30 November, 2012) on the streams Yenikoy, Koydere and Yassigecit just outside the borders of the Project Area (Figure 7.5.18, please note that the proposed water sampling points on the map are not exact locations) flowing to Terkos Lake, Alibey Dam and the water basin to the east of the Project Area, respectively, and also at Kumluca, Ciftepinar, Terkos 1 and Terkos 2. In case any contamination due to earthworks and construction of the Project is detected than necessary actions will be put in place in line with the emergency action plans.

Seasonal (every 3 months) sea water quality monitoring will be conducted at locations SWQ1 to SWQ5 (see Figure 7.5.18) in line with Table 4 (General Quality Criteria for Sea Water) of the Turkish Water Pollution Control Regulation.

Details on the monitoring requirements for wastewater discharges (including parameters and frequency) and water quality are summarised within **Chapter 8 Framework ESMP**.

7.5.6.2 Airport Operation

Water Use

Project activities involving water use will prevent adverse impacts to the availability of water resources. During the operational phase of the Project, in line with GIIP, a water management programme will be implemented to promote reductions in water consumption and achieve savings in water pumping, treatment and disposal costs.

Water conservation measures may include water monitoring/management techniques; water recycling, reuse; and sanitary water conservation techniques.

The water management programme will consider the following water-saving features:

- Regular maintenance of plumbing to identify and repair leaks;
- Shut off water to unused areas (e.g. WC areas);
- Installation of water-efficient appliances including self-closing taps, automatic shut-off valves, spray nozzles, and water conserving sanitary fittings (e.g. low flow shower heads, faucets, toilets, urinals; and spring loaded or sensored faucets);
- Operation of any commercial dishwashers and laundries on full loads, and only when needed;
- Installation of water saving equipment in lavatories, such as low flow toilets;
- Native flora species will be used;
- Reuse of treated wastewater for the irrigation of green areas; and
- Harvest and use storm/rainwater where possible.

Increasing awareness of the employees by trainings is also part of the water management programme.

Details of water conservation measures will be contained within the ESMP.

Wastewater Discharge

Effluents from airport operations will mainly consist of stormwater runoff from paved surfaces and sanitary/domestic wastewater from employees, passengers and from aircraft.

Project activities involving wastewater discharges should prevent adverse impacts to the quality of groundwater and surface water resources.

Necessary measures will be put in place for a sound wastewater management system to avoid, minimise, and control adverse impacts to human health, safety, and the environment.

Wastewater management includes water conservation, wastewater treatment, stormwater management, and wastewater and water quality monitoring.

For the operation phase of the Project, general measures for wastewater management include:

- Efficient use of water to reduce the amount of wastewater generation;
- Prevention or reduction of wastewater discharge through measures as recycling and reuse within the facility if feasible;

- Effluent segregation (industrial, sanitary/domestic and stormwater) in order to limit the volume of water requiring specialised treatment;
- 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 WBs. 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;
- The compliance of wastewater discharges with the applicable discharge standard to the receiving environment and water quality standard for a specific reuse (e.g. if the wastewater is reused for irrigation) as given in Section 7.5.5.3 of this Chapter. Monitoring of effluents prior to discharge to surface WBs;
- The design and operation of the selected wastewater treatment technologies to avoid uncontrolled air emissions of volatile chemicals from wastewaters;
- Runoff from areas without potential sources of contamination is minimised (e.g. by minimising the area of impermeable surfaces) and the peak discharge rate is reduced (e.g. by using vegetation and retention ponds);
- Where stormwater treatment is deemed necessary to protect the quality of receiving WB, priority should be given to managing and treating the first flush of stormwater runoff where the majority of potential contaminants tend to be present;
- When water quality criteria allow, stormwater is to be managed as a resource for meeting water needs at the facility;
- Oil water separators and grease traps installed and maintained as appropriate at refuelling facilities, workshops, parking areas, fuel storage and containment areas;
- Sludge from stormwater catchments or collection and treatment systems disposed in compliance with national regulatory requirements; and
- Sludge from industrial and sanitary wastewater treatment operations disposed in compliance with national regulatory requirements.

The runoff of aircraft de-icing/anti-icing fluids (ADF) will be prevented and controlled by:

- Limiting aircraft de-icing to small areas such as graded de-icing pads, designed to facilitate the collection and recycling of ADF (note that glycol recycling requires specialised filtration and distillation equipment);
- 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; and
- Use of ice detection systems such as ultrasonic devices to detect ice thickness, or computerised spraying systems that can accurately and selectively apply ADF on airplane surfaces.

The runoff airfield (runways and aprons) anti-icing and de-icing fluids will 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 de-icers 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 de-icers near stormwater drains that lead directly to surface WBs;
- 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 (stormwater management activities should consider potential contamination to soil and groundwater from stormwater that may escape the drainage system and instead infiltrate into the ground adjacent to aprons, taxiways and runways);
- Stormwater collected from de-icing areas will be diverted to de-icing pads from where it will be sent to the biological WWTP; and
- Recovery of the de-icing agents by distillation or other appropriate GIIP technique will be an option.

The effluent from the WWTP will be discharged into the Black Sea and/or pumped to terminal areas for irrigation of landscaped area. For wastewater discharges to the Black Sea, monthly monitoring will be made in line with WPCR Table 21.4 (domestic wastewater discharges, Class 4). If a sewerage system exists at the time of the operation of INA, effluent may be discharged into the municipal system upon compliance with ISKI's Wastewater Discharge to Sewage System Regulation (Table 7.5.18) and permit requirements.

In order to ensure that any accidental discharge/spillage within the Project Area does not reach the drinking water resources of Istanbul (Terkos Lake and Alibey Dam), weekly visual monitoring is to be conducted at points just outside the Project Area including: Yenikoy (flowing to Terkos Lake), Koydere (flowing towards Alibey Dam) and Yassigecit (flowing towards the basin to the east of the Project Area).

