## Appendix A3

### Environmental Impact Assessment for the Sorek Desalination Plant

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# Chapter 5

# 5. Measures for Preventing Environmental and Health Nuisances

The construction and operation of a desalination plant may create environmental nuisances that proper planning and preparation in advance will minimize and/or prevent.

In Israel and throughout the world there are desalination plants, some of which have been operating for many years. The broad experience that has been accumulated in these projects for the application of methods to prevent/minimize environmental nuisances will be applied in the design of the Sorek plant.

## 5.1 Measures to Minimize/Prevent Anticipated Environmental Nuisances in the Marine and Land Environment

The directives of National Master Plan 34 b/2 relate, among other things, to the minimization of environmental impacts, for example the directives of sections 12.2, 12.3, 15.2, 15.3, 16, 19.2, 19.5, 21, 22, 23, Appendix 1 and section 8 of Appendix 3.

The design of the desalination plant at Sorek took into consideration these directives.

### 5.1.1 Measures for Reducing Negative Impacts on the Coast and at Sea

The steps to be taken in order to minimize possible negative impacts on the coastal and marine environment as a result of the construction and operation of the plant shall be as detailed hereunder:

During Construction

- A condition for granting a building permit will be the preparation of a detailed work plan that will ensure, among other things, minimal execution time at sea so that it will be possible to reduce to a minimum the duration of the undesirable impacts during construction (subject to the limitations of the Ministry of Defense ).
- The plan will include a technical section that will explain the manner of execution of the works on the coast and at sea, and the location of organization/mobilization areas that will be as far as possible from the water line.
- The work space in the coastal environment will be reduced to the minimal operational area required. This work space and the access thereto will serve both during the construction and during the dismantling and evacuation of the launching plant.
- During the works strong night lighting is to be avoided in the direction of the sea and the sandy coastal strip.
- Use will not be made of concrete, asphalt or any other sealing material, other than Kurkar [aeolianite; cemented sand] substrate, in the work space and the access

thereto. The substrate will be laid on a geo-technical sheet that will be removed upon completion of the work.

- All excavated material from the marine excavations and from the temporary launching installation in the sea will be transferred to a temporary storage pile at sea, in an area marked in the permit application.
- The excavated material from the launching installation on the coast will be evacuated to a temporary piling site on the coast, until its re-use for filling and restoring the area to its original state.
- All fuel and oil tanks will be placed on standard containment basins to prevent percolation and dripping of fuels.
- All the hydraulic equipment will be laid on percolation preventive surfaces.
- All suitable measures will be taken on board the vessels that will perform the work to prevent pollution of the sea as required by Law.
- There will be equipment on site to contain and absorb fuel at sea, in at least the following quantities:
    - Containment-absorbing boom: long enough to circle the largest vessel at least one and a half times
    - A set of absorbent pillows
    - A set of absorbent cloths
- Any event of a failure or oil spillage at sea and on the coast should be reported to the authorities and the oil shall be contained and absorbed immediately, and other measures should be avoided (such as the use of chemicals) without the approval of the Marine and Coastal Environment Division.
- On completion of the work, efforts should be made to restore the situation to its original state including the dismantling of all temporary roads and installations.
- Excess sand and Kurkar will not be removed from the coastal system, but rather disposed to the sea and coast according to the instructions of the Marine and Coastal Environment Division.
- Dismantling of the marine launching installation: on completion of the laying of the pipe in the shallow water the temporary launching plant will be dismantled and the scaffolding removed so that no waste will be left on the sea bed and on the coast. Furthermore, all necessary actions will be taken to rehabilitate the coast line, by the transfer of sand from where it accumulated (if it accumulated) to the place where it recessed (if it recessed). The necessary actions will also be taken to rehabilitate the coast – blurring of signs of excavation, cleaning and leveling the sand and additional actions if required.
- Piping for the plant will be buried at least 1m under the sea bed in order to prevent undesirable impacts on sand transport on the sea bed.
- The location of the concentrate discharge and its constituents, including their calculated concentrations will be determined at the time of issuing the building permit according to the results of the marine flow model.
- The entry velocity of seawater into the intake suction head will not exceed 15 cm/sec in order to prevent any impact on the sea bed.
- The intake suction head will be at least 4 meters under the water surface and at least 4 meters above the sea bed.

