Jersey Airport Fire Training Ground Redevelopment

(Extracts from 2006 World Environmental and Water Congress Conference Paper)

Jersey Airport serves a million passengers a year. Until 1994, Jersey Airport Fire Training Ground (FTG) was used for fire fighting training with water and foam on simulated aircraft on an unpaved and unsealed surface. As a consequence, hydrocarbons and foams contaminated the ground below. National governments, including the UK, now restrict or are in the process of regulating its use. As a consequence of the contamination, adjoining drinking water wells became visibly contaminated with foam, leading to suspension of fire training with foam and the need to provide mains water.

Fire training on the new water cooled rig

The development of the new facility was constrained by a prohibition on the disposal of surface runoff to watercourse or to groundwater (because of the water use for public water supply and aquifer flow into a protected area of ecological value).

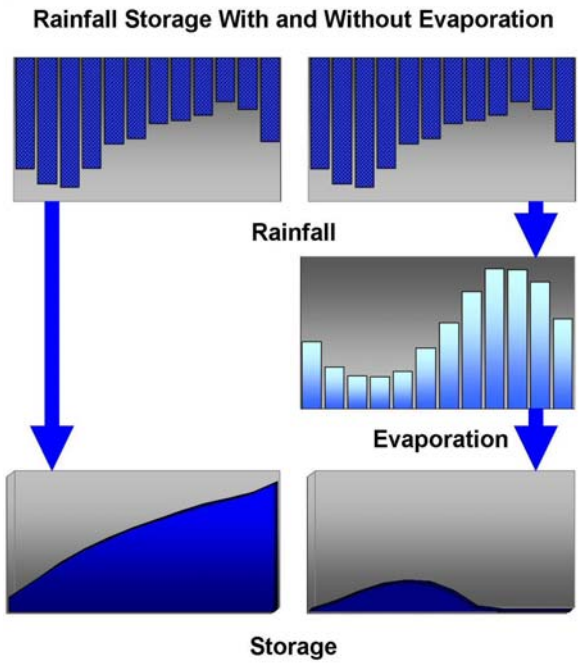
Aerial View of new Fire Training Ground

The most challenging element was the disposal of surface water from the 4660m^2 of paved training area because of the large volume of surface water mildly contaminated with pollutants. Disposal to a long sea outfall by culvert was not economically viable because the site was 2km from the sea.

The only acceptable option that was identified to meet the objectives was the use of an inventive concept of storing the rainfall runoff under the paved area in a lined geo-cellular storage cell (see picture bottom overleaf), and then disposing of it by spraying the water onto the paved surface and utilising climatic evaporation (this concept has now been patented UK Patent No 240681, International Patents Pending) combined with the reuse of some of the water for fire training. The system contains any contaminants to ensure they are not released to the adjoining environment.

A computer model was developed to simulate potential evaporation with average and extreme annual weather conditions at the site and the storage required when taking into account abstractions from the cell for water reuse. This established the viability of water management utilizing the evaporative disposal and water reuse. The mathematical model was used to simulate the day to day rainfall runoff and evaporation and calculate the storage required (see below). The model also used the highest recorded monthly and three monthly rainfall together with a contingency for climate change; for climate change all rainfall was increased by 10%. A storage volume of 2200m^3 was recommended after allowance for harvesting for other uses described below.

The stored water is applied to the permeable surface using water droplet sprays as opposed to fine



Annual Water Balance in FTG Storage Cell

mist sprays, to reduce the risk of drift beyond the boundaries of the site.

A real time computer control system was developed to match the rate of spray application to the continuously changing evaporation rate calculated from the prevailing weather conditions.

Once the fire crews have washed down and left the site, all rainfall and runoff is automatically diverted to an underground storage cell. There are then four destinations for the water:

- the bulk of water is disposed of through managed evaporation;
- some of the water is used to act as a drench for the rig to keep it cool during practice;
- some of the water is used as a wash down after practice;

and the water can also be used to top up the fire fighting tenders.

Construction of the below pavement storage cell

Evaporation is achieved using a system of 20 water jets placed around the fire training ground (see photograph top right) that apply water from the cell to the paved surface.

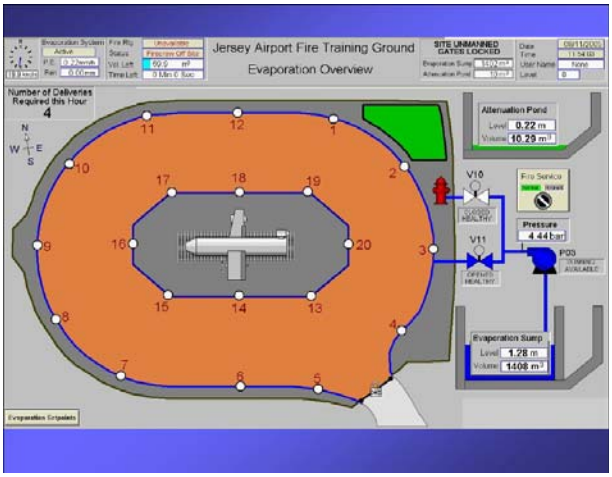
They are automatically switched on once a fire practice is completed and the vehicles have left the site, and when the on-site weather station indicates that there is sufficient evaporative potential. Wind speed and direction are constantly measured so that individual jets are switched on only if their spray will fall within the site boundary.

The system of water management is unique in that it contains and manages all runoff within the site, and except for a limited discharge to foul for the particularly polluted fire practice runoff, the site has no discharge to local watercourse or groundwater.

One of the 20 controlled, evaporation sprays

A SCADA (***S**upervisory **C**ontrol **A**nd **D**ata **A**cquisition)* system was developed for the FTG which programmes the water management of the site to operate in a predetermined way, in response to information received through monitoring (see mimic display below). The FTG can run unmanned and change its mode of operation. For example, when the fire crews enter the site through a key coded gate, the evaporation system is switched off and drainage is directed to the attenuation pond. On leaving the site, the on-site weather station linked to the control system constantly calculates the Potential Evaporation, delivering a set amount of water for each threshold of evaporation.

The Fire Training Ground was constructed and opened in September 2004 and the weather conditions, spray rates and stored volumes for the system have been continuously recorded and the evaporation system performance has been shown to exceed expectations with the pumping electricity cost estimated at only £26 a year.



SCADA control panel showing evaporation spray system