Seasonal (every 3 months) water quality monitoring will be conducted in line with the Turkish legislation (Table 5 in Annex 5 of the Surface Water Quality Management Regulation, Official Gazette No. 28483, date 30 November, 2012) on the streams Yenikoy, Koydere and Yassigecit just outside the borders of the Project Area (Figure 7.5.18, please note that the sampling points on the map are not exact locations) flowing to Terkos Lake, Alibey Dam and the water basin to the east of the Project Area, respectively, and also at Kumluca, Ciftepinar, Terkos 1 and Terkos 2 (see Figure 7.5.18). In case any contamination due to operation of the Project is detected than necessary actions will be put in place in line with the Emergency Response Plan.

Seasonal (every 3 months) sea water quality monitoring will be conducted at locations SWQ1 to SWQ5 (see Figure 7.5.18) in line with Table 4 (General Quality Criteria for Sea Water) of the Turkish Water Pollution Control Regulation.

A wastewater and water quality monitoring programme with adequate resources and management oversight will be developed and implemented to meet the objective(s) of the monitoring programme. The wastewater and water quality monitoring programme should consider the following elements:

Monitoring parameters: The parameters selected for monitoring include parameters that are regulated under compliance requirements;

Monitoring type and frequency: Wastewater monitoring take into consideration the discharge characteristics from the facility over time;

Monitoring locations: The monitoring location selected with the objective of providing representative monitoring data. Process discharges will not be diluted prior or after treatment with the objective of meeting the discharge or ambient water quality standards; and

Data quality: Monitoring programmes will apply internationally approved methods for sample collection, preservation and analysis. Sampling will be conducted by or under the supervision of trained individuals. Analysis will be conducted by entities permitted or certified for this purpose. Sampling and Analysis Quality Assurance/Quality Control (QA/QC) plans will be prepared and, implemented. QA/QC documentation will be included in monitoring reports.

Details on the monitoring requirements for wastewater discharges (including parameters and frequency) will be contained within the ESMP.

7.5.7 Summary of Impacts

A summary of the impacts is given in Table 7.5.20 below.

Table 7.5.20 Summary of Impacts

Topic	Receptor/ Beneficiary	Phase	Impact Categorisation	Potential Significance Prior to Mitigation	Design, Enhancement or Mitigation Measures	Management Plan	Residual Significance
Increased water demand associated with construction activities (vehicles, equipment and facilities)	Local	Earthworks/ Construction	Type: Negative Duration: Medium Term Extent: Local/Regional Reversibility: Irreversible Sensitivity: Low sensitivity	Likelihood: Probable Severity: Moderate Significance: Moderate	Adoption of Construction Phase Environmental and Social Management Plan to include the following measures as part of the water management programme: • Identify, regularly measure and monitor the principal flows within construction works; • Identify construction activities where action should be taken to reduce water use. • Storm/rainwater harvesting and use where possible.	ESMP Pollution Prevention Plan	Low (Adverse) within a regional and local context.
Storm water and wastewater discharge	Black Sea	Earthworks/ Construction	Type: Negative Duration: Medium Term Extent: Local Reversibility: Reversible Sensitivity:	Likelihood: Probable Severity: Low/Moderate Significance: Low to Moderate	• Adoption of Construction Phase Environmental and Social Management Plan to include best management practice with regard to managing storm water runoff from earthworks and construction operations. • Vehicle wash facilities, batch and crushing plants will be appropriately constructed to contain wash and wastewater and direct it to appropriate treatment facilities prior to discharge.	ESMP Pollution Prevention Plan	Low (Adverse)

Topic	Receptor/ Beneficiary	Phase	Impact Categorisation	Potential Significance Prior to Mitigation	Design, Enhancement or Mitigation Measures	Management Plan	Residual Significance
			Low sensitivity		• Each construction camp will be provided with biological wastewater treatment and discharge systems that will be appropriately permitted (Project approvals and discharge permits will be obtained for these biological WWTPs from the Ministry of Environment and Urbanisation in line with Circular No. 2014/07 dated 04.03.2014 on “Project Approval for Wastewater Treatment/Deep Sea Discharge Plants” of the Ministry.). • The most stringent discharge criteria for each parameter given in the Turkish legislation (Water Pollution Control Regulation, Table 21.1 Domestic Wastewater Discharges (Class 1: BOD load 5-120 kg/day, Population: 84-2000)) and IFC Environmental, Health, and Safety General Guidelines (Table 1.3.1-Indicative Values for Treated Sanitary Sewage Discharges, IFC Environmental, Health, and Safety General Guidelines, April 30, 2007) will be adopted as the Project’s discharge standard. • Monthly monitoring will be made in line with WPCR Table 21.1 (domestic wastewater discharges).		

Topic	Receptor/ Beneficiary	Phase	Impact Categorisation	Potential Significance Prior to Mitigation	Design, Enhancement or Mitigation Measures	Management Plan	Residual Significance
Deterioration/ Change of water quality in the Black Sea and in stream/creeks within Alibey Basin as a result of dewatering of WBs	Black Sea, streams/ creeks within Alibey Basin	Earthworks/ Construction	Type: Negative Duration: Short Term Extent: Local/Regional Reversibility: Irreversible Sensitivity: Low sensitivity	Likelihood: Probable Severity: Low Significance: Moderate	• Engineered design and control to effectively manage dewatering activities so as to minimise potential negative impacts on Black Sea and streams/creeks within Alibey Basin (to water quality and local ecosystems) • Weekly monitoring for suspended solids and biweekly monitoring for the rest of the parameters listed in Table 4 of the Water Pollution Control Regulation (for seawater quality) at the discharge points to the Black Sea. The biweekly monitoring frequency can be decreased depending on the successive monitoring results. • The trigger level for an intervention will be the exceedance of Table 4 parameters as compared to the baseline water quality at the discharge point (it should be noted that some Table 4 parameters could already be exceeding the limits for the baseline seawater quality). If any exceedance occurs than the dewatering would stop and depending on the level of exceedance and the parameter of	ESMP Pollution Prevention Plan	Low (Adverse)

