As 5 million liters of oil gush through the Arava Desert, Israel mobilizes to deal with one of its major environmental disasters

The final month of 2014 will long be remembered as the month in which a massive oil spill in the south of Israel endangered human health, jeopardized water sources, contaminated the soil, ravaged a unique nature reserve and posed a major risk to the Gulf of Eilat/Aqaba and its unique coral reefs. Due to a breach in the 42" pipeline of the Eilat-Ashkelon Pipeline Company (EAPC), some 5 million liters of crude oil gushed southwards alongside Route 90, Israel’s major north-south highway, then crossed the road eastward toward the acacia grove at the edge of the Evrona salt flats, stopping just 400 meters short of the international border with Jordan.

Immediately upon receiving the first report of the breach at 9:00 pm on December 3, 2014, firefighters, police, the Ministry of Environmental Protection, the Nature and Parks Authority and engineers and maintenance teams of the EAPC arrived at the scene. Emergency crews worked round-the-clock. Within the first 24 hours, they erected embankment dams to stop the flow of oil, pumped the oil from the ground, and began removing heavily contaminated soil to the nearby Nimra landfill, which was especially prepared to receive the soil. Within just over a week, more than 90% of the oil was removed by vacuum pumping or earth removal techniques. At the same time, sorbents and containment booms were deployed to prepare for a potentially devastating scenario whereby rain would carry the oil to the Gulf of Eilat.

**Coordinated Action**

Guy Samet, director of the Ministry of Environmental Protection’s Southern District, remembers the actions taken in the first days following the soil spill as “a race against time.”

All stakeholders were mobilized to respond to the event, with the Ministry of Environmental Protection responsible for overall coordination, including environmental monitoring, risk assessment, removal and treatment of the contaminated soil, and preparedness for possible marine pollution. On its part, the Nature and Parks Authority was responsible for minimizing damages to the Evrona Nature Reserve, for removing contaminated soil from the reserve and for preparing and initiating rehabilitation, monitoring and inspection plans. In parallel, a host of other bodies took part in efforts to mitigate the damages – from the first responders, the Israel Police and Firefighting Service, to the Water Authority, Drainage Authority, Hydrological Service, Meteorological Service and local authorities. A situation room was set up by the Ministry of Environmental Protection in Be’er Ora, the village adjacent to the source of the oil spill, and by the Nature and Parks Authority at the entrance to the Evrona Nature Reserve, and relevant stakeholders gathered together twice a day for assessment, review and planning.

Concern for human health was foremost in the minds of Ministry of Environmental Protection officials.
Oil Spill Timeline: First Ten Days

December 3: First report of an oil spill in Israel’s southern Arava region, south of the communal village of Be’er Ora, is received at 9:00 pm. Crews are immediately dispatched to begin cleanup operations and the Ministry of Environmental Protection’s Green Police begins to investigate the event, in conjunction with other bodies. Five million tons of crude oil spill from the breached pipeline and reach the Evrona Nature Reserve.

December 4: Aerial views show a 6-kilometer oil stain from Be’er Ora through the Evrona Nature Reserve. Emergency crews begin to pump the crude oil deposits to reduce immediate environmental damages.

December 5: Contaminated soil is first removed to the Nimra landfill, just north of Eilat, following special preparation of the site.

December 6: 6,000 tons of contaminated soil are removed to the Nimra landfill. The EAPC is ordered to augment its manpower and equipment in order to expedite cleanup operations following forecasts of rain and potential flooding.

December 7: Pumping of oil from the main pools continues, with 8,500 tons of contaminated soil transferred to the landfill.

December 8: The Ministry of Environmental Protection deploys absorbent materials in the southern Arava region in anticipation of rainfall and possible flooding. Dams are constructed in the Evrona Nature Reserve to prevent the oil from reaching the Gulf of Eilat in case of flooding. A containment boom is deployed to prevent oil runoff that may reach the Gulf from dispersing. 15,278 tons of contaminated soil are removed to the landfill and 2 million liters of oil are pumped.

December 9: Rain begins but crude oil does not flow outside the contaminated area. Nature and Parks Authority inspectors map damaged acacia trees in the reserve for treatment and follow up. Dams and sorbents are deployed at the drainage opening (Kinet Canal) at the northern point of the Gulf of Eilat to prevent the oil from reaching the sea. 20,000 tons of contaminated soil are removed.