<u>During Operation</u>

- Additives to the desalination process that may have a adverse impact on the sea and on its biota will be treated on land as detailed hereunder:

- Sand filters backwash will be treated by a technology based on separating solids, thickening and squeezing and evacuation of the solids to an authorized site. The sludge from the filter backwash to be buried will contain over 25% solids at least and with concentration of dissolved solids (TDS) of less than 6% (60 gr TDS/kg dry solids).
- The concentration of iron, the source of which is in the iron coagulant additive, to be discharged to the sea will be less than 0.3 mg/l monthly average and 0.5 mg/l at any given time.
- Limestone reactors washings discharged to the sea will be treated to bring the concentration of the suspended solids (TSS) to a level that will not exceed 30 mg/l and turbidity that will not exceed 30 NTU in the washings prior to discharge and mixing with the concentrate (to be discharged to the sea).
- Water from periodic washing of the membranes containing organic substances will be collected in a special tank and disposed to an authorized site.

- In the area of the suction and distribution heads sailing and fishing will be limited. Their position will be marked according to the instructions of the Port Authority.

### 5.1.2 Measures for Reducing Negative Impacts on Land

The steps to be taken in order to minimize the possible negative impacts on the land environment as a result of the construction and operation of the plant will be as follows:

<u>During Construction</u>

- Prevention of noise and vibration nuisances during construction:
  - Working hours will be as prescribed by the Abatement of Nuisances Regulations (Prevention of Noise) – 1992.
  - Mechanical systems and/or construction equipment that will be operated during the construction works, in noise sensitive areas, will meet the requirements of the Abatement of Nuisances Regulations (Unreasonable Noise from Construction Equipment) – 1979.
  - Prior to start of works, the executing contractor will provide documents showing that the work equipment and machinery that he intends to use meet the requirements of the above regulations.
  - Operation of the machines mentioned in Abatement of Nuisances Regulations in residential areas (Unreasonable Noise from Construction Equipment) – 1979, will be according to the requirements of Abatement of Nuisances Regulations for (Prevention of Noise) – 1992.
  - The criteria for the permitted noise level from construction equipment and machinery that is not subject to the Abatement of Nuisances Regulations (Unreasonable Noise from Construction Equipment) – 1979 will be determined according to the Abatement of Nuisances Regulations (Unreasonable Noise) – 1990.
- The work plan will define access roads, organization/mobilization areas, temporary work areas and a work strip. The mobilization area for the construction of Stage A of the desalination plant will be in the area designated for Stage B. During the construction of Stage B an organization/mobilization area will be designated together with the relevant planning authority. The organization/mobilization areas for the first water reservoir and water pipelines will be within the boundaries of the Plan. The mobilization area for the second reservoir will be designated together with the relevant planning authority.
- Defining area for conservation – prior to start of works the areas and the landscape elements to be conserved (including lone trees) will be identified and marked.

- A full risk assessment survey will be conducted for all hazardous substances that will be characterized by the Concessionaire, to examine the impact on the environment and on the population around the desalination plants, reservoirs and pumping stations. The survey will be a condition for the permit and will include all the additives. It will include measures for protection from hazardous substances and prevention of emissions.
    - The risk assessment will be carried out for all the hazardous substances that are stored or used on the site.
    - Including hazardous substances for routine and periodic maintenance activities, such as periodic sanitization of the membranes.
    - The risk assessment will include all the hazardous substances that will be required by the concessionaire for the construction of the plants.
    - The impact on the environment and the risks of the various substances (risks to the population and soil and water pollution) are to be examined, such as: sedimentation inhibitors, coagulants, antiscalants and the like. Risks to the population, land and water pollution.
- In order to prevent dust and dirt nuisances on the adjacent roads and access ways, trucks should be covered as part of their meeting the conditions of the permit.
- The detailed design will consider the location of mature trees, particularly in the area of the Rishon LeZion Municipal Park, in order to minimize damage to them.
- Used oil from mechanical equipment will be collected, stored in a closed container and evacuated to an authorized oil recycling plant.
- The fuel tanks will be placed in approved containment basins with a storage volume of 110% of the storage capacity of the tank.
- Fueling of the mechanical equipment will be done carefully to avoid overflow from the tank.
- Filling of the tanks and fueling will be done in the containment basin.

<u>During operation</u>

- Meeting the following acoustic criteria must be ensured:
    - Maximum permitted noise levels according to the Abatement of Nuisances Regulations (Unreasonable Noise) – 1990
    - The IDF requirement that the noise level not exceed 45dB(A) in the front of the residential buildings on the military base.
- The hazardous substances will be stored according to the regulations and professional guidelines of the various government offices. Meeting all the requirements of the authorities and the Ministry of Environmental Protection within the framework of issuing a Business License and a Poisons permit.
- Protective and safety measures will be installed to provide an immediate response in the case of an emergency event on site.
- Hazardous substances will be stored in the amounts required for current operation only.
- All tanks and dosing systems will be located in containment basins with a volume of 110% and coated with corrosion and leak resistant materials.