Topic	Receptor/ Beneficiary	Phase	Impact Categorisation	Potential Significance Prior to Mitigation	Design, Enhancement or Mitigation Measures	Management Plan	Residual Significance
					concern a treatment option will be considered before discharge. • Opinions of relevant governmental institutions will be taken regarding the dewatering within Alibey Basin and, if required, relevant permissions will be obtained in advance as Alibey Reservoir is one of the drinking water sources for Istanbul. • At points where water from the WBs is directed to streams/creeks within Alibey Basin, weekly monitoring will be conducted for suspended solids and biweekly monitoring for the rest of the parameters listed in Table 5 in Annex 5 of the Surface Water Quality Management Regulation (Official Gazette No. 28483, dated 30 November, 2012). The biweekly monitoring frequency may change depending on the successive monitoring results. • The trigger level for an intervention will be the exceedance of Table 5-Annex 5 parameters as compared to the baseline water quality results (it should be noted that some Table 5-Annex 5 parameters could already be exceeding the limits for the		

Topic	Receptor/ Beneficiary	Phase	Impact Categorisation	Potential Significance Prior to Mitigation	Design, Enhancement or Mitigation Measures	Management Plan	Residual Significance
					baseline water quality). If any exceedance occurs then the dewatering would stop and, depending on the level of exceedance and the parameter of concern, a treatment option will be considered before redirecting the water.		
Increased flood risks due to change of hydrological settings at the Project Area	Local Communities / Airport Workers	Earthworks/ Construction	Type: Negative Duration: Short Term Extent: Local Reversibility: Reversible Sensitivity: Moderate / Low Sensitivity	Likelihood: Possible Severity: Moderate Significance: Low	• Improvement of hydrologic conditions in coordination with DSI to prevent floods during earthworks/construction phase. • Engineered design of site drainage system to accommodate surface runoff and possible flood risks • Taking necessary precautions concerning occupational health and safety, in accordance with related regulations.	ESMP Construction Health and Safety Management Plan Related plans that are prepared by governmental organisations	Negligible / Low (Adverse)
Accidental discharges/spillages and surface runoff	Terkos Lake and Alibey Reservoir	Earthworks/ Construction	Type: Negative Duration:	Likelihood: Unlikely Severity: High	• An engineered site drainage system to manage storm water runoff from earthworks and construction operations. • Wastewater generated from vehicle wash facilities, batch and crushing	ESMP Emergency Response Plan	Negligible

Topic	Receptor/ Beneficiary	Phase	Impact Categorisation	Potential Significance Prior to Mitigation	Design, Enhancement or Mitigation Measures	Management Plan	Residual Significance
			Medium Term Extent: Local/Regional Reversibility: Irreversible Sensitivity: High sensitivity	Significance: Low	plants will be appropriately treated prior to discharge. • Construction camps will be provided with wastewater treatment and discharge systems that will be appropriately permitted. • In order to ensure that any accidental discharge/spillage within the Project Area does not reach the drinking water sources for Istanbul (Terkos Lake and Alibey Dam), weekly visual monitoring is to be conducted at points just outside the Project Area including: Yenikoy (flowing to Terkos Lake), Koydere (flowing towards Alibey Dam) and Yassigecit (flowing towards the basin to the east of the Project Area). • Seasonal water quality monitoring (every 3 months) will be conducted in line with the Turkish legislation (Table 5 in Annex 5 of the Surface Water Quality Management Regulation, Official Gazette No. 28483, dated 30 November, 2012) on the streams Yenikoy, Koydere and Yassigecit just outside the borders of the Project Area, flowing to Terkos Lake, Alibey Dam and the		

Topic	Receptor/ Beneficiary	Phase	Impact Categorisation	Potential Significance Prior to Mitigation	Design, Enhancement or Mitigation Measures	Management Plan	Residual Significance
					water basin to the east of the Project Area, respectively, and also at Kumluca, Ciftepinar, Terkos 1 and Terkos 2. In case any contamination due to earthworks or construction of the Project is detected then necessary actions will be put in place in line with the Emergency Response Plan. Seasonal (every 3 months) sea water quality monitoring will be conducted at locations SWQ1 to SWQ5 in line with Table 4 (General Quality Criteria for Sea Water) of the Turkish Water Pollution Control Regulation.		
Increased water demand associated with the operation of airport	Regional population	Operation	Type: Negative Duration: Long Term Extent: Local/Regional Reversibility: Irreversible Sensitivity:	Likelihood: Probable Severity: Moderate Significance: Moderate	• Regular maintenance of plumbing to identify and repair leaks; • Shut off water to unused areas (e.g. WC areas); • Installation of water-efficient appliances including self-closing taps, automatic shut-off valves, spray nozzles, and water conserving sanitary fittings (e.g. low flow shower heads, faucets, toilets, urinals; and spring loaded or sensored faucets); and	ESMP Pollution Prevention Plan	**Low to Moderate (Adverse)** within a regional and local context.

Topic	Receptor/ Beneficiary	Phase	Impact Categorisation	Potential Significance Prior to Mitigation	Design, Enhancement or Mitigation Measures	Management Plan	Residual Significance
			Low sensitivity		• Operation of any commercial dishwashers and laundries on full loads, and only when needed. • Installation of water saving equipment in lavatories, such as low flow toilets. • Storm/rainwater harvesting and use where possible.		
Storm water and wastewater discharge	Black Sea and/or ISKI municipal sewage system	Operation	Type: Negative Duration: Long Term Extent: Local/Regional Reversibility: Reversible Sensitivity: Low sensitivity	Likelihood: Probable Severity: Moderate Significance: Moderate	Adoption of Operational Phase Environmental and Social Management Plan to include best management practices for wastewater management including stormwater, industrial and sanitary wastewaters. Wastewater management includes measures such as but not limited to: • Efficient use of water to reduce the amount of wastewater generation. • Prevention or reduction of wastewater discharge through measures as recycling and reuse within the facility if feasible. • Effluent segregation (industrial, sanitary/domestic and stormwater) in order to limit the volume of water requiring specialised treatment. • Diverting and treating stormwater drainage from areas of potentially	ESMP Pollution Prevention Plan	Low (Adverse) within a regional and local context.