December 10: The public is advised to remain away from the contaminated area, and the nature reserve remains closed. Air quality monitoring reveals high levels of benzene in the nature reserve, but normal air quality values in Eilat and Be’er Ora. The Green Police confiscate the section of the pipeline that burst.

December 11: Deputy Environmental Protection Minister Ofir Akunis orders the dam walls to be raised to further reduce the risk of oil reaching the Gulf of Eilat in case of flooding. 90% of the oil is removed, and only a few oil puddles remain in the nature reserve.

December 12: Crews continue to prepare for rain by raising the dam walls and improving drainage.

December 14: Deputy Environmental Protection Minister Ofir Akunis reports to the cabinet on the emergency response.
Ongoing assessments and preparation of cleanup and rehabilitation plans.

In parallel to the cleanup operations, the Green Police of the Ministry of Environmental Protection mobilized to cooperate with the relevant authorities on investigating the causes of the oil spill and the actions taken to prevent and contain it.

And, most importantly, from the very start, the Ministry of Environmental Protection kept local authorities, Jordanian authorities and international environmental organizations up to date on the spill and the actions taken to mitigate its impacts. Transparency was a major priority.

**Threat to the Evrona Nature Reserve**

By far, the greatest ecological damage was caused to the Evrona Nature Reserve, a unique nature reserve in the Arava, where dozens of hectares were contaminated. The reserve, home to the last salt flat to be preserved in its entirety in the Arava desert, features some 500 acacia trees at a density of up to 200 trees per kilometer, about 250 Dorcas gazelles, representing a quarter of Israel’s entire population of this endangered species, and a grove of doum palm trees situated at the northernmost limit of their worldwide distribution.

To minimize damages within the nature reserve, heavy mechanical engineering equipment was initially used to create sites for the containment and collection of the oil. Penetration of oil into the soil, especially in the clay-rich areas, did not exceed a few centimeters, and reached approximately 20 cm in the more sandy areas where the oil was collected. Crude oil was pumped from the large oil pools and transferred to the EAPC facility in Eilat while contaminated soil was removed to the nearby Nimra landfill.

At the same time, additional activities were initiated by the Nature and Parks Authority. Analyses of the contaminated soil piles were conducted, surveillance was initiated to identify animals in distress, remote sensing was undertaken, acacia trees were surveyed, marked and tagged, acacia seeds were collected from the oil-saturated soil to prevent animals from eating them, measures were taken to keep birds away, and potential means of treatment and rehabilitation were investigated with the help of experts in Israel and abroad.

When the state of emergency was lifted on December 9, the use of heavy engineering equipment to clean up the area was stopped in order to prevent the risk of secondary damage, while consultations with Israeli and international experts, universities and organizations on the best means of treating and rehabilitating the clay-rich desert soil intensified.

Different alternatives were reviewed – including biological treatment, chemical treatment, thermal treatment and stabilization/solidification – and innovative remediation technologies were proposed by entrepreneurs. However, questions remained. Is natural attenuation appropriate in some areas? Can remediation techniques be implemented in some areas without risk of secondary pollution? The answers were not easy to come by, especially in view of the relative scarcity of information on the rehabilitation of oil-contaminated desert ecosystems and the very high ecological sensitivity of the Evrona Nature Reserve.

Meanwhile, a call for proposals was published by the EAPC and by the Nature and Parks Authority on means of treating the residues of crude oil at the Evrona Nature Reserve. Selected applicants will be invited to demonstrate
their technologies for the removal of oil residues on a small scale in the nature reserve itself in order to help identify the most appropriate technologies and materials. At the same time, the EAPC published a call for bids for the receipt and treatment of the contaminated soil in the Be’er Ora region.

**Rehabilitation Plans for the Evrona Nature Reserve**

By all accounts, the coordinated and timely response to the oil spill was instrumental in avoiding a worse catastrophe, but from the start, it was clear that rehabilitation would be a long process. A government decision was needed to assure that rehabilitation would minimize environmental and ecological impacts and would restore previous conditions based on international standards, on the one hand, and prevent environmental degradation from future events, on the other hand. Furthermore, the oil spill highlighted the need for increased national preparedness and response in environmental emergencies in order to protect public and environmental health, preserve and conserve natural assets and prevent environmental hazards.

