

**Confirmed Minutes of the 98th Meeting of
the Environmental Impact Assessment Subcommittee
held on 17 September 2007 at 3:30 pm**

Present:

Dr NG Cho-nam, BBS (Chairman)
Mr TSANG Kam-lam (Deputy Chairman)
Dr Dorothy CHAN, BBS
Mr Edwin LAU
Prof POON Chi-sun
Mr Simon WONG
Dr YAU Wing-kwong
Prof LAM Kin-che, SBS, JP (ACE Chairman and non-EIASC Member)
Ms Josephine CHEUNG (Secretary)

Absent with Apologies:

Ms Betty HO
Prof Paul LAM
Dr MAN Chi-sum, JP

In Attendance:

Mr Elvis AU	Assistant Director (Environmental Assessment), Environmental Protection Department (EPD)
Mr CHAN Jee-keung	Acting Assistant Director (Conservation), Agriculture, Fisheries and Conservation Department
Mr KWAN Chung-kit	Office Manager (CBD), EPD
Miss Sarah NG	Executive Officer (CBD), EPD

In Attendance for Agenda Item 3:

Dr YEUNG Hung-yiu	Principal Environmental Protection Officer (Sewerage Infrastructure), EPD
Mr Simon HUI	Principal Environmental Protection Officer (Regional Assessment), EPD
Mr Stanley LAU	Senior Environmental Protection Officer (Regional Assessment) ³ , EPD
Mr W H KO	Assistant Director/Sewage Services, Drainage Services Department (DSD)
Mr W W CHUI	Chief Engineer/HATS, DSD
Mr Lawrence HO	Senior Engineer/HATS, DSD
Mr Alex KWAN	Director, Maunsell Consultants Asia Ltd. (MCAL)
Mr Alan KWOK	Director, MCAL

Mr Josh LAM	Associate, MCAL
Mr James CHAN	Associate, MCAL
Ms Echo LEONG	Senior Engineer, MCAL
Ms Amy CHEUNG	Senior Environmental Consultant, MCAL
Mr Wilson KWOK	Environmental Consultant, MCAL
Ms Carol TSE	Assistant Environmental Consultant, MCAL

Action

Agenda Item 1: Confirmation of the Draft Minutes of the 97th Meeting held on 19 March 2007

The Chairman informed Members that the draft minutes of the 97th meeting had been circulated to Members in May 2007. Members had confirmed the draft minutes by circulation.

Agenda Item 2: Matters Arising from the Minutes of the 97th Meeting held on 19 March 2007

2. There were no matters arising from the minutes of the last meeting.

Agenda Item 3: Environmental Impact Assessment Report on Harbour Area Treatment Scheme (HATS) – Provision of Disinfection Facilities at Stonecutters Island Sewage Treatment Works *(ACE-EIA Paper 7/2007)*

Internal Discussion Session

3. The Chairman informed Members that two sets of public comments received by the Environmental Protection Department (EPD) during the public inspection period from 16 August to 14 September 2007 had been referred to Members for reference before the meeting. Separately, some Council Members had raised some questions to the project proponent, the Drainage Services Department, and had requested the project proponent to provide notes of the public consultation sessions on the EIA study. The responses of the project proponent to Members' questions and the notes of relevant public consultation sessions had been circulated to Members for information before the meeting.

4. The meeting agreed that the discussion should focus on the

justifications for the project, selection of disinfection options, impacts on water quality, impacts on marine ecology and fisheries, human health and ecological risks as well as Environmental Monitoring and Audit.

(The project proponent team joined the meeting at this juncture.)

Presentation Session

5. Mr W H Ko briefed Members on the background and purpose of the project. Mr Alan Kwok briefed Members on the findings of the EIA study.