Topic	Receptor/ Beneficiary	Phase	Impact Categorisation	Potential Significance Prior to Mitigation	Design, Enhancement or Mitigation Measures	Management Plan	Residual Significance
					frequent leaks and spills of chemicals and fuels through use of an oil/water separator prior to discharge to surface WBs. • Collection systems for aircraft and airport facility sanitary sewage will be provided. • Runoff of aircraft de-icing/anti-icing fluids (ADF) should be prevented and controlled by applicable measures. • Runoff airfield (runways and aprons) anti-icing and de-icing fluids should be managed by appropriate measures. • Stormwater collected from de-icing areas will be diverted to de-icing pads from where it will be sent to the biological WWTP. • Recovery of the de-icing agents by distillation or any other appropriate GIIP technique will be an option. • A wastewater and water quality monitoring programme with adequate resources and management oversight should be developed and implemented to meet		

Topic	Receptor/ Beneficiary	Phase	Impact Categorisation	Potential Significance Prior to Mitigation	Design, Enhancement or Mitigation Measures	Management Plan	Residual Significance
					the objective(s) of the monitoring programme. • A biological WWTP will be installed on-site and located on northeastern/eastern boundary of the Project Area. An approval will be obtained from the Ministry of Environment and Urbanisation in line with Circular No. 2014/07 dated 04.03.2014 on “Project Approval for Wastewater Treatment/Deep Sea Discharge Plants” of the Ministry. • For discharges to the Black Sea, the most stringent discharge criteria for each parameter given in the Turkish legislation (Water Pollution Control Regulation, Table 21.4 Domestic Wastewater Discharges (Class 4: BOD load >6000 kg/day, Population >100.000)) and IFC Environmental, Health, and Safety General Guidelines (Table 1.3.1-Indicative Values for Treated Sanitary Sewage Discharges, IFC Environmental, Health, and Safety General Guidelines, April 30, 2007.) will be adopted as the Project’s discharge standard. Monthly monitoring will be made in line with WPCR Table 21.4		

Topic	Receptor/ Beneficiary	Phase	Impact Categorisation	Potential Significance Prior to Mitigation	Design, Enhancement or Mitigation Measures	Management Plan	Residual Significance
					(domestic wastewater discharges, Class 4). • If any sewerage system exists at the time of the operation of INA, effluent may be discharged also to the municipal system in compliance with ISKI's Wastewater Discharge to Sewage System Regulation.		
Accidental discharges/spillages and surface runoff	Terkos Lake and Alibey Reservoir	Operation	Type: Negative Duration: Long Term Extent: Local/Regional Reversibility: Irreversible Sensitivity: High sensitivity	Likelihood: Unlikely Severity: High Significance: Low	• An engineered site drainage system to manage storm water runoff from airport operations. • Industrial and sanitary wastewater management and treatment. • In order to ensure that any accidental discharge/spillage within the Project Area does not reach the drinking water sources for Istanbul (Terkos Lake and Alibey Dam), weekly visual monitoring will be conducted at points just outside the Project Area: Yenikoy (flowing to Terkos Lake), Koydere (flowing towards Alibey Dam) and Yassigecit (flowing towards the basin to the east of the Project Area). • Seasonal water quality monitoring (every 3 months) will be conducted in line with the Turkish legislation (Table 5 in Annex 5 of the Surface	ESMP Emergency Response Plan	Negligible

Topic	Receptor/ Beneficiary	Phase	Impact Categorisation	Potential Significance Prior to Mitigation	Design, Enhancement or Mitigation Measures	Management Plan	Residual Significance
					Water Quality Management Regulation, Official Gazette No. 28483, date 30 November, 2012) on the streams Yenikoy, Koydere and Yassigecit just outside the borders of the Project Area , flowing to Terkos Lake, Alibey Dam and the water basin to the east of the Project Area, respectively, and also at Kumluca, Ciftepinar, Terkos 1 and Terkos 2 (see Figure 7.5.18). In case any contamination due to operation of the Project is detected then necessary actions will be put in place in line with the Emergency Response Plan. • Seasonal (every 3 months) sea water quality monitoring will be conducted at locations SWQ1 to SWQ5 in line with Table 4 (General Quality Criteria for Sea Water) of the Turkish Water Pollution Control Regulation. •		
Treated wastewater use for irrigation	Greenlands at the terminal areas	Operation	Type: Positive Duration:	Likelihood: Probable Severity: Moderate	• Adoption of Operational Phase ESMP to include GIIP for wastewater management including treatment requirements for	ESMP	Moderate (Positive) within a local context.

Topic	Receptor/ Beneficiary	Phase	Impact Categorisation	Potential Significance Prior to Mitigation	Design, Enhancement or Mitigation Measures	Management Plan	Residual Significance
			Long Term Extent: Local Reversibility: Reversible Sensitivity: Low sensitivity	Significance: Moderate	wastewaters intended to be reused for irrigation purposes. • In the event that treated wastewater from the biological WWTP is to be used for the irrigation of landscaped areas, the treated water will to meet the quality criteria defined in Annex 7 of the Communique on Technical Procedures for Wastewater Treatment Plants (Official Gazette No: 27527, date March 20, 2010).		

7.5.8 Conclusions

The earthworks and construction phases of the INA Project will result in increased water demand affecting the local population and operation phase of the Project affecting the regional population. For the earthworks and construction phases of the Project prior to mitigation, the impact has been classified as a medium term impact with moderate significance. Implementation of the following measures as part of the water management programme during the construction phase will result in **Low (Adverse)** residual significance:

- Identify, regularly measure and monitor the principal flows within construction works;
- Identify construction activities where action should be taken to reduce water use; and
- Storm/rainwater harvesting and use where possible.

For the operation phase of the Project, prior to mitigation, the impact has been classified as a long term impact with moderate significance. Implementation of the following measures as part of the water management programme during the operational phase will result in **Low** to **Moderate (Adverse)** residual significance:

- Regular maintenance of plumbing to identify and repair leaks;
- Shut off water to unused areas (e.g. WC areas);
- Installation of water-efficient appliances including self-closing taps, automatic shut-off valves, spray nozzles, and water conserving sanitary fittings (e.g. low flow shower heads, faucets, toilets, urinals; and spring loaded or sensored faucets);
- Operation of any commercial dishwashers and laundries on full loads, and only when needed;
- Installation of water saving equipment in lavatories, such as low flow toilets; and
- Storm/rainwater harvesting and use where possible.

