Annex B

EIA report on "Desalination Plant at Tseung Kwan O"

Summary of issues discussed by the Environmental Impact Assessment Subcommittee at the meeting on 14 September 2015

The Environmental Impact Assessment (EIA) Subcommittee (EIASC) discussed the EIA report on "Desalination Plant at Tseung Kwan O" at the meeting on 14 September 2015. The issues discussed were summarized below.

Impacts on marine ecology and corals

2. Members asked about the method and extent of submarine construction works as well as the dredging volume for the intake/outfall pipelines during the construction phase of the project. They were also concerned about the discharge of reverse osmosis (RO) concentrate during the operation phase and the potential impact on marine ecology and marine life, including corals identified near the intake and outfall locations, i.e. SR36 and SR37 respectively. Suggestion was made for the project proponent to conduct hydraulic modelling of northerly current flow (for both dry and wet seasons) which would disperse effluent and RO concentrate to show the potential impact on corals identified particularly in the vicinity of SR37. The proposal on coral translocation plan was also discussed.

3. In reply, the project proponent advised that micro-tunnelling method would be adopted for construction of submarine intake/outfall pipelines to minimize the extent of dredging works and the associated impacts on water quality and marine ecology. The estimated dredging volumes were 1 740 m^3 and 4 590 m^3 for seawater intake structures and outfall diffuser respectively, which were considered to be small in extent. While marine dredging would be inevitable during the construction phase for works including installation of above-seabed portion of the outfall diffuser and intake structures, measures to reduce the environmental impact due to the dredging works and volume of sediments would be planned in the detailed design, e.g. controlling the dredging rate and use of silt curtains to reduce dispersion of suspended solids. Sediment testing conducted had confirmed that the sediments within the proposed dredging area were uncontaminated. Application for a marine dumping permit would also be made for the disposal of sediments in full compliance with the Dumping at Sea Ordinance, Cap. 466. Advice from EPD supplemented that for small-scale excavation works including this proposed desalination plant project, mitigation measures would typically include control on dredging rate and dredging volume, and use of closed grabs and double silt curtains to

contain dispersion of suspended solids.

4. The project proponent further advised that based on the water quality modelling results under the worst case scenario with the ultimate discharge rate, the mixing zone where there might be a relative salinity elevation of over 10% would be highly localized without encroaching into the corals identified at SR36 and SR37 which were located around 80-100 m away from the intake and outfall locations. The increase of salinity at SR36 and SR37 was predicted to be around 1% to 2% from the modelling results. As the desalination plant would not be operating and discharging in its ultimate flow rate at its first stage of commissioning, the corals should be capable to acclimatize to the slight variation of salinity level in the surrounding waters. They had conducted toxicity studies which confirmed that the chemicals in RO concentrate, including anti-scalant, sodium metabisulphite and residual chlorine would be below the assessment criteria and not result in unacceptable effect to water quality, and hence minimal impacts on marine ecology and fisheries.

5. Members opined that the Environmental Monitoring & Audit (EM&A) programme of the project should include post-construction regular monitoring on corals identified at SR37 to ensure that the health status of the corals was kept in good condition. It was important to conduct regular monitoring of water quality impact during the operation phase as a mere 10% change of salinity level of ambient seawater would be hazardous to marine life including corals. Furthermore, Members considered that there should be substantial difference in the projected water quality impact when the desalination plant operated with an output capacity of 135 million litre per day (Mld) as compared with the operation at 270 Mld.

6. As regards the suggestion on translocation of corals, the project proponent advised that any translocation plan had to take into account the need and mobility of the corals in question, suitability of the recipient site, as well as the chance of survival after translocation. Most of the corals found at SR37 were small patches on seashore and bedrock. The EIA report had assessed that the translocation as proposed would not be necessary in light of the mitigation measures that the project would adopt.

7. In response to Members' question on the exact locations of the intake point and the outfall diffuser, criteria in determining the optimal length of the submarine pipelines, as well as the standards adopted in the hydraulic modelling on the impact assessment on corals, the project proponent said that the figures presented were based on the three-dimensional grid modelling system in compliance with EPD's requirement. With a view to minimizing the potential impact of submarine construction, trenchless method would be adopted for the installation of intake pipelines while dredging method with

suitable control measures be adopted for the outfall diffuser and concrete intake structures. The intake structures were required to reduce the intake flow rate while intake filters were to be built 1 - 2 meters above seabed. While the length of the submarine pipelines would be kept to the minimum to reduce disturbance to seabed, sufficient distance had to be provided for the outfall diffuser for adequate mixing and diluting the RO concentrate in ambient seawater. The diffuser was also designed to strategically align with the main current flow of Victoria Harbour to facilitate the dispersion process. Marine water monitoring stations would be established at SR36 and SR37, and continuous monitoring on the impact on corals be conducted during the operation phase and checking for potential exceedance cases. Apart from the concern on corals, consideration over dispersion efficiency, marine traffic and safety as well as other environmental impacts would have to be taken into account in devising the alignments and locations of the submarine pipelines, intake structures and outfall diffuser. Any proposal to further extend the pipelines would need to take into account potential impact on other sensitive receivers, e.g. mariculture in Tung Lung Island. The project proponent confirmed that the site for the submarine outfall as currently proposed had taken into account these factors with optimal tidal flow to facilitate dispersion.