Question-and-Answer Session

Justifications for the project

6. A Member expressed concern about the need and beneficial gain of the project having regard to the substantial financial resources required and the anticipated improvement in water quality of the western harbour after completion of the regional sewerage improvement schemes as well as the HATS Stage 2A for expanding the capacity of the Stonecutters Island Sewage Treatment Works (SCISTW) and Stage 2B for provision of secondary sewage treatment facilities. Mr W H Ko explained that without the disinfection project, the water quality of Tsuen Wan beaches could not be restored even with the completion of regional sewerage improvement schemes, which could only arrest the local pollution problems, and would remain jeopardized by the un-disinfected HATS Stage 1 effluent. More than \$700 million had already been spent on improving local sewers to address the local pollution problems at Sham Tseng, Ting Kau and Tsing Lung Tau areas. Mr Lawrence Ho added that branch sewers were being extended to nearby villages at an estimated cost of about \$100 million, the last phase of which was expected to be completed in 2009 to tie in with the completion of the advanced disinfection facilities (ADF) which would substantially reduce the *E. coli* levels in the western Harbour and Tsuen Wan beaches.

7. Mr W H Ko further explained that if disinfection facilities were not put in place, the water quality level of the western harbour would be even worse than that under Stage 1 due to the anticipated increase of 450,000 m³ sewage flow per day conveyed under Stage 2A from the Hong Kong Island to SCISTW for

centralized treatment and disposal. For HATS Stage 2B, the timetable had yet to be reviewed in 2010/11 and hence Stage 2B might only be completed by 2020 the earliest. Thus, the Tsuen Wan beaches could not be considered for re-opening before the completion of Stage 2B if the disinfection facilities were not put in place. Even with the provision of secondary treatment facilities under Stage 2B, modelling results showed that due to high variability of the marine condition, the water quality in some of the beaches might at times still fall below the required *E. coli* standard if disinfection facilities were not provided.

8. A Member enquired about parameters other than *E. coli* which would affect the water quality and thus re-opening of Tsuen Wan beaches. Mr W W Chui explained that the water quality in Victoria Harbour had improved after implementation of HATS Stage 1. Even at the Tsuen Wan beach area, the levels of other parameters, such as biochemical oxygen demand (BOD), suspended solids (SS) and dissolved oxygen (DO), had also improved and thus were not of concern in considering whether the beaches could be re-opened. The only parameter which was of current concern was *E. coli*. Mr W H Ko added that the closure of Tsuen Wan beaches was mainly due to two sources, the HATS Stage 1 effluent discharge and local pollution sources. The proposed ADF, together with reduction of localized untreated wastewater discharges being implemented under the regional sewerage improvement schemes, were necessary to improve the water quality in the area and facilitate the re-opening of these beaches. As a large portion of the *E. coli* level at Tsuen Wan beaches was attributed to the HATS Stage 1 effluent discharge, the level could not be reduced to the acceptable level without the disinfection process.

9. A Member expressed concern about the modelling of water quality parameters other than *E. coli* which might prevent the re-opening of Tsuen Wan beaches even if the level of *E. coli* could be reduced to an acceptable level after completion of the ADF. Mr W W Chui explained that as the current EIA report focused on the impacts of disinfection, modelling was thus conducted on *E. coli* and related parameters such as total residual chlorine (TRC) and chlorination by-products (CBPs). Mr Lawrence Ho added that modellings of other water quality parameters for various water control zones (including Tsuen Wan beach area) would be conducted under another EIA report on HATS Stage 2A to be completed in late 2007. After implementation of HATS Stage 1, water quality parameters (including DO and SS) at Tsuen Wan beaches were found acceptable. With implementation of the regional sewerage improvement schemes and then

HATS Stage 2A, water quality other than *E. coli* in Tsuen Wan beaches would be expected to further improve and would not affect the re-opening of the beaches.

10. The Chairman said that the scope of the current EIA report was on impacts of the disinfection process in addressing the problem of *E. coli* attributed from the HATS Stage 1 effluent. The re-opening of beaches would depend on parameters related to health impacts (*E. coli* being the key parameter) rather than parameters related to water quality (such as DO and SS). Dr H Y Yeung said that the decision of whether to open or close a beach to the public rested with the Leisure and Cultural Services Department which would consult the EPD for advice.

