4. LIFELINES

As has been described in Chapter 3, soils in the affected areas are mostly stiff on the whole. For this reason, the earthquake did damage to lifelines in some limited areas with soft soil deposits. The damage to Moquega Sewage Treatment Plant is given herein as one example.

4.1 SEWAGE TREATMENT FACILITY

Figure 4.1 shows a plan of two oxidation ponds for sewage treatment in Moquegua. The upper and lower ponds have a capacity of 21000 and 13000 m^3, respectively, and have been cleaned every ten years. Their bottom is sealed with clay layer.

By the earthquake, the embankment on the downstream side of the lower pond suffered cracking in its crest (**Figure 4.2, left**). The total opening width of the cracks amounted up to 46 cm at maximum (**Figure 4.2, right**), and the residual settlement at the embankment shoulder was about 10 to 20 cm. In addition, the embankment between the upper and lower ponds became partly wet (**Figure 4.3**), suggesting a sign of piping. This location corresponds to a boundary between the original embankment constructed 40 years ago and the newer embankment re-constructed 6 years ago.

After the earthquake, in order to avoid instability of these embankments, the water level in both ponds were lowered by about 1 m. In order to cope with the current influent flow rate of 120 liters per second, which exceeds the design flow rate of 38 liters per second, the oxidation period had to be reduced down to 5 hours from the design value of 10 hours. These operations resulted into poor quality of treated water, which was used for irrigation purposes. Because the pipes to distribute the treated water were also damaged by the earthquake, it leaked into the adjacent Osmore River, affecting the quality of the river water.

It is reported that this sewage treatment facility will be closed after constructing a new facility on the downstream side, which would cover all the demand from the residential areas.

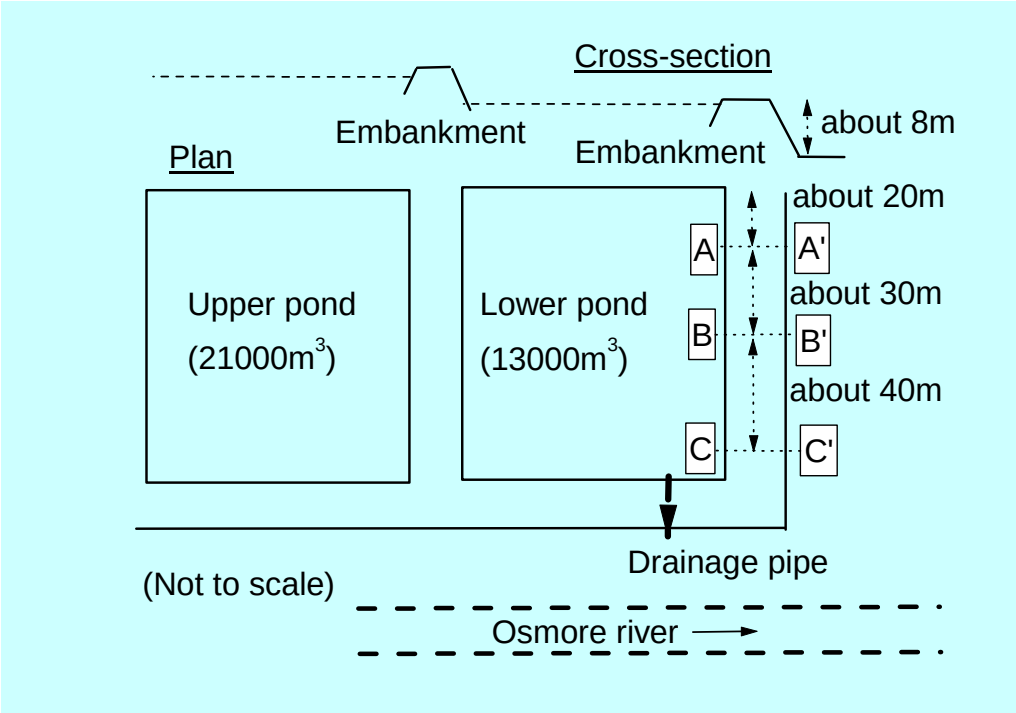

Figure 4.1. Plan of two oxidation ponds for sewage treatment

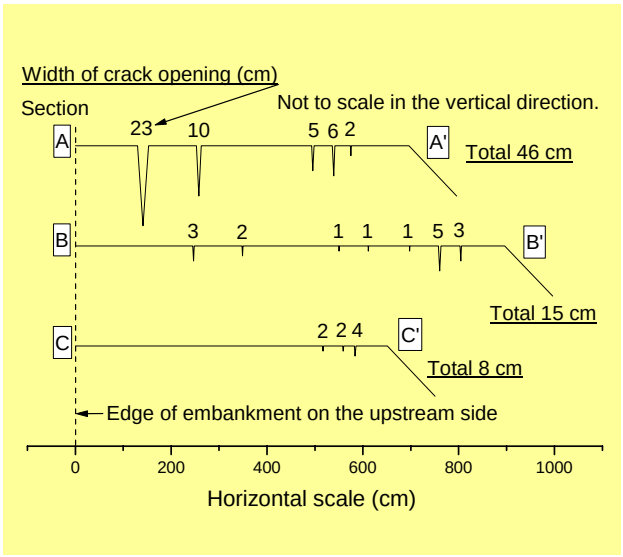

Figure 4.2. Longitudinal cracks

Figure 4.3. Embankment between the upper and lower ponds

(**4.1**/ *Junichi KOSEKI***,** IIS, University of Tokyo)

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