Therefore, some three weeks after the oil spill, the Ministry of Environmental Protection presented Israel’s cabinet with a plan for the rehabilitation of the southern Arava region and the Evrona Nature Reserve. On December 18, 2014, the government approved a NIS 17 million (about $4.35 million) action plan with the following elements:

1. Appointment of a directorate to oversee rehabilitation of the contaminated area and to submit reports to the Minister of Environmental Protection on implementation. Members include representatives of the Ministry of Environmental Protection (chair), Nature and Parks Authority, Arava Drainage Authority, Hevel Eilot Regional Council and environmental organizations.


3. Monitoring and environmental research in the Arava region and Gulf of Eilat, outside the bounds of the Evrona Nature Reserve, by the Ministry of Environmental Protection, including a research study on long-term environmental impacts and a review of available advanced technologies for soil rehabilitation.

4. Rehabilitation and restoration of animal populations at risk of extinction in the impacted area by the Nature and Parks Authority, including construction of an eco-bridge for animal passage above Route 90.

5. Development and implementation of educational and information programs on ecosystem rehabilitation in local authorities in the vicinity of the oil spill.

6. Declaration and expansion of the Evrona Nature Reserve to facilitate the rehabilitation of natural assets and animal populations that were adversely impacted by the oil spill.

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When environmental emergencies such as the Arava oil spill occur, it is the job of the Ministry of Environmental Protection to coordinate the activities of all relevant bodies – on the one hand, the Eilat-Ashkelon Pipeline Company, which is responsible for the event and is under investigation; on the other hand, a wide range of bodies, including the Nature and Parks Authority, Drainage Authority, Ministry of Health, Hydrological Service, Meteorological Service, local authorities and municipal economic companies, and the residents themselves.

In an emergency such as this, our aim is to get to a point where there is no damage to the environment and no risk to man. The first responders in such an event are the police and firefighters, but as soon as these first responders leave, about six hours after the beginning of the event, we begin with one objective in mind – to minimize risks.

We ran this environmental emergency like a military operation. We met in round tables, where participants voiced their professional opinion. We conducted situation assessments twice a day, with summaries immediately distributed to all participants. We reviewed the data and built a work plan for half a day at a time. Inclusiveness and transparency were all important. All factors were involved, including the Ministry of Foreign Affairs, and, of course, the media. Data, pictures and aerial photographs were available to everyone, including the local and foreign media.

Yet, there were major dilemmas along the way that called for difficult decisions. For example, just a little more than a day after the oil spill, a triathlon was planned in Eilat. We were concerned about the possible impacts of the oil spill on participants, especially the possibility of high concentrations of benzene. We used a photoionization detector – PID – to measure volatile organic compounds and other gases in the air. At the end of the day, the police decided not to cancel the triathlon but the route was changed so as to keep participants away from the impacted area.

Another dilemma related to how to conduct the cleanup itself. The public wanted maximal cleanup. This would have been an achievement, on the one hand, but at the end of the day it would have constituted an ecological disaster. It’s easy to bring in heavy machinery and to “shave down” the area. However, this was the wrong thing to do. It would have meant changing the unique ecosystem and the biodiversity within it which had gradually developed over the years. Our goal was maximal removal of the contaminated material with minimum damage. We had to manage the risk and take responsibility. We opted to concentrate on the most contaminated parts, where damage had already occurred. Some 2,000 cubic meters of oil were pumped and removed in the first few days out of a total of 5,000 cubic meters. Some 33,000 tons of contaminated soil were removed and stored in the Nimra landfill which was especially prepared to receive the soil. The rest will take time, using in-situ treatment.

Yet another difficulty related to Be‘er Ora itself, the communal village located just a few hundred meters from the source of the oil spill. The odor was strong. Residents were afraid. We therefore set out to take immediate steps to sample air quality in the area, bringing in vacuum canisters and making sure the results were in before the weekend.

The rain forecast for the week after the oil spill was especially difficult for me. That night, I saw lightening and heard thunder from my hotel room in Eilat, but our initial activities proved critical. We made sure that the oil would not travel beyond the nature reserve. We planned ponds for the collection of surface runoff in those places in which we pumped the oil and so, when the rain did begin, the waters were transported into the ponds and pumped from there. At the end of the day, the oil did not flow outside the nature reserve and did not reach the Gulf of Eilat. Our preparations proved themselves.
7. Completion of the Ministry of Environmental Protection’s preparedness, as a second responder, for prevention and treatment of environmental emergencies, including purchase of designated equipment and environmental sampling.

8. Allocation of additional human resources to the Ministry of Environmental Protection for the prevention of future failures and leaks and for the rehabilitation of contaminated soils, including a review of soil remediation technologies.