11. The Chairman and a Member expressed concern about the need for dechlorination after the disinfection process. Mr Alan Kwok explained that dechlorination would be necessary to ensure that any residual chlorine (including free available chlorine and chloramines) remaining in the effluent after chlorination would be removed to avoid causing any environmental impacts. If the level of residual chlorine exceeded a certain concentration level, there would be toxic effects on some marine organisms. For the SCISTW, the concern would mainly be the toxic effects of chloramines on marine organisms. Due to the presence of ammonia in the effluent, the added chlorine would all be converted to chloramines which had less oxidative energies than free chlorine to react with most sewage organics to form any significant level of CBPs. The acceptable concentration level of total residual chlorine (TRC) was 0.38 mg/l based on literature research.

12. The Chairman enquired about the feasibility of operating the disinfection facilities only in swimming seasons from a cost-effectiveness perspective. Mr Alan Kwok confirmed that it was feasible for the disinfection facilities to be operated only in swimming seasons and to be closed in non-swimming seasons. This option had been looked into in the EIA study. Mr W H Ko explained that there would still be swimmers in winter months requiring the operation of the facilities on public health grounds.

Selection of disinfection options

13. A Member enquired about the experience of using chlorination for

disinfecting chemically enhanced primary treatment (CEPT) effluent in Hong Kong. Mr W H Ko confirmed that there was no such local experience. Ultra-violet (UV) radiation was used for some small-scale STWs in Hong Kong, such as those in Sham Tseng and Siu Ho Wan. Mr Alex Kwan explained that the considerations of selecting disinfection options were project-specific having regard to a number of factors, including the large scale of SCISTW, environmental setting of the existing outfall and the plan to upgrade the CEPT plant to secondary treatment plant under Stage 2B. Review had been conducted on the application of overseas experience. Overseas experience of using UV radiation on large-scale facilities was found significantly less when compared with the use of chlorination disinfection. The planned treatment capacity of SCISTW was 1.7 million to 2.5 million tonnes per day. Research of overseas examples showed that the processing capacity of the largest STW in the surveyed cities using UV radiation was about 680,000 tonnes per day while that of the largest primary treatment plant using chlorination was about 1.8 million tonnes per day. Making reference to the experience of proven application for large-scale STW with similar capacity would render more confidence in using chlorination for SCISTW. Another important consideration was that the existing SCISTW outfall was located in an area mainly used for marine traffic with low ecological and fisheries resources.

14. Mr Alan Kwok further explained that a multi-tier evaluation process was adopted for the selection of disinfection options for SCISTW. Under Tier 1, all available disinfection options were reviewed. Chlorination and UV radiation were found technically feasible in terms of functionality and provenness. Under Tier 2, both options were found environmentally acceptable with respect to marine water quality and human/ecological health. Under Tier 3, both options were found to comply with relevant environmental criteria. Under Tier 4, the two options were compared on various aspects, including scale-up factors, total life cycle cost, flexibility and implementation issues. Chlorination was a preferred option under all these criteria. Flexibility was a key criterion for HATS having regard to the upgrading plan. Under HATS Stage 2B, the demand for disinfection was expected to be greatly reduced. The use of chlorination would result in less abortive work. On the implementation issue, UV radiation would involve much more complicated installations and thus require a much longer timeframe.

15. A Member enquired about the use of membrane technologies

which did not require the use of chemicals. Mr Alex Kwan explained that there was no large-scale application experience available which could compare with the requirement of SCISTW and thus was not considered as a technically feasible option under Tier 1 of the evaluation process.

Impacts on water quality

16. The Chairman said that a Council Member had raised some written questions shortly before the meeting. As the written response from the project proponent was available and circulated to Members in the morning of the meeting date, he would like the project proponent team to elaborate the responses at the meeting to facilitate Members' consideration. One of the questions was about the possibility of underestimating the toxicity reference value (TRV) of two chemicals, chloroacetic acid and bromoacetic acid, as they were derived from the testing of freshwater species and might not be suitable for assessing the risk to marine species. Mr Alan Kwok explained that bromoacetic acid was not selected as contaminants of concern in the risk assessment. The first page of Annex B of the EIA report listed the criteria adopted in deriving the TRV, which showed the preference of marine species over fresh water species. Since no marine species data was available from literature on chloroacetic acid and dibromoacetic acid, their TRVs were therefore derived from freshwater species. Uncertainty factor was generally not applied for conversion of TRV for risk assessment in marine environment from freshwater species toxicity data, as reviewed in previous relevant studies and USEPA assessment protocol. Moreover, the hazard quotient of the chloroacetic acid and dibromoacetic acid were very low, application of an uncertainty factor of as high as 100 would not result in considerable increase to hazard quotient and hazard index level.