## 5.2 Capability of the Plant to Remove Pollutants from the Water

The following operations will be carried out so as to ensure the removal of pollutants from the intake seawater:

- Sterilization and filtration with rotating filters at the pumping station.

- Granular, sand and anthracite filtration in gravitation filters.
- Passage through 5-10 micron micronic filters.
- Desalination of the water by reverse osmosis membranes to the level of ion rejection.
- An additional pass of second (third and fourth) stage desalination in reverse osmosis membranes (the cascade).
- Disinfection of the limestone for hardening and of the product water.

## 5.3 Measures for Coping with Marine Pollution

The desalination plant's maintenance system will include an oil pollution detector, which will stop the operation of the facility automatically when pollution is detected.

## 5.4 Location of the Brine Discharge Point Relative to the Head of the Intake Pipe

In the application for a construction permit, the brine discharge point will be determined according to the results of the ecological-hydrodynamic model, which will be run in accordance with the instructions of the Ministry of Environmental Protection.

## 5.5 Compliance of the Plant's Components with the Israeli Standard

The parts of the plant that come into contact with the water, including the materials serving them, will comply with the requirements of Israeli Standard 5452.

## 5.6 Steps to Minimize the Damage to the Landscape, the Flora and Fauna.

### 5.6.1 In the land environment

- See Section 5.1.2 above.
- Survey for locating and safeguarding rare flora: a survey for locating and safeguarding rare flora will be carried out prior to the start of the works on site during the growing season (October, December, February, May) throughout the sand dunes area as well as the fallow land that may be affected by the plan for the plant, the reservoirs and the water conveyance piping. Special attention will be given to the area of the Purple Iris nature reserve. Rare flora that will be found during the survey and, which may be negatively impacted by the Plan, must be saved in accordance with the instructions of an agronomist (transplantation, collecting seeds, exposure, etc.). Performance of the complete survey will be a prerequisite for the commencement of works on site.
- A plan will be prepared for the electricity array during the construction and for the routine operation in the area of the pumping station and the facilities, so as to reduce to a minimum the possible impacts on the natural habitats, in accordance with the directives of the Nature and Parks Authority (subject to the directives of the Defense Authorities).
- Prior to commencement of the earthworks, the upper layer of the soil will be removed and laid aside separately, and will later be used to cover the upper layer of soil on completion of the construction works and the performance of the restoration.
- On completion of the construction works, the original topography of the area will be restored as much as possible.

- The finishing materials and their colors will be such that they will blend in with the environment as much as possible. As detailed below:
    - The air vents along the water conveyance lines will be painted in a shade in accordance with the instructions of a landscape architect, so that their conspicuousness in the landscape will be minimized.
    - Reservoirs: the shade of the external wall, should it not be constructed of soil, will be similar, as far as possible, to the shade of the sand dunes surrounding the facility. Furthermore, the texture of the rigid elements, of which the wall will be constructed, will be as similar as possible to gravel/sand.
    - The walls of the surplus channel will be stabilized by flora as much as possible.
- Operations to restore the flora will be carried out along the pipeline strips wherever the natural surface is marred. In each area natural vegetation will be planted in accordance with the existing vegetation in the area, as per the instructions of the landscape architect.
- Removal of invasive plants: actions for the removal of invasive plants will be carried out along the pipeline strips and on both sides thereof, in 20 meter barrier strips on each side. Actions for the removal of invasive plants will be employed for at least two years, until the establishment of a sustainable local flora.

### 5.6.2 Coastal and Marine Environment

- See Section 5.1.1 above.
- The crossing of the Soreq River will be carried out as much as possible by pipe-jacking. The position and angle of the crossing will be determined at the time the application for a construction permit is submitted, taking into account the location of the widening of the Soreq River before the estuary and within the Blue Line.

## 5.7 Drainage of the Desalination Plant

- Since the plant is located in a sandy area lacking a central drainage system, the run-off water will be directed, as far as possible to penetrate the adjacent sandy area. Any additional run-off will be directed to the drainage channel crossing the southern part of the Plan.
- Run-offs from areas within the facility, which may be polluted, will be transferred into an oil/water separator.

## 5.8 Measures for Controlling the Prevention of Pollutants Penetration

- For particulars of the measures for controlling the penetration of pollutants see Section 5.2.
- As part of the terms for the operation of the plant, the operator will be given a plan for detailed monitoring and control by the Ministry of Health and the Ministry of Environmental Protection, which will include directives with regard to the mechanism for reporting to the Ministry of Health and the Ministry of Environmental Protection, both for routine reports and with regard to the conduct of the operator during exceptional events of seawater pollution, deviations in the quality of process water and product water or malfunctions in the desalination plant.