9. Completion of the Ministry of Environmental Protection’s strategic preparedness for prevention and treatment of marine pollution by oil in order to protect the coastal environment and to assure that appropriate equipment is available, including vessels and professional manpower.

10. Assurance of the preparedness of the EAPC to prevent and treat future soil, marine or coastal pollution, including vessels and equipment for the containment and pumping of oil, as per Ministry of Environmental Protection guidelines.

11. Establishment of an interministerial team to formulate recommendations on the measures needed to prevent similar incidents and to reduce risks from fuel infrastructure.

12. Establishment of an interministerial team to check the environmental aspects of the EAPC’s land and coastal uses.

The resolution stipulates that the resources allocated for implementation of the decision do not derogate from the EAPC’s responsibility for the incident and for the repair of the damages caused by the oil spill or from its obligation to rehabilitate the region and restore previous conditions, in accordance with the “polluter pays” principle.

In relating to the government decision, Deputy Environmental Minister MK Akunis stated: “The government adopted my position that in addition to the ‘polluter pays’ principle that will be applied to the EAPC, we must take a first and immediate step toward redressing the injustice that was caused to the entire public as well as to the flora and fauna in the Arava region. The plan that was approved today will enable quick rehabilitation of the unique animal populations in the Arava that were harmed, such as gazelles that will benefit from wider open spaces. It will also begin the process to complete the Ministry of Environmental Protection’s preparedness for future hazardous materials incidents, in order to ensure public health.”
What was your biggest fear when you heard about the oil spill?

In addition to concerns about the risk to the Evrona Nature Reserve, the main fear of the Marine and Coastal Environment Division was that rain would begin to fall in the area. It was feared that flooding would transport large quantities of the oil to the “Kinet” Canal, the open drainage canal that runs parallel to the Israel-Jordanian border and empties into the Gulf of Eilat. The risk to this highly sensitive marine ecosystem would have been enormous.

How did the ministry prepare to avert such a disaster?

As soon as we were informed about the oil spill, the Marine and Coastal Environment Division took immediate steps to protect the upper Gulf of Eilat. We gathered a think team to decide on the best means of preventing the oil from reaching the Gulf, due to the risk of rain-caused flooding, and set out to determine the best course of action, should the rain materialize.

In parallel, we also used our excellent relations with our international connections and consulted with them. Naturally, as per our obligations, we immediately informed REMPEC – the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea – and also requested expert advice from our Mediterranean Assistance Unit on how to block the flow of oil to the sea and on known methods and techniques for treating contaminated land. The consultation system worked excellently and also served us well in informing neighboring countries of the event.

We also maintained continuous communications with the Jordanian unit in the Port of Aqabia, providing constant updates throughout the course of the event.

What specific activities were undertaken?

In the first 24 hours, we sent a surveillance aircraft to assist in identifying the flow veins of oil. This allowed us to identify the best locations in which to place sand barriers to collect the storm water mixed with oil, so as to prevent its flow downstream and enable the oil to be pumped out of the water, should it rain. The Nature and Parks Authority undertook similar activities in the Evrona Nature Reserve.

Within two days, we deployed a sorbent boom and oil traps to absorb the oil should it flow downstream. In accordance with our contingency plan for large-scale oil spills, the Eilat-Ashkelon Pipeline Company put its equipment stockpiles at our disposal. We spread a 250 meter open-sea oil boom in the area surrounding the Kinet Canal’s opening to the sea to assure that the flow of oil could be contained and skimmed by vessels from the seawater. Luckily, the floods didn’t materialize, but we were ready.

All of our partners, including the EAPC and the Eilat municipality, acted in accordance with the steps outlined in the contingency plan. Everyone was ready to help, making advice and equipment readily available.

What conclusions can you draw from the event?

The incident demonstrated again that we are in a good position when it comes to know-how about the steps to be taken in tackling such emergencies. We are relatively well-prepared in terms of procedures and information. However we are not prepared for such a potentially disastrous, large-scale oil spill. Although we have an excellent team of highly professional marine pollution prevention inspectors, we lack the necessary quantity of human resources, the necessary modern equipment, and also the necessary barges and vessels, both in the Gulf of Eilat and in the Mediterranean Sea.

The Arava oil spill has highlighted the need for better preparedness and response capabilities. Hopefully, the implementation of the recent government decision on rehabilitation, monitoring and emergency response will help fulfill our needs, which are the needs of the State of Israel.