8. On this, Members suggested that apart from evaluating the ecological impact on corals indirectly by monitoring impact on water quality, the project proponent should conduct regular on-site assessments to monitor any changes in coral coverage. An alternative was to invite AFCD to include the corals at SR37 in the Hong Kong Reef Check in their annual survey exercise for collecting updated data on coral distribution and trends of abundance.

[<u>Post meeting notes</u>: The project proponent provided clarifications based on the EIA report to address Members' concerns on possible current flow directing towards the corals at SR37 near the submarine outfall location and the dredging works for the intake and outfall utilities –

<u>Hydraulic modelling on current flow at SR37</u>

- *the prevailing current directions in the vicinity of the outfall area were northeast to southwest, parallel to the shoreline of Tit Cham Chau*
- *the corals at SR37 were located at northwest of the outfall; flow with current direction pointing towards the corals was not observed*
- *relevant figures illustrating the modelling results (with scale bars) were extracted from the EIA report to indicate the water current directions under the worst case scenario*

Dredging works for intake and outfall utilities

- *the proposed dredging works were of relatively small scale and would be confined to the intake point and the outfall diffuser*
- *the dredging rate would be reduced to about 750 m^3 and 3 500 m^3 per day for the intake and the outfall respectively*
- *duration of the dredging works would be 3-4 days and 1-2 days for the intake point and the outfall diffuser respectively*
- *the dredging works would not be carried out concurrently to minimize disturbance to the submarine conditions*
- *silt curtains would be used to reduce dispersion of suspended sediments]*

Ecological baseline survey for ecological assessment

9. Members enquired about the rationale of conducting ecological field surveys for only two occasions in dry season as opposed to four in wet seasons and whether the simulated study on the impact of effluent discharge on corals was conducted on the desalination plant operating at an output capacity of 135 Mld or 270 Mld. In response, the project proponent confirmed that all water quality modelling simulations were based on the maximum production capacity of 270 Mld so that the extent of the mixing zone and impact to corals could be analysed under the worst case scenario. During operation, the desalination plant would be gradually geared up to reach the first stage of production capacity of 135 Mld. Corals in the vicinity of the outfall area should be capable of acclimatizing to the condition. As regards the frequency/interval of field surveys, the project proponent explained that some fauna groups were generally more active in the wet season. Focused field surveys would be conducted mainly in the wet season and less in the dry season. For the desalination plant project, the EIA Study Brief had specified that field surveys of six months should be conducted to cover both wet and dry seasons.

Impact on fisheries

10. Members were concerned about the potential impact on existing fisheries resources and commented that the literature review in the EIA report on the fisheries study conducted in 1998 was not adequate as the study had not covered the project site and the surrounding waters. Members opined that with enforcement of the trawling ban in 2012, the depleted fisheries resources in Hong Kong should have gradually restored. The waters near Ninepin Group, Port Shelter and Po Toi Island at the outer ring of the project site were well-recognized fish spawning and nursery grounds. An updated baseline fisheries survey should be conducted before commencement of construction of the submarine works to verify the presence of any spawning and nursery grounds near the project site and to fine-tune the detailed design of the intake and outfall utilities as

appropriate. Members stressed that in the event of important fisheries stock being identified, mitigation measures should be adopted to reduce the impact and a requirement for regular monitoring of the fisheries resources be included in the EM&A programme.

11. The project proponent explained that the 1998 study was a territory-wide assessment on fishery resources in Hong Kong for mapping out recognized spawning and nursery grounds for commercial fishing. The intake point would be located more than 2 km away from recognized fish spawning and nursery grounds, and the intake utilities would follow environmentally friendly design with careful control of intake rate. In prioritizing resources available for fisheries field surveys, transact/monitoring station had not been assigned at the project site or the neighbouring waters. The project proponent advised that water quality monitoring stations would be set up at SR36 and SR37 during the operation phase and under the EM&A programme. The EM&A programme could include triggering levels for action so that the change in salinity and impact on marine ecology and fisheries could be closely monitored and timely appropriate remedial actions be taken.

Hazard to life and landscape and visual impacts

12. In reply to Members' enquiry about the risk assessment of chlorine drum storage, the project proponent advised that the Chlorination Store would be planned at the centre of the desalination plant and designed to store at maximum 37 tonnes of liquid chlorine contained in 1-tonne chlorine drums. Computational Fluid Dynamics (CFD) simulation runs had shown that the design would comply with EPD's acceptance criteria in terms of both individual risk and societal risk as stipulated in the Hong Kong Risk Guidelines of the Technical Memorandum on EIA Process.