## 5.9 Measures for Monitoring – Terms of Operation

### 5.9.1 Monitoring of the Marine Environment

As a condition for the operation of the plant, a plan for monitoring the marine environment will be prepared in accordance with the directives of the Ministry of Environmental Protection and the Ministry of Health.

### 5.9.2 Monitoring of the Pipeline Routes

Means will be installed to monitor, control and prevent the percolation of seawater and/or concentrate into the subsoil. This monitoring plan will be submitted for approval by the Water Authority.

### 5.9.3 Monitoring of the Intake Water

The intake water at the entry to the plant will be monitored on a routine basis in accordance with the directives of the Ministry of Health.

## 5.10 Limitations on Land Uses at Sea and on Land

The movement of vessels and fishing vessels in the area of the intake and concentrate discharge heads will be in accordance with the directives of the Shipping and Ports Authority.

## 5.11 Limitations on Activities at Sea

See Section 5.10

## 5.12 Terms for Granting a Building Permit

Submission of the following documents will be among the terms for a building permit:

- An update of the existing bathymetric mapping along the routes of the marine pipelines extending to 200m beyond the end of the pipelines and 250m on both sides of each pipeline. Also a differential map between the actual bathymetric mapping and the bathymetry used for the model, together with the opinion of the model writers as regards the significance of the differences for the results of the model.
- A mapping on a color orthophoto updated to the last year, on which the path crossing the Soreq River as well as the angle of crossing will be clearly marked.
- A cross section of the configuration of the sea bed and the geological and sedimentological structure.
- Submission of detailed plans of intake water and product water pipelines including data on distances or crossings of pollution sources such as streams and sewage and effluent pipelines.
- An estimate of the concentrate dispersion, an expert opinion (a marine biologist/ecologist) as to the possible effects of the suction of the concentrate, with an emphasis on the biota.
- An expert opinion as regards the quality of the water at the intake site.
- Preparation of a monitoring program according to directives of the Ministry of Environmental Protection and the Ministry of Health.
- A detailed description of the marine facilities.
- A detailed description of the pretreatment facilities, including the treatment of the backwash prior to its discharge into the sea, as regards compliance with the detailed

requirements in the Ministry of Environmental Protection Policy Document from December 31, 2008.

- A detailed work plan, which will determine the work site, the manner of the construction, the means for reducing nuisances and minimizing the damage to nature and landscape values during the construction, the landscape and environmental restoration at the completion thereof. The work plan will include a detailed landscape appendix, prepared by a landscape architect, which will include an analysis of the various coastal units and instructions as to the manner of work and restoration for each of them.
- The work plan will determine access roads, organization/mobilization areas, temporary work areas and a work strip. The organization/mobilization area for the construction of Stage A of the desalination plant will be within the boundaries of the area intended for Stage B. During the construction of Stage B, the organization/mobilization areas will be coordinated with the relevant planning institution. The organization/mobilization areas for the first reservoir and the water lines will be within the perimeter of the Plan. The organization/mobilization areas for the second reservoir will be coordinated with the relevant planning institution.
- A condition for the granting of a building permit will be the submission of a budget of excavation and fill materials in accordance with the procedure of the Ministry of the Interior.
- A condition for the granting of a building permit will be detailed consideration of various measures for minimizing damage to the ecosystem such as: a survey of unique species, relocation of fauna and flora, detailed instructions for the period of construction and during the facility operation etc.
- A condition for the granting of a building permit will be the preparation of a detailed acoustic performance appendix, which will be approved by the Committee for National Infrastructures.
- A list of additives, quantity, storage volume, concentration in the process water and in the concentrate, and a certificate attesting to their being approved.
- All measures will be undertaken to prevent dust emission during the construction works including wetting of earth roads, covering of earth moving trucks, swiping of access roads on each day after work, rtc.
- Conduct of a full risk assessment survey for all hazardous materials, which will be characterized by the concessionaire, to assess the effect on the environment and the population in the vicinity of the desalination facilities, reservoirs and pumping stations. The survey will constitute a condition for the permit and will include all the additives. It will also include measures for protection from hazardous materials and the prevention of emissions.
  - The risk assessment will be carried out for all the hazardous materials that are stored or in use at the site.
  - This will include hazardous materials for routine and periodic maintenance activities, such as periodic disinfection of the membranes.
  - The risk assessment will be carried out for all the hazardous materials that may be required by the concessionaire for the construction of the facilities.
  - An examination must be carried out regarding the impact on the environment and the risk from the various materials, such as: sedimentation inhibitors, coagulants, antiscalants, etc; the risks to the population, soil and water pollution.