During the earthworks and construction phases of the Project, 15.5 million m^3 of water from the WBs will be used for dust suppression, concrete mixing and vehicle washing. The remaining water in the WBs on the northern part of the Project Area will be directed to the Black Sea. The remaining water in the WBs on the southern part of the Project Area, falling within the boundaries of Alibey Basin, will be directed to streams/creeks within Alibey Basin. The dewatering process will have a temporary impact on the water quality in the Black Sea shoreline where the discharge takes place and on the streams/creeks within Alibey Basin where water is directed. This will be a short term impact with moderate significance prior to mitigation. Taking into account the baseline water quality results, consultation with relevant governmental institutions will be undertaken regarding the dewatering within the Alibey Basin and, if required, relevant permits will be obtained in advance as Alibey Dam is one of the drinking water sources for Istanbul.

The baseline water quality assessments made for the eight WBs within the Project Area is considered to be representative of all the WBs, which reveal that they have no quality issues (as evaluated in the light of national and international standards) regarding metals, colour, BOD and COD.

One issue regarding dewatering will be sediment transport throughout the WB interconnections, which has the potential to result in increased turbidity, suspended solids and sediment deposition at the discharge points to the Black Sea coast and to the streams/creeks flowing within Alibey Basin. In order to minimise potential negative impacts due to the

discharge of water containing high suspended solids, water will not be discharged immediately to the sea environment and will allowed to settle within the final WB, which will act as a sediment trap. Once the water level within the final WB reaches the maximum level on the sea side of the WB, water will overflow to the sea. The same approach will also be used for the dewatering process in the southern part of the Project Area.

Implementation of the following measures during the construction phase will result in **Low (Adverse)** residual significance:

- Engineered design and control to effectively manage dewatering activities so as to minimise potential negative impacts (to water quality and local ecosystems); and
- Weekly monitoring of suspended solids and biweekly monitoring of the rest of the parameters listed in Table 4 of the Water Pollution Control Regulation (for seawater quality) at the discharge points to the Black Sea. The biweekly monitoring frequency can be decreased depending on the successive monitoring results.

- At points where water from the WBs is directed to streams/creeks within Alibey Basin, weekly monitoring of suspended solids and biweekly monitoring of the rest of the parameters listed in Table 5 of Annex 5 of the Surface Water Quality Management Regulation (Official Gazette No. 28483, date 30 November, 2012). The biweekly monitoring frequency may change depending on the successive monitoring results.

Monitoring activities will provide data to trigger an intervention if required. The trigger level for an intervention will be the exceedance of the Table 4 parameters (of the Water Pollution Control Regulation) and/or Table 5-Annex 5 parameters as compared to the baseline water quality results (it should be noted that some Table 4 parameters are already exceeding the limits for good baseline seawater quality given in WPCR. It should be noted that some Table 5-Annex 5 parameters may already be exceeding the limits for the baseline water quality). If an exceedance occurs, the dewatering would stop and, depending on the level of exceedance and the parameter of concern, a treatment option will be considered before redirecting the waters.

During the earthworks and construction phases of the Project, changes to the hydrological settings in the Project Area have the potential to result in an increased flood risks potentially affecting the local communities and airport workers. Prior to mitigation, the impact has been classified as a short term impact with low significance. Implementation of the following measures will result in **Negligible** to **Low (Adverse)** residual significance:

- Improvement of hydrologic conditions in coordination with DSI to prevent floods during earthworks/construction phase;
- Engineered design of site drainage system (including diversion of riverbeds which is subject to DSI approval) to accommodate surface runoff and possible flood risks; and
- Taking necessary precautions concerning occupational health and safety, in accordance with related regulations.

There are no planned discharges from the Project activities to the riverbeds (dry or running) that flow to Terkos Lake and Alibey Dam, which are the two closest drinking water sources for Istanbul. However, the fuel farm within the boundary of the airport falls within the Terkos Lake and Alibey Dam basin boundaries where necessary permits are required from ISKI in line with ISKI's Regulation on the Drinking Water Basins and the relevant authorities prior to the construction of the fuel farm.

For the earthworks and construction phases of the Project prior to mitigation, accidental discharges/spillages and surface runoff reaching to Terkos Lake and Alibey Dam are considered to be an unlikely, medium term impact with low significance. Implementation of the following measures will result in a **Negligible** residual significance:

- An engineered site drainage system to manage storm water runoff from earthworks and construction operations;
- Wastewaters generated from vehicle wash facilities, batch and crushing plants will be appropriately treated prior to discharge;
- Construction camps will be provided with wastewater treatment and discharge systems that will be appropriately permitted;
- In order to ensure that any accidental discharge/spillage within the Project Area does not reach the drinking water sources for Istanbul (Terkos Lake and Alibey Dam), weekly visual monitoring is to be conducted at points just outside the Project Area including: Yenikoy (flowing to Terkos Lake), Koydere (flowing towards Alibey Dam) and Yassigecit (flowing towards the basin to the east of the Project Area); and
- Seasonal (every 3 months) water quality monitoring (Table 5 in Annex 5 of the Surface Water Quality Management Regulation, Official Gazette No. 28483, date 30 November, 2012) on the streams Yenikoy, Koydere and Yassigecit just outside the borders of the Project Area (see Figure 7.5.18), flowing to Terkos Lake, Alibey Dam and the water basin to the east of the Project Area, respectively, and also at Kumluca, Ciftepinar, Terkos 1 and Terkos 2 (see Figure 7.5.18). .