13. In answering Members' enquiry on whether the project site could be shifted southwestward so that no works would be required on the natural slope within the Clear Water Bay Country Park at the northeast boundary of the project site, the project proponent advised that for the safety of the public (including country park visitors) as well as the construction workers and operators of the desalination plant, slope mitigation measures involving minimal disturbance to the natural slope were required to alleviate landslide risks and boulder hazard. Slope mitigation works would include rock and boulder stabilization, installation of flexible barriers for retaining the landslide debris and soil nailing for stabilizing the hillside. Tree felling within the country park would be avoided. They would take on Members' suggestion for referring to the Technical Guidance Notes of the Civil Engineering and Development Department (CEDD) in planning the slope mitigation works.

Waste management

14. For promoting wider use of renewable energy, Members asked for the exploration on the use of landfill gas generated from the nearby Southeast New Territories Landfill as an alternative source of power supply for the operation of the desalination plant and its ancillary facilities. Waste generated from the dredging works should also be re-used in-situ as far as practicable. The project proponent in reply advised that they had started discussion with EPD and the gas company on the matter. As regards the handling of construction waste from marine dredging and excavation works, the inert construction waste would be re-used in-situ as far as practicable. Any surplus would be transferred to the adjacent fill bank or other public fill reception facilities. The remaining non-inert construction waste would be disposed at landfills.

Water management

15. In response to Members' enquiry on the desalination process, the project proponent explained that permeate produced for potable water use constituted about 40% of the total seawater intake, while the remaining would be discharged as RO concentrate via the outfall.

16. In consideration that the desalination plant was expected to contribute 5% to 10% of the total freshwater demand in Hong Kong, Members enquired whether the aggregate freshwater supply was sufficient to meet the long-term water demand in Hong Kong especially in times of severe droughts. The project proponent said that the output capacity of 135 Mld freshwater by the desalination plant had taken into account the projected freshwater demand in 2020 and the possibility of sustained severe droughts resulting from climate change. The need for increasing the production capacity to the maximum of 270 Mld or constructing another desalination plant was dependent on freshwater demand at that time and the associated production costs which should reduce progressively with advancement in technologies. At present, the cost of producing one cubic metre of freshwater by the desalination plant was about $12 - $13, which was higher than that for supply of Dongjiang water at about $9 per cubic metre. As regards the carbon footprint for the desalination plant operation, the project proponent advised that seawater reverse osmosis technology to be adopted was more energy efficient when compared to conventional thermal distillation. With technological advances, alternative source of power supply such as solar energy and landfill gas would be further explored to support the operation of the desalination plant.

17. In response to Members' enquiry on the location of the volcanic vent as noted in the public comment, the project proponent advised that the volcanic vent was at the

seabed near Ung Kong in Sai Kung. As the desalination plant site was to be located on reclaimed land far away from the volcanic vent, any impact to the geology of the area would be negligible.

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

Conditions of endorsement

(a) The Project Proponent should conduct an updated fisheries survey as early as possible and in any case, not later than 12 months before commencement of the construction of submarine works to verify if there is any fish spawning and nursery ground in the vicinity of the planned location and alignment of the seawater intake and submarine outfall for fine-tuning of the detailed design of these facilities as necessary. Details of the baseline fisheries survey shall be drawn up in consultation with the Agriculture, Fisheries and Conservation Department (AFCD) for submission to the Director of Environmental Protection (DEP) for approval before commencement of the survey.

(b) The Project Proponent should include in the Environmental Monitoring & Audit (EM&A) programme of the project post-construction regular monitoring on fisheries in the vicinity of seawater intake and submarine outfall areas to ensure no significant impacts on fisheries resources. The EM&A programme should also include post-construction regular monitoring on corals identified in the vicinity of the submarine outfall area to ensure the health status of the corals was kept in good condition. Details of the fisheries and coral monitoring programme shall be submitted to DEP for approval prior to commencement of operation of the desalination plant.

Recommendations

(c) The Project Proponent should conduct further run(s) of the effluent dispersion model to ensure that the nearby coral groups near the submarine outfall will not be adversely affected under the most critical conditions including tidal water current or seasonal water current which will bring effluent or RO concentrate to the direction of the corals and typhoons which will blow the RO concentrate towards the corals. The Project Proponent should report the model run results to ACE EIA Subcommittee.

(d) The Project Proponent should explore the use of landfill gas as an alternative source

of power supply for the operation of the desalination plant and its ancillary facilities.

(e) The Project Proponent should carry out all slope mitigation works on the natural slopes within the Clear Water Bay Country Park in the northeast boundary of the desalination plant with reference to the guidelines and standards adopted by the Civil Engineering and Development Department, and prior written consent of AFCD should be sought for any proposed slope works inside the country park.

(f) The Project Proponent should minimize the generation of marine dredged materials and rock fills from the project, and these materials should be re-used in-situ as far as practicable.

(g) The Project Proponent should consider further mitigation measures to keep impacts on marine ecology and marine life to a minimum, including the use of double silt curtain, further minimization of both daily volume of marine sediments to be dredged and the dredging rate.

19. The meeting agreed that the project proponent team would not be required to attend the full Council meeting on the report.

EIA Subcommittee Secretariat
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