

THE INTERIM TECHNICAL MEASURES FOR PREVENTING MIGRATION OF DIOXIN CONTAMINATION IN DA NANG INTERNATIONAL AIRPORT

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Introduction

Reduction of agent orange/dioxin in the northern portion of the Da Nang International Airport (Fig. 1), where were the Former Storage Area, Mixing and Loading Area, Washing Area for the US aircraft that returned from defoliant spraying missions, is the emergent work for the local human health and environmental protection. Based on the data evaluation of Vietnam Ministry of Defense [1] and other international organizations such as Hatfield Consultant, Canada [2] it showed that Da Nang is the high dioxin contaminated soils and lake sediments at the Site (dioxin content > 360,000 ppt) are hundred times higher than the allowable standards (1,000 ppt for the none-agricultural lands and 150 ppt for the sediment). They needed to be applied the thoroughly and long-term treatment measures. Due to the financial shortage the thoroughly dioxin treatment measures could not be implemented, therefore it needed firstly to be implemented the interim measure for reduction of dioxin diffusion in the environment under the influents of weather and cultivation activities of the people who are living in the areas.

Materials and methods

In the frame of financial support from Ford Foundation, the Vietnamese and US experts of BEM (BEM System, Inc. has been retained by USEPA) in the field of dioxin remediation had been designed and implemented the construction of some integrated facilities with specific functions such as preventing infiltration and land erosion by surface concrete capping in the contaminated area at the end of runway; monitoring; collecting sediment and sludge in the surface water (mainly run-off water) from the dioxin contaminated areas by constructing the new settling tank and special filtration systems, enhancing the edges of drainage ditch; reducing the flow rate of water inlet from the airport entering the Sen Lake in the rainy seasons (because of heavily dioxin contaminated lake sediment) by constructing the new reservoir and overflow dam; warning and ban on aquaculture, fishing and harvesting of aquatic organisms/products in the contaminated area; reinforcing the fences and sentry boxes; warning signs indicating dioxin contaminated areas to keep unauthorized personnel from entering these areas.

Results and discussion

The above mentioned facilities had been constructed in the period of September 2007 to February 2008 (Fig. 2) and implemented in time, functioned to ensure the quality agreed the designed structure. These integrated facilities will be contributed controlling the contaminated areas and step-by-step to establish the general measures for treatment of contaminated soil and sediment in the future. The technical information of the facilities is described as the followings:

The dioxin contaminated area had been capped covering almost 6,900 square meters of steel wire-reinforced concrete with the thickness of 15 cm according to the BEM's standard. The concrete cap with the relative good impermeability and high durability will adequately prevent the infiltration of storm water bring the dioxin into the lower soil layer which can cause the groundwater source contamination. Moreover, the concrete cap is also used for preventing the erosion from the storm water and transporting contaminants from the contaminated area to the neighbouring areas, consequences reducing the contaminated pervasiveness.

The total area of the end of runway is approximately 63,000 square meters. The content of dioxin in the soil is from some thousands ppt to some hundred thousands ppt. The concrete area of 6,900 square meters was capped on this area and the area of more than 13,000 square meters is free ground with brown and dark-brown colors solidified surface and the area is sparsely vegetated. Due to weather and topography of the contaminated area (the average height of 6.0-6.5 m at sea level) the contamination was transporting down to the Sen Lake (the average height of 1.5-2.8 m at sea level) for past years. The settling - filtration tank had been constructed in the

contaminated area since 1998-1999 for evaluation and studying of preventing ability of dioxin contaminated pervasiveness. Based on the average rainfall in the rainy months (from September to December every year) in Da Nang the new settling–filtration tank was designed and constructed for controlling and filtrating all the amount of storm water in the contaminated area. The settling-filtration facility can be used for removing 50-80% the suspended solids in the water before entering the water body. The settling-filtration facility comprised two stages: settling and filtration. The settling tank consisted of a number of compartments. Filtration tank consisted of sand and granular active charcoal layers. Storm water infiltrate with the direction of below to top flowed through filtration layers. The advantage for this filtration facility avoids clogging and combination between sieving and gravity filtration. The disadvantage is that required large tangent surface, limited filtration capacity. However, this system is self operation and not required direct operator and it is appropriate for the dioxin contaminated area in the irregular weather.

The investigation of ability of deflect freshet for the rain in torrent in 1995 on the overflow dam and mathematic models had been done by the experts in the collaboration with the Dynamic Solutions International, LLC, USA in Vietnam. The modeled results (Fig. 3) showed that the overflow dam measure is feasible and effective for flow controlling and reduction of Sen Lake contaminated sediment sweep away. The overflow dam consisted of one compartment (length of 34 m, width of 5 m) and one flow channeling and driving dam (length of 34 m, width of 10 m) was constructed at the end of drainage ditch which leading run-off water from the airport through the contaminated area entering the Sen Lake. This dam was constructed and operated for the effective reduction of dioxin contamination and pervasiveness into the environment.

The above Interim Technology Measures for Preventing the Dioxin Contamination Pervasiveness with the specific function and integrated functions will give an adequate efficiency for contribution of reduction and control of dioxin contaminated soils in the contaminated area. The practice affectivity of each unit will be further monitored and evaluated in the coming periods.

Fig. 1. The former herbicide storage area in Da Nang during the Vietnam War (left, source: US DOD) and remains in recent situation (right)



Fig. 2. The settling-filtration tank (left) for controlling run-off water and the overflow dam for controlling water flow to the Sen Lake (right)



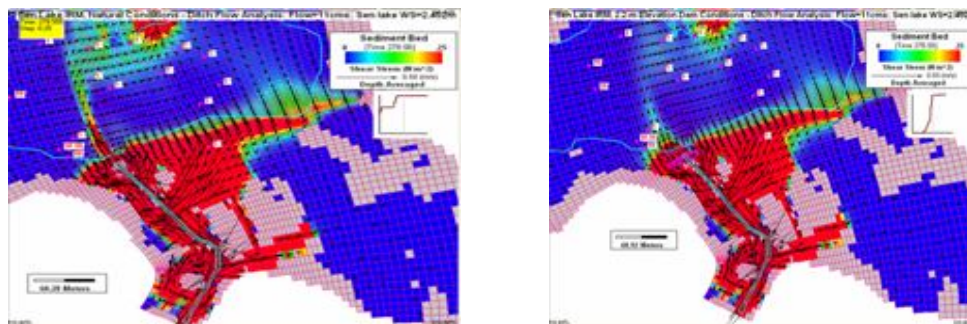


Fig. 3. Characteristics of flow to Sen Lake without (left) and with the overflow dam constructed (right)

References

1. Net NX. Sub-Research Project in the Z2 Project, MOD 1999.
2. Draft Report of Hatfield Consultants, Canada 2007.