17. The Chairman said that another question was about the review of long-term monitoring results on water quality from overseas experience using similar technology. Mr Alex Kwan explained that discharge of effluent from a STW to receiving waters was regulated under the National Pollutant Discharge Elimination System in the US. All discharge permits specified effluent limitations and monitoring requirements. A routine monitoring programme (including LC₅₀ and C-NOEC) for receiving waters was required for all STWs with or without disinfection. When chlorination was adopted, limit for TRC was required. The monitoring of coastal discharge in the US was mainly based on industrial discharge and chlorine residue. For the case of Deer Island STW in

Boston, the results of the marine water monitoring were available on the website. The monitoring results of acute and chronic toxicity tests showed that there were no unacceptable environmental impacts on Massachusetts Bay arising from the discharge of chlorinated/dechlorinated effluent.

18. A Member enquired about the assessment of over-dosage of sodium bisulphite (the dechlorination agent which would be injected to the disinfected effluent prior to submarine discharge to remove any remaining TRC). Mr Alan Kwok explained that assessment had been conducted by evaluating impacts of sodium bisulphite on the potential of DO depletion in the water. The results showed that the impact on DO depletion was insignificant and the chemical had no toxicity effect.

19. The Chairman enquired about the monitoring of CBPs in the US. Mr Alex Kwan explained that CBPs were not of general concern under the US monitoring system on effluent discharge and they were mainly of concern in drinking water. Nonetheless, a more prudent approach would be adopted in monitoring the effects of the effluent discharge on the environment after chlorination/dechlorination was applied for the ADF.

Impacts on marine ecology and fisheries

20. In reply to a Member's enquiry about the impacts of the disinfection process on marine mammals, Mr Alan Kwok explained that risk assessments had been conducted for different phases of HATS Stage 2 (including ADF, Stage 2A and 2B). While there was no dolphin activity detected around the SCISTW outfall, very conservative assumptions were made by assuming that dolphins appeared 25% of the time at the outfall area and exposed to CBPs. Under the disinfection process plus existing pollutants, the hazard index on marine mammals was about 0.1 which was well below the USEPA hazard risk criteria of 1 to 10.

21. The Chairman said that another question from the Council Member expressed doubt about the conclusion of no adverse impacts on fish eggs and larvae based on the whole effluent toxicity test (WETT) results on five marine species. Mr Alan Kwok explained that the conclusion made in Chapter 9 of the EIA Report under Fisheries Impact that "fish eggs and larvae would not be adversely impacted by the chlorination and dechlorination effluent discharge" was

made not in the context of whole effluent toxicity but in the context of impact on fishery resources. This conclusion was derived from the following –

- (a) TRC discharge standard (0.2 mg/l) would be less than the TRC concentration of 0.31-0.38 mg/l reported in literature that could cause abnormal development of fish eggs and larvae. Actual TRC concentration at the edge of the zone of initial dilution after initial dilution of 34 times minimum would be considerably less than the discharge standard;
- (b) the nearest spawning ground was over 14 km from the SCISTW outfall;
- (c) the nearest nursery ground was over 40 km from the SCISTW outfall; and
- (d) Dichloroacetic acid would have the largest mixing zone among all CBPs detected, with a size of 1685 m X 2450 m in the wet season of year 2020. At the edge of this mixing zone, all CBPs detected would be at background levels. The CBP impact area was therefore inside this mixing zone, which was more than 10 km from the nearest spawning ground and more than 35 km from the nearest nursery ground.