For the operational phase of the Project prior to mitigation, accidental discharges/spillages and surface runoff reaching to Terkos Lake and Alibey Dam is considered to be an unlikely, long term impact with low significance. Implementation of the following measures will result in **Negligible** residual significance:

- An engineered site drainage system to manage storm water runoff from airport operations;
- Industrial and sanitary wastewater management and treatment;
- In order to ensure that any accidental discharge/spillage within the Project Area does not reach the drinking water resources of Istanbul (Terkos Lake and Alibey Dam), weekly visual monitoring is to be conducted at points just outside the Project Area including: Yenikoy (flowing to Terkos Lake), Koydere (flowing towards Alibey Dam) and Yassigecit (flowing towards the basin to the east of the Project Area); and
- Seasonal (every 3 months) water quality monitoring (Table 5 in Annex 5 of the Surface Water Quality Management Regulation, Official Gazette No. 28483, date 30 November, 2012) on the streams Yenikoy, Koydere and Yassigecit just outside the borders of the Project Area (see Figure 7.5.18), flowing to Terkos Lake, Alibey Dam and the water basin to the east of the Project Area, respectively, and also at Kumluca, Ciftepinar, Terkos 1 and Terkos 2 (see Figure 7.5.18)..

In the event of contamination due to the Project activities is detected on the streams flowing to Terkos Lake and Alibey Dam, necessary actions will be put in place in line with the Emergency Response Plan.

During the construction and operational phases of the Project, seasonal (every 3 months)sea water quality monitoring will be conducted at locations SWQ1 to SWQ5 (see Figure 7.5.18) in

line with Table 4 (General Quality Criteria for Sea Water) of the Turkish Water Pollution Control Regulation..

The earthworks, construction and operational phases of the Project will have stormwater and wastewater discharges to the Black Sea. Prior to mitigation, the impact has been classified as a medium term impact with low to moderate significance. Implementation of the following measures during the construction phase will result in **Low (Adverse)** residual significance:

- Best management practice with regard to managing storm water runoff from earthworks and construction operations;
- Vehicle wash facilities, batch and crushing plants will be appropriately constructed to contain wash and wastewater and direct them to appropriate treatment facilities prior to discharge; and
- Construction camps will be provided with wastewater treatment and discharge systems that will be appropriately permitted.

Each construction camp will be provided with a biological wastewater treatment and a discharge system that will be appropriately permitted (project approvals and discharge permits will be obtained for these biological WWTPs from the Ministry of Environment and Urbanisation in line with Circular No. 2014/07 dated 04.03.2014 on “Project Approval for Wastewater Treatment/Deep Sea Discharge Plants” of the Ministry).

The most stringent discharge criteria for each parameter given in the Turkish legislation (Water Pollution Control Regulation, Table 21.1 Domestic Wastewater Discharges (Class 1: BOD load 5-120 kg/day, Population: 84-2000)) and IFC Environmental, Health, and Safety General Guidelines (Table 1.3.1-Indicative Values for Treated Sanitary Sewage Discharges, IFC Environmental, Health, and Safety General Guidelines, April 30, 2007) will be adopted as the Project Standard for discharge. Monthly monitoring will be made in line with WPCR Table 21.1 (domestic wastewater discharges, Class 1).

For the operational phase of the Project prior to mitigation, discharges of stormwater and wastewater to the Black Sea and/or ISKI municipal sewage system has been classified as a long term impact with moderate significance. Implementation of the following measures during the operational phase will result in **Low (Adverse)** residual significance:

- GIIP for wastewater management, including stormwaters, industrial and sanitary wastewaters;
- Wastewater management including measures such as but not limited to:
  - Efficient use of water to reduce the amount of wastewater generation;
  - Prevention or reduction of wastewater discharge through measures as recycling and reuse within the facility if feasible;
  - Effluent segregation (industrial, sanitary/domestic and stormwater) in order to limit the volume of water requiring specialised treatment;
  - 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 WBs;
  - Collection systems for aircraft and airport facility sanitary sewage will be provided;
  - Runoff of aircraft de-icing/anti-icing fluids (ADF) should be prevented and controlled by applicable measures;

- Runoff airfield (runways and aprons) anti-icing and de-icing fluids should be managed by appropriate measures;
- Stormwater collected from de-icing areas will be diverted to de-icing pads from where it will be sent to the biological WWTP;
- Recovery of the de-icing agents by distillation or any other appropriate GIIP technique will be an option; and
- A wastewater and water quality monitoring programme with adequate resources and management oversight should be developed and implemented to meet the objective(s) of the monitoring programme.

A biological WWTP will be installed on-site and located on north-eastern/eastern boundary of the Project Area. An approval will be obtained for this WWTP from the Ministry of Environment and Urbanisation in line with Circular No. 2014/07 dated 04 March 2014 on “Project Approval for Wastewater Treatment/Deep Sea Discharge Plants” of the Ministry.

For discharges to the Black Sea, the most stringent discharge criteria for each parameter given in the Turkish legislation (Water Pollution Control Regulation, Table 21.4 Domestic Wastewater Discharges (Class 4: BOD load >6,000 kg/day, Population >100,000)) and IFC Environmental, Health, and Safety General Guidelines (Table 1.3.1-Indicative Values for Treated Sanitary Sewage Discharges, IFC Environmental, Health, and Safety General Guidelines, April 30, 2007) will be adopted as the Project Standard for discharge. Monthly monitoring will be made in line with WPCR Table 21.4 (domestic wastewater discharges, Class 4).

If a sewerage system exists at the time of the operation of INA, effluent may be discharged to the municipal system in compliance with ISKI’s Wastewater Discharge to Sewage System Regulation and permit requirements.

During the operational phase of the Project, treated wastewater use for the irrigation of landscaped areas in the terminal areas has been classified as a positive, long term impact with moderate significance. The treated wastewater from the biological WWTP if used for irrigation of landscaped areas will have to meet the quality criteria defined in Annex 7 of the Communique on Technical Procedures for Wastewater Treatment Plants (Official Gazette No: 27527, date March 20, 2010). The ESMP will include GIIP for wastewater management and treatment requirements of wastewaters intended to be reused for irrigation purposes. Implementation of the ESMP will result in **Moderate (Beneficial)** residual significance.