22. In reply to the Chairman's enquiry about the sites of nearest fisheries spawning grounds, Mr Josh Lam said that the grounds were mainly at the southern waters of Hong Kong near Cheung Chau South and Lamma South which were about 14 km away from the outfall based on the information of Agriculture, Fisheries and Conservation Department. There was a fish farm near Ma Wan which was about 7 to 8 km away from the mixing zone.

Human health and ecological risks

23. A Member enquired about the impacts of CBPs, which were carcinogenic, on human life due to the passing of CBPs in the marine environment along the food chain. Mr Alan Kwok explained that risk assessments were conducted on aquatic life. The hazard index under the disinfection process was about 0.7 which was well below the USEPA risk criteria of 1 to 10. It was found

that the hazard index under disinfection process plus existing pollutants was about 3.4 which showed that the influence of existing pollutants was much more serious than that of disinfection process. In the Environmental Monitoring & Audit (EM&A) programme, a chronic WETT was recommended to monitor the impacts of existing pollutants on aquatic life.

Environmental Monitoring and Audit

24. A Member enquired about contingency measures in case the disinfection process turned out to be not as effective as anticipated in improving the beach water quality. Mr Alan Kwok explained that modellings conducted were based on very conservative assumptions and calibrated against *E. coli* monitoring data provided by EPD and the design chemical dosages were estimated based on two comprehensive bench-scale testing programmes. Contingency measures would include re-assessment of the dosages required to achieve the disinfection target.

25. A Member enquired about the determination of the maximum chemical dosage which was environmentally acceptable. Mr Alan Kwok explained that the design dosage was found to be about 11 to 15 mg/l based on bench-scale tests to achieve the disinfection target. Tests on marine organisms and chemical tests were however performed based on dosages up to 20 mg/l. The usual control of the disinfection process was on the TRC rather than on the dosage level. The maximum level of TRC in the effluent would be set at 0.4 mg/l.

26. A Member enquired about benchmarking of the dosage of sodium hypochlorite as compared with those used in the Deer Island STW. Ms Echo Leong confirmed that the dosage of sodium hypochlorite used in the Deer Island STW for primary treatment was in the same order as those proposed for SCISTW.

27. A Member enquired about the monitoring process to ensure that the disinfection process would not have adverse impacts on the marine ecology. Mr Alan Kwok explained that the EIA assessment results showed a large safety margin and the modellings were based on the worst-case scenarios. Reference had been made to the experience and monitoring information of the Deer Island STW. Moreover, EM&A would be conducted during the operation phase with emphasis on the concentration level of TRC and CBPs. Chronic WETTs on

effluent would also be carried out.

28. In reply to a Member's enquiry about the storage of sodium hypochlorite on the site, Mr Lawrence Ho explained that a total of six storage tanks plus one-day dosing tank were recommended for the storage of sodium hypochlorite for HATS effluent. The dosing tank next to the dosing point could hold a half-day dosage and pumping would be required only twice a day to transfer the sodium hypochlorite from the main storage tanks for use at the dosing point. This would facilitate the control of dosage level at the dosing point and reduce the operating problems and costs for continuous pumping directly from the main storage tanks to the dosing point which was more than 300 m apart. The daily volume of sodium hypochlorite for the ADF operation was estimated to be about 200 m³. The capacity of the main storage tanks was based on a 7-day storage at average design hypochlorite dosage and flow rate after taking into account various factors, such as reliability of supply, allowance for decay and avoidance of over-storage of chemicals. To minimize the rate of decay, the sodium hypochlorite would be stored in a shed house.

(The project proponent team left the meeting at this juncture.)

Internal Discussion Session

29. A Member considered that while there was pressure to re-open the Tsuen Wan beaches as early as possible, it was necessary to consider the need of the project from a wider perspective and most importantly the environmental acceptability of the disinfection process. Dr Yeung Hung-yiu explained that while HATS Stage 1 had brought about water quality improvement in the Victoria Harbour, the water quality in the western harbour including Tsuen Wan beaches had yet to be restored as effluent from previously dispersed discharges was now being disposed of via the SCISTW outfall. From an overall perspective of the HATS project, the current project aimed at addressing the outstanding issue of the HATS Stage 1 commissioned in 2001. The completion of the ADF would not only bring about improvement to the water quality of the Tsuen Wan beach area, but also that of western harbour in terms of bacterial content.