References

Ref. 7.5.1	The Commission on the Protection of the Black Sea Against Pollution, http://www.blacksea-commission.org/
Ref. 7.5.2	Performance Standard 3, Resource Efficiency and Pollution Prevention, IFC, 01 January 2012
Ref. 7.5.3	Performance Standard Guidance Note 3, Resource Efficiency and Pollution Prevention, IFC, 01 January 2012
Ref. 7.5.4	Environmental, Health and Safety (EHS) Guidelines for Airports, IFC, 30 April 2007
Ref. 7.5.5	Environmental, Health and Safety (EHS) Guidelines, General EHS Guidelines: ENVIRONMENTAL, IFC, 30 April 2007
Ref. 7.5.6	Turkish EIA Report, May 2013
Ref. 7.5.7	Ove Arup and Partners, Istanbul New Airport Master Plan, December 2013 as amended in March 2015 (new runway layout and drawings) .
Ref. 7.5.8	Fugro, Hydrological and Hydrogeological Report for the Istanbul New Airport, August 2014
Ref. 7.5.9	Fugro, Project Memorandum on Groundwater/Drainage, 3 February 2015
Ref. 7.5.10	ENCON, Water Quality Database for Istanbul New Airport, August 2014
Ref. 7.5.11	ISKI Wastewater Discharge to Sewage System Regulation, 2013: http://www.iski.gov.tr/Web/UserFiles/File/mevzuat/pdf/ISKI_Atiksularin_Kanalizasyona_Desarj_Yonetmeligi.pdf
Ref. 7.5.12	ISKI Regulation on the Drinking Water Basins, 2011 http://www.cevrenorm.com.tr/wp-content/uploads/2013/04/ISKI_Icmesuyu_Havzalari_Yonetmeligi.pdf

Annex 7.5.A: Methodology for Water Quality Sampling and Analysis

Introduction

Water sampling and analyses have been carried out in order to determine the baseline water quality conditions of the Project Area, its Area of Influence (1 km from the airport border) and the vicinity of the Project Area (extending up to far west point of the Terkos Lake). This study identified any groundwater or surface water concerns from previous uses of the land and existing mining operations. In this regard, relevant water quality parameters were measured on site or in the laboratory following proper sampling.

In this context surface and ground water can be defined as follows:

- Surface waters are rivers and streams, brooks, waterways, lakes, ponds, marshes, swamps, bogs, wetlands, creeks, coastal and transition WBs and other natural or artificial, public or private bodies of water, excluding groundwater.
- Groundwater is water flowing through earth materials beneath the ground surface, excluding surface waters.

Sea water quality will also be determined through water quality sampling and analyses study, in order to define baseline conditions in the marine environment in the vicinity of the Project Area.

These water quality studies will also serve for identifying the sensitive and already polluted water resources, if any. All these baseline data and information will form the basis for the assessment of potential impacts of the Project and relevant mitigation measures (if any needed) for sensitive water resources.

Relevant Legislation

Surface and ground water quality classifications are usually made together to provide a picture of overall water quality goals. However, different quality standards have to be taken into account while evaluating the results of the measurements and analyses on surface water, groundwater, and seawater. National and international (mainly EU) water quality standards are presented below.

Turkish water classification system mainly provides the framework for pollution control in Turkey, which is also important from an EU perspective. International standards on water quality presented in this methodology mainly include the EU Water Framework Directive (EU WFD) criteria (http://ec.europa.eu/environment/water/water-framework/). These criteria for various parameters are given in Table 1 below. The IFC General EHS Guidelines indicate that the local legislation should be used to determine the water quality in an area if such legislation exists.

Surface Water Resources

Surface water quality classification standards are defined in Turkish Surface Water Quality Management Regulation, published in official gazette dated 30.11.2012, no 28483. The aim of this regulation is to determine the biological, chemical, physico-chemical, and hydro-morphological qualities of the surface waters and classify the WBs accordingly, which will provide the most appropriate way for protection. Annex 5, Table 5 of “Surface Water Quality Management Regulation” shows the water quality classes, their designated uses, and specifies the water quality criteria to be met for each class. These classifications are as follows:

- Class I: High quality waters; can be used for drinking water supply after disinfection, all recreational activities, farming of trout, irrigation and all other uses.

- Class II: Slightly polluted waters; can be used for supply of drinking water following appropriate treatment, recreational purposes, and propagation of fish other than trout, irrigation, and industrial uses.
- Class III: Polluted waters; can be used, following appropriate treatment, for supply water for industries, except foodstuff and textile industries.
- Class IV: Highly polluted waters; are inferior quality when compared with Class I, II, and III waters and cannot be used for any purposes without appropriate treatment.

In order to make a classification, the water quality for each relevant parameter should be determined in the water resources. Water quality criteria under Turkish legislation for different parameters are given in Table 7.5.A.1 below.

Table 7.5.A.1 Water Quality Criteria According to Turkish Legislation for Inland Surface Water Resources

Water Quality Parameters		Turkish Water Quality Classes			
		I	II	III	IV
General Conditions	Temperature (°C)	≤ 25	≤ 25	≤ 30	> 30
	pH	6.5 - 8.5	6.5 - 8.5	6.0 - 9.0	Except 6.0 - 9.0
	Conductivity (µS/cm)	< 400	400-1000	1001-3000	> 3000
	Colour	RES 436 nm: 1.5	RES 436 nm: 3 RES 525 nm: 2.4	RES 436 nm: 4.3	RES 436 nm: 5
A) Oxygenation Parameters	Dissolved oxygen (mg O_2/L)	> 8	6 - 8	3 - 6	< 3
	Oxygen saturation (%)	90	70-90	40-70	< 40
	Chemical oxygen demand (COD)	< 25	25-50	50-70	> 70
	Biological oxygen demand (BOD)	< 4	4 - 8	8 - 20	> 20
B) Nutrient Parameters	Ammonium nitrogen NH^{4+}-N (mg/L)	< 0.2	0.2 - 1	1 - 2	> 2
	Nitrite nitrogen NO_2-N (mg/L)	< 0.002	0.002-0.01	0.01 - 0.05	> 0.05
	Nitrate nitrogen NO_3-N (mg/L)	< 5	5 - 10	10 - 20	> 20
	Total kjeldahl-nitrogen (mg/L)	0.5	1.5	5	> 5
	Total phosphorus PO_3^{-4} (mg/L)	< 0.03	0.03-0.16	0.16 - 0.65	> 0.65
C) Trace Elements (Metals)	Mercury (mg/L)	< 0.1	0.1 - 0.5	0.5 - 2	> 2
	Cadmium (mg/L)	≤ 2	2 - 5	5 - 7	> 7
	Lead (mg/L)	≤10	10 - 20	20 - 50	> 50
	Copper (mg/L)	≤20	20 - 50	50 - 200	> 200
	Nickel (mg/L)	≤20	20 - 50	50 - 200	> 200
	Zinc (mg/L)	≤200	200 - 500	500 - 2000	> 2000
D) Bacteriological Parameters	Fecal coliform (EMS/100ml)	≤10	10 - 200	200 - 2000	> 2000
	Total coliform (EMS/100ml)	≤100	100 - 20000	20000 - 100000	> 100000