30. The Chairman said that based on information on available disinfection options, the chlorination option was considered acceptable. Moreover, reference had been made from overseas experience of proven

application of chlorination disinfection for large scale STW.

31. A Member was concerned about the generation of sludge after the disinfection process. Dr Yeung Hung-yiu confirmed that chlorination and dischlorination would not generate additional sludge as in the case of UV disinfection where a change in the chemical used for the CEPT process would have to be contemplated.

32. The Chairman considered that the fisheries nursery and spawning grounds were at reasonable distance from the mixing zone. A Member considered that while the use of chemicals should be minimized as far as possible, the treating of *E. coli* was necessary to restore the water quality of the western harbour. On balance, it was important to ensure that the impact of chlorination disinfection process was environmentally acceptable.

33. A Member considered that it was necessary to exercise control on the TRC concentration as well as the dosage of disinfection chemicals added to the plant. Another Member suggested that close to real time on-line monitoring could be put in place to avoid over-dosage.

34. In reply to a Member's enquiry about the monitoring programme, Mr Elvis Au said that the EM&A programme proposed that water quality monitoring concerning TRC and CBPs would be conducted four times during the first year of operation, and that WETT would be conducted once in the first year of operation of the project. On the WETT, Dr Yeung Hung-yiu explained that no standard chronic test using local marine species (except algae) was available in Hong Kong. The tests were being developed for Hong Kong. For now, water samples would have to be sent to overseas for testing purposes and even then only foreign marine species would be used. Two Members suggested that the monitoring programme during the operation phase could be enhanced. A Member agreed and considered that the monitoring programme should make reference to international best practices for similar large-scale disinfection facilities.

35. A Member suggested that a suitable emergency response plan should be put in place to deal with deviation of monitoring results from predictions.

36. Having regard to the findings and recommendations of the EIA report and information provided by the project proponent, Members agreed to recommend to the full Council that the EIA report could be endorsed with the following proposed conditions –

- (a) a suitable control mechanism should be put in place on the dosage of sodium hypochlorite and sodium bisulphate in the disinfection process to avoid over-dosage and adverse environmental impacts on water quality and marine ecology;
- (b) close to real time on-line monitoring should be conducted on the dosage of sodium hypochlorite and sodium bisulphate as well as TRC concentration at the inlet chamber to the submarine outfall and marine water quality as far as practicable;
- (c) the quality of the effluent discharge (including but not limiting to pH, BOD, SS, *E. coli*, TRC and CBPs) into the inlet of the submarine outfall should be able to meet the discharge limits to be established by the EPD;
- (d) the monitoring programme during the operation phase should be enhanced on the marine water quality for chemical parameters on TRC and CBPs as well as the whole effluent toxicity tests having regard to international best practices for similar large-scale disinfection facilities. The monitoring schedule should be enhanced by increasing the frequency of tests and subject to a period of review. The monitoring reports should be put on a designated website;
- (e) the results of the monitoring should be reported to the EIA Subcommittee of ACE on a quarterly basis; and
- (f) a suitable emergency response plan should be put in place to deal with deviation of monitoring results from the predictions in respect of water quality and marine ecological risk.

37. The meeting also agreed that there was no need to invite the project proponent to attend the full Council meeting.

Agenda Item 4 : Monthly Updates of Applications under the Environmental Impact Assessment Ordinance

38. Members noted the updates.

Agenda Item 5 : Any Other Business

39. The Chairman informed Members that the Secretariat would liaise with relevant parties and notify Members whether there would be submission of EIA report which required the deliberation of the Subcommittee in due course.

Agenda Item 6 : Date of Next Meeting

40. The next meeting was scheduled for 22 October 2007.

(Post-meeting note: The meeting scheduled for 22 October 2007 was cancelled.)