Groundwater Resources

The chemical status of groundwater is assessed according to Turkish Regulation on the Protection of Groundwater against Pollution and Deterioration" which is published in Official Gazette No: 25687, date December 31, 2004. Turkish regulation is compatible with the EU WFD on the protection of groundwater against pollution and deterioration. Indicators of pollutants (or pollution parameters) for groundwater are given in Annex 3 of the Turkish Regulation. The minimum list of parameters are as follows; arsenic, cadmium, lead, mercury, ammonia, chloride, sulphate, trichloroethylene, tetrachloroethylene, and conductivity.

The threshold values in groundwaters for these parameters are going to be established by General Directorate of Water Management for each basin in Turkey. In this context there are no such thresholds for the Project Area and vicinity yet, so the thresholds for surface water (Table 5 of Surface Water Quality Management Regulation) will be used. The chemical status for groundwater can be evaluated in accordance with the threshold values for these parameters.

Seawater

Seawater quality criteria are defined in the Table 4 of Turkish Water Pollution Control Regulation, which is published in Official Gazette (dated 31.12.2004, no 25687) and summarised in Table 7.5.A.2 below.

Table 7.5.A.2 Quality Criteria for Seawater

Parameter		Criteria	Considerations
pH		6.0 - 9.0	-
Colour and Turbidity		Natural	Colour and turbidity should not affect more than 90% the normal photosynthesis activity at the depth of sampling.
Floating matter		-	No floating matter should be present in the sample as liquids (oil, tar, etc.) or solids (waste materials).
Suspended Solid (mg/L)		30	-
Dissolved oxygen (mg/L)		Over 90% of saturation	Dissolved oxygen should be monitored with respect to depth all along the sea depth.
Crude oil and petroleum products (mg/L)		0.003	The parameters should be evaluated separately in the biota and the sediment and preferably should not exist.
Phenols (mg/L)		0.001	
Heavy Metals	Copper (mg/L)	0.01	
	Cadmium (mg/L)	0.01	
	Chrome (mg/L)	0.1	
	Lead (mg/L)	0.1	
	Nickel (mg/L)	0.1	
	Zinc (mg/L)	0.1	
	Mercury (mg/L)	0.004	
	Arsenic (mg/L)	0.1	
Ammonia (mg/L)		0.02	

Sampling and Analysis

Sampling and Analysis Methods

Sampling procedures, sample preservation and storing techniques were carried out complying with the national regulations given in Water Pollution Control Regulation Sampling and Analysis Methods published in Official Gazette (dated 10.10.2009, no 27372) and up to date Turkish Standards (TS EN ISO 5667-3). Methods used for in situ measurements, laboratory analyses and taking water samples are presented in Table 7.5.A.3.

Table 7.5.A.3. Standards for Sampling and Analyses

Parameter	Method
Heavy Metals	EPA 200.7
Phenols	SM- 5530 B-C
Ammonia	SM- 4500-C
Nitrate Nitrogen	SM- 4500 E
pH	SM- 4500-H+ B
Suspended Solid	SM- 2540 D
Dissolved oxygen	SM- 4500-O B
BOD	SM- 5210 B
COD	SM- 5220 C
Colour	SM- 2120 B and SM- 2120 C
Turbidity	SM- 2130 B
Oil and grease	SM- 5520 D
Total coliform	SM- 9222 B
Fecal coliform	SM- 9222 D

**SM: Standard Method*

Sampling Locations and Frequencies

Sampling locations have been chosen to represent the whole study area (including both the Project Area, its Area of Influence and its vicinity as described above). In this regard accessibility of the sampling locations was also considered in selection of sampling sites. Sampling locations are shown in the map in Figure 7.5.2 of this Chapter.

Samples were taken in three different seasons; winter, spring, and summer. This aims to follow the possible seasonal changes in the water quality. The type of samples, number of sampling locations, and the frequency of sampling are given in Table 7.5.A.4 below.

Table 7.5.A.4. Sampling Locations and their Frequencies

	Analysis	Number of Field Samples	Number of Quality Control Samples	Number of Duplicates	Total Number of Samples
SWQ.	Sea Water Quality Analysis (According to the parameters given in Table 4 of Water Pollution Control Regulation) (5 locations, 4 times)	20	2	2	24
WQ Terkos	Water Quality Analysis - Terkos Lake (According to the parameters given in Table 5 of Surface Water Quality Management Regulation) (2 locations, 4 times)	8	1	1	10
WQ	Water Quality Analysis - WBs within the Project Area (According to the parameters given in Table 5 of Surface Water Quality Management Regulation) (8 locations, 3 times) (WBs no: 3, 4, 5, 23, 30, 37, 58, 66)	24	3	3	30
WQ Out	Water Quality Analysis - WBs outside the Project Area (According to the parameters given in Table 5 of Surface Water Quality Management Regulation) (2 locations, 3 times)	6	1	1	8
WQ Surface	Water Quality Analysis - streams (According to the parameters given in Table 5 of Surface Water Quality Management Regulation) (3 locations, 3 times)	9	1	1	11
GWQ	Water Quality Analysis - Groundwater (According to the parameters given in Table 5 of Surface Water Quality Management Regulation) (2 locations, 3 times)	6	1	1	8